

*David H. Secor: Migration ecology of
marine fishes*

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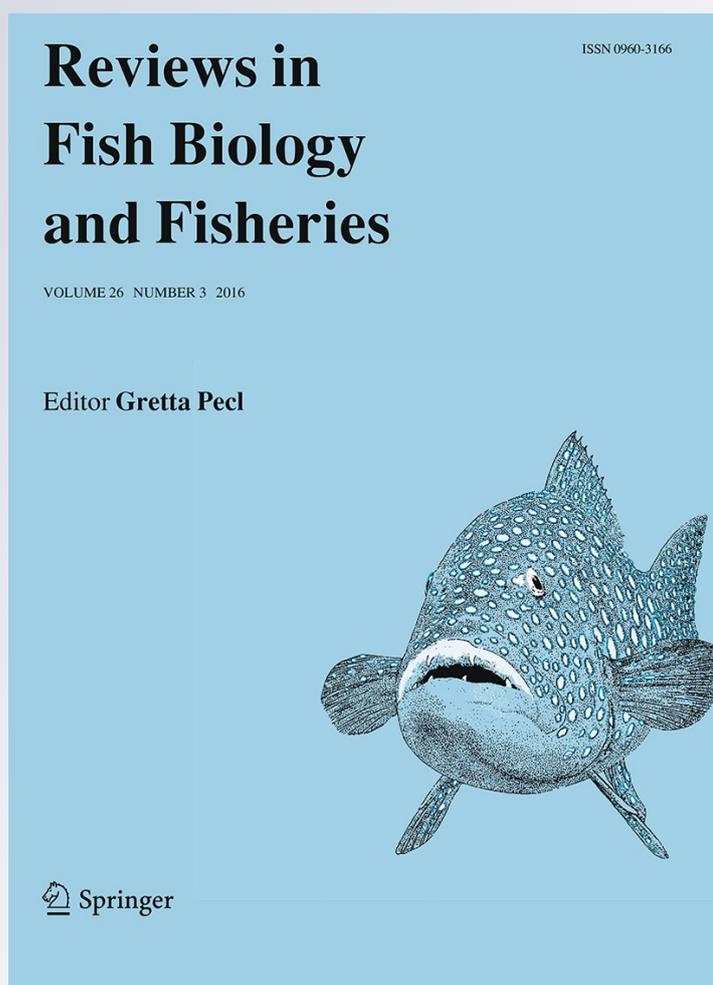
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David H. Secor: Migration ecology of marine fishes

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Migration Ecology of Marine Fishes by David Hallock Secor provides an overview of fish migration and its underlying causes, building on the framework of Harden Jones' (1968) original and only comprehensive review on migratory fishes. In seven chapters, Secor summarizes and explains the latest research and developments on fish migration and its organization as a collective agency.

This book was reviewed by students at the Master's level in a Marine Fisheries Ecology and Management course. The suitable audience for this book includes graduate level students or professionals with a background in ichthyology and marine fish ecology. It should be read by those interested in the migration ecology of fishes and its underlying propensities, or professional fisheries scientists seeking a deeper understanding of the migration ecology of fish.

The introduction familiarizes the audience with migration as a conditional concept, dynamic and dependent on biotic and abiotic factors. It also describes migration as an ecological event in which Secor analyzes its consequences. It outlines subsequent chapters and shows that the propensity to migrate depends on organismal and phylogenetic constraints, mating

systems, larval dispersal, systems of inheritance, habitat resources, climate and ocean forcing and anthropogenic pressures through fishing and habitat alteration.

Chapter 2 covers the physiological movement and constraints of fishes and explains how the digital age has contributed to the ability to track and assess fish movement. The influence of current fish tracking technology becomes particularly obvious when compared to the limited ability to track migratory birds. For example, telemetry is used to track fish location during migration, but also their proximity to other individuals. Both fish and birds exhibit similar patterns of aggregation and depend on common vertebrate navigation techniques.

Chapter 3 reviews mating systems and larval dispersal with a focus on collective agencies. These agencies counteract the dispersive environment, where sperm is dispersed from eggs and larvae from the spawning grounds. It also considers mating behaviors and aligns mating systems and larval dispersal with oceanographic factors.

