
Book Reviews

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1 Climatic Change and Global Warming of Inland Waters. Impacts and Mitigation for Ecosystems and Societies

by: Charles R. Goldman, Michio Kumagai and Richard D. Robarts

Published 2013

by Wiley-Blackwell

9600 Garsington Road, Oxford, OX4 2QD,

Chichester, UK, 472pp

ISBN: 978-1-119-96866-5 (hardback)

The effects of climate changes can hardly be underestimated. During the years to come, we shall face a warming world accompanied by rising sea levels and weather extremes that are already occurring. The globe is now warming at a rate sufficient to significantly alter the quality and the quantity of fresh and marine waters, and thus the life of the biota living in and around these water bodies.

This book is about changes that have occurred and are likely to happen in surface inland waters, both fresh and saline, as warming proceeds. The book is organised in three parts, of which the first is most impressive. Its 20 chapters describe and analyse the effects of a warming environment on inland waters from the Arctic to the Antarctic. In particular, lakes, but also rivers, wetlands, and their watersheds in all major biomes are discussed. The chapters illustrate how these changes vary considerably in different locations. Changes have already been well documented in the Arctic and the Antarctic, where critical regime shifts are already under way (chapters 1, 2 and 20). Of particular notice are, for example, chapter 6 on Lake Buwa (Japan), where a combination of eutrophication and global warming has caused the release of arsenic, resulting in repeated dead waves of fishes. The situation is interpreted as a lake having passed a tipping point, with a shift in the ecological regime due to climate change. In Lake Tahoe (California-Nevada, USA), domestic fishes have been replaced by exotic fish species, such as large mouth bass, which prefer warm water (chapters 14 and 15). Overall, the chapters show that climate changes not only alter the physical conditions (quantity, temperature) of surface water. There is now growing evidence for effects on fish reproduction, trophic relationships, littoral communities, sedimentological regimes, and enhanced methane ebullition.

Although some of these 20 chapters also address the impacts on humans (eruption of gas from the volcanic Lake Nyos in Cameroon, for example, was responsible for the death of local people and their cattle), the selected societal aspects are discussed in the two chapters constituting the section on 'impacts on societies': on the altered availability of grazing and water supplies in Mongolia and the growing water management problems associated with the booming megacities.

As a whole, the book points to the unmet need for long-term monitoring systems based on sound science. Without this information and the accompanying modelling work, it is hardly possible to generate effective management and policies to protect and save inland waters. The book further shows that current adaptation and mitigation strategies alleviating the problem are still experimental, and that no sustainable solution can be offered today. The main advocated policy lines are taking climate changes seriously, installing a transition towards sustainable energy, and improving the existing management strategies for inland water ecosystems. In the end, it is about recommending a new carbon-based environmental ethic that drastically reduces greenhouse gas emissions.

An impressive number of 80 scientists from about 20 countries ranging from Canada and Russia to New Zealand are the authors of the chapters. They include limnologists, hydrologists, modellers, and environmental engineers. Most of them are active in the World Water and Climate Network, which was established during the Third World Water Forum (Japan, 2003). Editing this impressive and well-illustrated book (of which some maps and figures are in colour) must have been a gigantic operation.

Limnologists, climate change biologists, freshwater ecologists, palaeoecologists and students taking courses on earth and environmental sciences, will find this book, which summarises over 2000 references to the scientific literature, most valuable. It is equally of interest for decision makers, engineers and planners dealing with the climate change-freshwater ecology interface.

2 Improving Crop Productivity in Agriculture

by: Narendra Tuteja, Sarvajeet Sing Gill and Renu Tuteja (Editors)

Published 2013

by Wiley-VCH Verlag & Co. KGaA

Boschstrasse 12, 96469 Weinheim, Germany, 518pp

ISBN: 978-3-527-33242-7

Worldwide agriculture faces a turning point: by 2050 it has to feed an estimated 9.2 billion people; agricultural land is limited and already today too many farmers use marginal environments; production is threatened by climate changes; in many places growing food both causes and is affected by pollution (nitrification, pesticide use, salinisation) and physical environmental problems (erosion, water availability). Improving crop production under adverse conditions in a long-term sustainable agriculture context becomes imperative, although demanding from the point of view of the carrying capacity of the environment. The possible contribution of genetic engineering to this process elicits mixed replies. While nutritionally fortified rice is most common in China, and soya with modified genes is a major export product in Brazil, the attitude in Europe is regarding these DNA changes as potentially harmful and entailing risks that are not worth taking.

