

Preface

The impetus for this book is fuelled by the recognition that a growing number of marine scientists, geographers and marine managers around the world are increasingly asking questions about the marine environment that are best addressed with a landscape ecology perspective, yet few are aware that it exists. There is a substantial gap in the academic knowledge base, which if left untreated will leave a new generation of researchers without the benefits that the more cohesive and well-established marine science subjects provide. That emerging subject is seascape ecology – the application of landscape ecology to the seas.

This book includes a collection of contributions from researchers who are active at the frontiers of seascape ecology and are beginning to refer to themselves as seascape ecologists.

Their unique contributions encompass the concepts, methodology and tools and techniques that demonstrate the importance of a seascape ecology approach in ecology and marine management. The book captures the state-of-the-science in seascape ecology and provides guidance for future research priorities. We also feature a special epilogue, which presents the perspectives of three eminent landscape ecologists, who have been and continue to be instrumental in the development of modern landscape ecology. In fact, this final chapter serves equally well as a prologue for the book!

Many of us drawn to seascape ecology have an affinity with maps, spatial patterning and scale awareness. Today, as a society, we are immersed in spatial information. I have long held a fascination with pattern and scale in nature, perhaps from childhood, where my parents encouraged me to be mindful of plants, animals and ecological relationships in our small urban garden in South London and the many places that we were fortunate to visit around the world. At school, I was captivated by geography, particularly plate tectonics and the linkages between distant flora and fauna which once shared the same land mass. My first scientific research projects, however, involved identifying and counting dinoflagellate cyst assemblages in Scottish sea lochs followed by a research scholarship with Howard Platt in the Nematode Research Unit of the Natural History Museum in London, where I filtered sediment samples and identified nematodes and other meiofauna to assess impacts from a gas refinery in the Thames estuary. Long hours sat at the microscope not only indelibly etched the fine microstructures of these tiny but extremely important organisms into my memory but also helped me to decide that microscopic was not the resolution at which I wanted to focus my career as an ecologist.

My interest in applying landscape ecology to the sea was realised with my doctoral research and the challenge of mapping ecologically meaningful habitats for highly

mobile fishes in Queensland, Australia. Fishes in nearshore areas of Moreton Bay were undergoing extensive (>1 km) daily tidal excursions across spatially complex seafloor connecting subtidal seagrasses with intertidal seagrasses and mangroves. It became clear that to understand fish-habitat relationships required an approach capable of considering structure at a range of spatial scales relevant to the way that animals used space over time. To do this needed remote sensing, geospatial tools, and a different conceptual framework than anything I had considered before.

Since my doctoral research at the University of Queensland, where I had the unconventional but greatly influential, experience of working alongside a terrestrial landscape ecologist studying koalas and a remote sensing expert mapping coral reefs from space, I have been fascinated and excited by landscape ecology. Had I not left the familiar mindspace of marine zoology to venture out through the more holistic geographical sciences, and so fusing the two conceptual frameworks, I would probably not be writing this now. Although they had little interest in fish ecology, I owe my doctoral committee my gratitude for introducing me to the landscape ecology literature, where my new academic heroes became the likes of John Wiens, Kevin McGarigal (creator of FRAGSTATS software), Lenore Fahrig, Jingle Wu, Dean Urban and others.

My interest in applying landscape ecology to the marine environment led to my joining NOAA's Biogeography Branch, a globally rare team of applied marine spatial ecologists and technicians in the United States working intensively at the interface between geospatial science and management. It was here that I learnt how seascape ecology can be applied to address complex marine management problems and this book owes a lot to the technical expertise, proactive approach and boldness for innovative thinking demonstrated by the Biogeography Branch of the National Centers for Coastal Ocean Science.

Although the draft contents for a book on seascape ecology had been languishing (but never forgotten) in my 'Papers in Progress' folder since 2007 when I first brainstormed the project with Professor John Wiens, the then Chief Scientist of The Nature Conservancy, it was not until I was invited to speak on the topic at the Plymouth Marine Lab lunchtime seminar programme in 2013 that the vision crystallised. My presentation titled 'Taking landscape ecology into the sea' was seen by a commissioning editor for John Wiley & Sons who encouraged me to submit a proposal for a book, which then underwent academic peer review. After approval, the project slowly began to take shape, yet for the most part I had to fit it around my day job and a busy family life.

Fortunately, the time spent living and working as a marine ecologist in Australia, the United States of America, the Caribbean and in Europe enabled me to form a network of like-minded and specialist marine spatial scientists who provided an immense and valuable shortlist of potential contributors. I was delighted and relieved by the enthusiasm with which these individuals accepted the challenge and in the end we had 16 chapters from 36 authors based in Australia, the United States and various European countries. Thank you authors for accepting my guidance and my suggestions, which, I know, for many of you, pushed you a little deeper into the landscape ecology way of thinking than you had been before. I hope the process was interesting and will influence your future research directions as we consolidate and build a new discipline in the marine sciences.

We are hopeful that the individual parts of the book stimulate interest, provide useful specific guidance, and act as a catalyst for future studies that will reveal exciting new ecological insights. Furthermore, we hope that the book in its entirety generates

sufficient synergy to support the continued evolution of seascape ecology as a distinct discipline.

We are grateful for the focused time provided by reviewers which included several of the chapter authors, as well as the following external reviewers: Siân Rees (Plymouth University), Carrie Kappel (National Center for Ecological Analysis and Synthesis, University of California Santa Barbara), Charlotte Berkström (Department of Ecology, Environment and Plant Sciences, Stockholm University), Ron Kneib (RTK Consulting Services and University of Georgia), Nicola Foster (Plymouth University), Katherine Moseley (Seascape Analytics Ltd), Dave Whitall (NOAA National Centers for Coastal Ocean Science), Patrick Crist (NatureServe), and Manuel Hidalgo (Balearic Islands Oceanographic Centre).

*Simon J. Pittman
Plymouth, UK*

PART I

Spatial Patterns in the Sea