In the 4th chapter, Secor examines how life cycles are adapted to marine food webs, particularly emphasizing the important role of size in shaping complex life histories of marine fish. Broadening the definition of migration from the traditional spatial scale, Secor discusses how fish trophically migrate through the marine size spectrum. Strategies that arise from this migration result in trade-offs between survival, growth, and fecundity.

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Different population structures are explored in Chapter 5, where different life cycles confer specific abilities to overcome challenges in a dispersive environment. Natal homing, imprinting, and genetic and cultural transmission are considered as closed life cycles but metapopulation structures can pose a challenge to fisheries scientists when considering populations as unit stocks because it is an artificial management concept, where homogeneity across the unit stock is unrealistic.

Chapter 6 reviews partial migration theory of marine fishes of the same population. The individual's migration behavior is determined by threshold responses to environmental conditions. Dominant modes of behavior can be rapidly modified due to genetic latency of multiple modes of behaviors in populations.

The final chapter examines migration and population structure as adaptations and resilience to fishing and environmental change. Resilience theory is employed to explain changes in fisheries stocks following overfishing but is also applied to, for example, climate oscillations. Adaptive management frameworks ought to consider these influences for ecosystem-based management plans.

The structure of Secor's book is notably different from the first and only other fish migration book by Harden Jones (1968), illuminating the major advances in fish migration ecology from case studies to a fully developed field of research. Secor explains theory first and then provides examples of species, whereas Harden Jones focused on individual species and their behaviors, then extrapolated to broader concepts. We found this to be a major improvement as migration concepts and theories are more clearly discussed and analyzed with species comparisons. In our opinion, an overview of fundamental migration concepts to supplement understanding and relevance of subsequent chapters, could have been introduced earlier in the book (i.e.: Ch. 5 population structures and Ch. 6 partial migration theory).

We appreciated that Secor redrew the majority of the figures used in the book, as it provides an excellent compilation of models and concepts in the current migration literature. However, some of the figures and tables were often more detailed and complex than necessary. In addition, more details of the figures could be included in the text, rather than relegated to the extended legends.

The book provided the most comprehensive, creative, current, and ambitious overview of migration

literature to date. Secor especially succeeded in finding ways to discuss the mechanisms and ecological consequences of migration in almost every aspect of a fish's life, from larval dispersal, to food webs, to homing. Not surprisingly given the broad coverage, we felt that there were differences in how well each migration topic was covered. Some of the strongest chapters include topics in which the author is well versed, while others seemed rather abstract to the topic of traditional migration. For example, chapter 4 seemed to deviate from the rest of the book. Rather than discussing migration as movement through space or time, Secor introduces a progressive and novel view of migration through trophic levels. While we found this to be an interesting chapter, primarily because it incorporates exceedingly current ecological theory and research, we found it to be disconnected from the traditional definitions of migration that the book exemplifies.

The book would have benefited from a thorough conclusion at the end of the book. Chapter 7 seemed short and scattered, whereas we had expected a linking of concepts covered by the book to provide a broader conclusion. This was surprising as all preceding chapters had included a detailed summary and a segue into coming topics. Instead in Chapter 7, Secor looks forward and relates fisheries and climate change to the effects these can have on migratory species. He calls for ecosystem-based management in the context of resiliency theory, but provides no specific suggestions for solutions. A summary of the technological developments would have been more effective at the end of the book to demonstrate how we study migration today.

This book encapsulates the major advancements of the field, incorporating old and new concepts of migration to the latest technology in studying fish movement. While the book does not provide a build up of information from cover to cover, the chapters as separate components alone lead to an up-to-date and thoroughly improved review of the migration ecology of marine fishes. Overall, *Migration Ecology of Marine Fishes* is an exceptional read for a graduate student or fisheries ecologist. It provides a current review of migration theory—a synthesis that has been long overdue in the marine ecology literature.

Reference

Harden Jones FR (1968) Fish migration. Edward Arnold, London