This book offers a mainly Indian scientific perspective on the contribution of genetic engineering to increasing crop productivity. It focuses on crop production improvement under adverse conditions. The book presents a collection of 19 chapters, written by 55 high-level experts. The book is structured in three parts. The first one is entitled 'Climate change and abiotic stress factors', and is about environmental causes that stress productivity and food security. The section entails contributions not only on the effects of

the changing climate but also on acid soil tolerance in plants and the effects of tropospheric ozone. The 'Climate change and food security' chapter provides data on the extent of the problem: if policy remains unchanged the agricultural yields in India are estimated to drop by up to 20% by the year 2050 and the national GDP will erode annually by at least 1%.

Part 2 is about the ways for improving crop productivity in a changing environment. It includes five chapters describing a range of methods that act on protein kinases, rhizobacteria, plant viruses, stress tolerance and bio-fertilisers. Of conceptual interest is the chapter on beneficial viruses for plants. It shows that in some cases plants might benefit from viruses in reducing damage from both biotic and abiotic stress.

Part 3 is about applications of genetically modified plants. It contains chapters on graminoids (rice grain, millet and bamboo), leguminosa (groundnuts, chickpea, grain legumes, and pulse crops) and rosacea (*Fragaria* and roses). Of particular interest is the chapter on genetic modifications in rice, which is the most important staple food for a large part of the world's population. Therefore, even small improvements in the nutritional value, in particular the iron and zinc minerals content of the seeds, can have a significant impact on human health.

The over 500 pages of the book offer more than the analytical description of biological methods and examples of applications. They equally address the policy and economic implications of genetically engineered food. Overall, this book provides an up-to-date overview of recent progress in improving crop quality and quantity using current methods. The extended lists of references (some 100 to 150 per chapter) added to each chapter contribute to the documentary value of the publication. Also, from an editorial and publishing point of view, this book is excellently presented with a wealth of tables, graphs, maps, and figures. In view of the comprehensive scope of the book, it is a pity that a concluding chapter putting the essential data provided in context, is missing.

Readers in the field of agriculture, and particularly in abiotic stress management, biotechnology, and plant recombinant DNA cooking, will find this book very useful. This readership is found both in biotechnology and agro-industries, and in academia.

3 Ingrained. A Human Bio-geography of Wheat

by: Lesley Head, Jennifer Atchison and Alison Gates

Published 2012

by Ashgate Publishing Limited

Wey Court East, Union Road, Farnham,

Surrey, GU9 7PT, England, 232pp

ISBN: 978-1-4094-3787-1 (hardback); ISBN: 978-1-4094-3788-8 (ebook)

Interested in the common ingredient of ice-cream, hairspray, paper and milk? Do you want to know about the physical relation between pet food, vaginal pessaries, (post-) Saddam Husain's Iraq, and financial markets from Singapore to Chicago? You will find the answer in the intriguing 'Ingrained. A human bio-geography of wheat'. The book offers a comprehensive analysis of a variety of physical-ecological and cultural aspects of wheat. Data are organised in a life cycle approach. This entails (among others) the evolutionary origin of the grass, where and how it is grown, and how it is turned into food, and offers an analysis of the opportunities and threats on the plant in the future. The

book pays ample attention to the human-wheat relationships: its role as a food, its significance for food supply and development, and the threats of (climate change accelerated) drought.

Next to an introductory chapter, which provides an overview on the subject and a somewhat meagre conclusion, the book entails eight chapters. These are structured in two parts.

The first part is theoretical. It takes off with ontological discussions such as ‘what is a plant?’, introduces the concept of ‘plantiness’ (the essential elements that constitute a plant), and discusses how early wheat was domesticated, spread, and became a global commodity. The section pays special attention to wheat-dominated landscapes and the importance of these landscapes in reading nature.

The ‘empirical’ part is about the seasonal wheat cycle on farms, shows that its transport is complex and consumes high amounts of energy, and analyses how wheat becomes food (bread, pasta). Of particular interest is the challenge of the simple equation that local food equals sustainability. The case study on organic flour, as it moves around Australia, is the basis for a discussion. The section is concluded by reflections on the wide variety of uses of wheat and its future, which is subject to drought stress.

The book provides a kaleidoscopic, multi-disciplinary view on a wide variety of uses of wheat. Bio-geographical, ethno-botanical, evolutionary, economic and policy aspects are integrated in this book. This results in a most educated environmental view on the origins, transformations and applications of wheat. The theoretical discussions are illustrated with most interesting examples, merely from Australia.

This is a narrative book. It is illustrated by a series of well selected black and white photographs. The number of tables (and the related quantitative data) is limited.

The authors are employed at the Australian Center for Cultural Environmental Research (AUSCCER) of the University of Wollongong. They provide a book which is engagingly written and theorised, of a high academic standard, and a common subject approached in a non-conformist way. Moreover, the book emphasises the cultural dimension of the environmental debate, a factor that is often given insufficient attention.

