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Familiar and Unfamiliar Fish

The Behaviour of Teleost Fishes

edited by Tony J. Pitcher, *Croom Helm, 1986. £42.50 (1 + 553 pages) ISBN 0 7099 2070 9*

This book is packed full of interesting facts about fishes. Did you know that some fishes of the Poeciliidae family always mate with fish of a different species; or that in mouth-brooding cichlids, fertilization occurs in the female's mouth, which she opens attempting to pick up the male's dragging anal fin bearing egg-like markings; or that *Bathygobius*, a small tropical goby, needs just one high tide to be able to learn the characteristics of intertidal pools so that it can subsequently jump from one to another when the water has receded? I certainly didn't, nor did I know the full extent of the exciting behavioural and ecological work on teleost fishes, wherein lies the strength of this book.

First, three chapters tackle broad topics of the genetic basis, motivation and development of fish behaviour. The last of these, by Huntingford, uses the fish literature as a vehicle for discussing behavioural development in general; for example, she reviews how experience can improve antipredator behaviour in salmon but is not necessary for its appearance - hatchery reared fish still react to fast moving predators.

Then comes a four-chapter section on vision, underwater sound, olfac-

tion and the role of the lateral line in fishes. To my mind, only the first - on vision by Guthrie - really rises above uninspired accounts of anatomy and physical properties of water in relation to the modality in question. For example, in reviewing the fish visual system, Guthrie quotes some fascinating species' differences in eye morphology that are related to where these species live in the water column and to their feeding habits; and in discussing studies of visual behaviour he demonstrates the importance of colouration in individual recognition and territorial aggression, thereby pinning morphology to the selective forces that shape it.

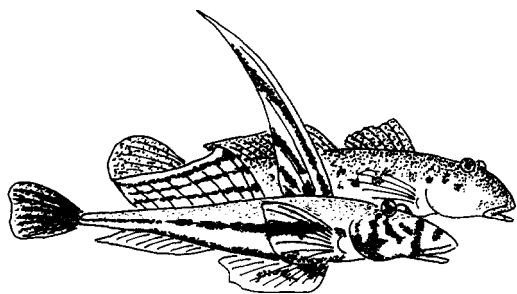
The third section, on behavioural ecology, comprises 10 of the 19 chapters. It attempts to provide reviews of topics, followed by chapters highlighting one particular aspect in detail: foraging in fishes (Hart) is followed by constraints that predators place on feeding (Milinski); teleost mating systems (Turner) by a chapter on parental care (Sargent and Gross); and shoaling behaviour (Pitcher) by a review of individual differences (Magurran).

Three of these chapters devote much space to antipredator behaviour and show that many of the numerous facets of this topic are being tackled in fishes. For example, old school group selectionist explanations for shoaling have now been dismissed (e.g. Ref. 1), and Pitcher clearly separates the probability of a group being detected from the risk of being a victim once the group has been located. Smaller groups of fish have been shown to detect predators later than larger groups², and sticklebacks with fewer spines (the preferred prey of pike) are more timid than spiny morphs in the presence of predators³. Moreover, Milinski's work has shown that hungry fish feed more efficiently on

a high density swarm of *Daphnia* than do less hungry fish⁴ because less hungry fish are not willing to pay the costs of overcoming the confusion effect (frightened fish prefer low prey densities⁵), and that fish feeding in high density areas overlook a cryptic predator⁶. This clever analysis of how the constraints predators place on feeding is affected by prey's hunger levels is years ahead of antipredator studies on other orders, and is but one example showing how behavioural work on fishes, which can be manipulated so easily in the laboratory, must be taken very seriously. Furthermore, the diversity of teleost mating systems, and complexities of sex reversal in many species, are important phenomena requiring explanations in their own right.

This central section of the book includes excellent accounts of the behavioural adaptations of fishes to crepuscular predators and to cave dwelling. Finally, there are two chapters under the heading Applied Fish Behaviour: species' behaviour in the face of an advancing trawl net (Wardle) is superbly described and backed up by remarkable photographs, but the last chapter on management of fresh water fisheries (O'Hara) lacks substance. I would have preferred an up-to-date account of attempts to conserve fish stocks and how these need to be tailored to the breeding systems, ranging patterns and behaviour of different species.

Most of the chapters in this wide-ranging book are unashamedly reviews, and hence very helpful to someone like me who does not work on fish; references are extensive and are fortunately at the end of each chapter. However, I could have done with a general synthesis in each of Pitcher's introductory sections rather than a potted version of what I was about to read. Fish behavioural



biologists, however, are likely to be on top of at least some of the fields covered and may desire something more substantial to chew on: little new research that has not been reported elsewhere is found in this volume. As for the price, it's way out of my reach.