This publication appeals to an audience searching for new ways of interdisciplinary thinking, as it integrates rural, urban and industrial frontiers, and offers both local and global perspectives.

Book Review

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The Mortal Sea

by: Jeffrey Bolster

Published 2012

by The President and Fellows of Harvard College

Cambridge (Massachusetts) and London (England), 378pp

ISBN: 978-0-674-04765-5 (alk. paper)

This book describes the history of fishing from the early 16th century until the late 19th century, in front of the east coast of the Northern USA and Canada. This is the era of non-motorised fishing, although by the end steam vessels and diesel engines appear.

The book describes in the first place, the history of a conflict between man and the sea as a provider of food, and other raw materials of which the importance has declined today (e.g., fish oil as a fuel for lights). The focus is on man's capability of destroying the marine and estuary ecosystems by piling stocks, and destroying biotopes, especially in breeding grounds.

In this sense, 'mortal' in the title should be read as 'capable of causing death', but also as 'subject to death'. It is remarkable to read how humans for centuries could not accept that the natural resources of the sea are limited.

The historian Bolster takes his audience back to the Middle Ages and describes how the feeding patterns changed from freshwater fish to marine fish, bird and mammal species. These changing food patterns were influenced by the Vikings, the church and the degradation of the river ecosystems. Consequently, this pushed sea fishing farther and farther away from the safe coast.

The discovery of the USA, and especially its alluring descriptions by the French explorer Jacques Cartier and the Englishman John Cabot (with Venetian roots), attracted quickly large-scale fishing in the waters bordering the coasts of Maine, Nova Scotia and Newfoundland.

The 21st century reader will be surprised that already during the 1520s thousands of French, British, and Basque fishers used these fishing grounds (only three decades after the discovery of the New Continent) to find cod, for example, after the European stock was decimated by overfishing. By that time, the north-eastern part of the Atlantic was abundantly species-rich. The book describes how the early settlers in North America used four menhagens for each corn plant as fertiliser!

For centuries hunting and fishing was ongoing in, what is called these days, an unsustainable way. The consequences were severe both for marine life and humans. Already at the beginning of the 19th century, a depleted ecosystem was the standard: whale, walrus, porpoise, and sturgeon were decimated; the giant auk was eradicated.

Those who think overfishing is a recent phenomenon are wandering. The alienation of humans from nature went on from the beginning and the reply to the growing problem of loss of fish stocks was unvaried. Experienced experts noticed what was going on and advocated reversing the declining trends of the stocks. The (local) authorities were, however, incapable of establishing proper regulation. They faced a lack of scientific data and knowledge. Moreover, at the time the first regulations appeared, they were hardly implemented by weak authorities.

The reply to the problem included changing the catch: from cod to herring, mackerel, halibut (difficult to salt and smoke), lobster and other crustaceans. The technology was modernised: from hook to net fishing. The consequences were more intense impacts on the ecosystems.

The author describes how the 19th century faced its fishing revolution: underused species were targeted, net fishery expanded dramatically, and long lining hook fishery with hundreds of hooks resulted in an exponential growth of the catches. All this increased the volume of fish unintentionally killed, while railroad transport of ice-conserved fish allowed providing more consumers. Considerable capital was invested in fisheries, vessel design changed radically, and subsidising systems ended, forcing fishermen to squeeze more profit from the ecosystem. Governmental policies changed: fish hatching was introduced in combination with artificial propagation. This contributed to the illusion that the resources could be restored, *quod non*.

In the end, the results were disastrous: the US fishing fleet had to go as far as the British Isles: the reverse of what happened during the 16th century!

After all, it is the same old story: humans destroy their own livelihoods driven by greed and lack of a long-term vision, and because, as a rule, ecosystems are not understood.

J. Bolster is an historian with an impressive knowledge of the sea. The book is excellently documented and based on authoritative research. The amount of references, documents and archives that the author consulted is enormous.

The book cultivates a high scientific standard. Therefore, it is odd that the author does not resist devoting a chapter to the curious story of an enormous sea monster/snake that was observed (and hunted) and finally proved to be a school of tuna!

Sometimes, an exaggerated amount of knowledge is displayed. The non-biologist has to deal with too detailed lists of fish, birds and other species. The same applies to the description of fishing techniques: for non-sailing landlubbers the description is often 'Fischer Latin'. Luckily the book contains a glossary that lists, in alphabetical order, the used terms of fish and fishing techniques.

This book differs from most of the books reviewed in this section. It is not about contemporary environmental frontier research. It looks back into historical times and describes, in a documented and convincing way, how slowly the learning process of sea stock management has evolved. It is compulsory reading for all researchers on marine science and management. The book offers a remarkable promotion of modesty in the progress of their findings.