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Forthcoming reviews in TREE:

- * **Carnivory in plants, D.H. Benzing**
- * **Molecular evolution of ubiquitin genes, P.M. Sharp and Wen-Hsiung Li**
- * **Metal tolerance in plants, M. MacNair**
- * **Succession in hydrothermal vents and deep-sea soft bottoms, C.R. Smith and R.R. Hessler**

-Tropical Forest Management

Natural Management of Tropical Moist Forests: Silvicultural and Management Prospects of Sustained Utilization

edited by François Mergen and Jeffrey R. Vincent, *Yale University School of Forestry and Environmental Studies*, 1987. \$10 (iii + 212 pages) (no ISBN number)

Tropical forestry is dominated by plantation foresters. Most of the research and development money available for tropical forestry is invested in pines, eucalypts and the fast-growing *Gmelina*. Plantations have the potential to be extremely productive and the high costs of establishment and maintenance are warranted where land is limited. However, although less productive per unit area than plantations, silviculturally managed natural forests are and will continue to be a major source of timber in the tropics. Natural forests are more diverse, less prone to epidemics and fire, and less expensive to manage than plantations.

Natural forest management has more than a 100-year history but a mixed reputation in the tropics. Publications like *Plantation Forestry in the Tropics* and 'Can the wet tropical forest survive?*' give the impression that silviculturally managed mixed forests have but a small role to play in tropical forestry. The reputation of natural forest management in the tropics has also suffered because much of the available information on the subject is scattered in poorly written government publications, reports from project consultants, and other non-reviewed documents to which access is difficult. The volume edited by Mergen and Vincent will help to rectify this situation.

The contributors to this book include several prominent natural forest managers with representa-

tives from Malaysia, West Africa and Puerto Rico. Advocates and critics of natural forest management are both represented. Unfortunately, representatives from Suriname, Brazil, Papua New Guinea, Australia, Liberia and other countries with active natural forest silviculture programmes were not included. Some of these research efforts should be represented in forthcoming proceedings of meetings recently held in Puerto Rico and Venezuela.

The volume includes chapters on silvicultural treatments, research methodologies and economic aspects of forest management, with a keynote address by J. Wyatt-Smith. Several of the chapters have appeared in modified form in the tropical forestry literature. Opinions expressed about the viability of natural forest silviculture in the tropics range from guarded optimism (e.g. I.D. Hutchinson) to nearly complete rejection (e.g. L.C. Nwoboshi).

To a great extent the criticisms leveled are not biological/silvicultural but rather are based on economic, social and political considerations. There is ample evidence that tropical forests can indeed be properly managed. Unfortunately, many successfully managed forests have been prematurely logged or completely destroyed because they were not protected from human encroachment and were growing on soils suitable for agriculture. Furthermore, in the light of A.J. Leslie's chapter on 'The economic feasibility of natural management of tropical forests', many of the economic criticisms mentioned in the book seem poorly founded and biased.

F.H. Wadsworth summed up the problem when he wrote 'Expected yields are lower than those of plantations, so shelterwood has been abandoned in many countries' (p. 94). Extensive, low-intensity, low-cost, long-term, sustained-yield

management of high species diversity forests cannot be reasonably assessed using economic models designed for application to industrial pursuits like the manufacture of hats. Reliance on such naive and inappropriate economic theory, coupled with unreasonable expectations, is contributing to disillusionment with natural forest management and ultimately to the destruction of species-rich tropical forests.

The complexity of trying to manage forests as diverse as those of the wet tropics makes exceptional demands on silviculturalists. Along with high diversity of species and diverse ecological interactions, tropical forest managers must respond to social pressures, modify their silvicultural treatments in accord with the vagaries of timber markets and changing wood-use technology, and weather political instabilities. Failure to anticipate increased marketability of lesser-known timber species, for example, has too frequently resulted in the poison girdling of what later became valuable tree species.

Most contributors to the volume advocate a balanced approach to wood production in the tropics, with both plantations and selectively logged and silviculturally treated natural forests. Wadsworth makes the reasonable suggestion that silvicultural improvement of idle secondary forests should be a high priority. Enrichment planting of logged-over forests to supplement natural regeneration, on the other hand, receives little attention from any of the authors.

To some extent the disillusionment with natural forest management expressed by the authors stems from application of low-intensity silvicultural treatments in places where high-yield plantations would be more appropriate. The permanent forest estate in parts of West Africa, for example, is too small