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Lots of good fish in the sea

Fishes: A Guide To Their Diversity. Philip A. Hastings, Harold Jack Walker Jr. and Grantly R. Gal-land, 2014, University of California Press. 336pp. £24.95 (Paperback) / \$34.99 (eBook) ISBN: 9780520283534 / 9780520959330; <http://www.ucpress.edu/>

There is a range of excellent guide books out there for the budding non-academic ichthyologist, young student and more wizened academic. The majority however have been developed as field guides, with excellent colour photographs of the species in their natural habitat (where available) or at least with an apt description of their ecology. Hastings et al's '*Fishes A Guide to their Diversity*' is different, and has been developed for those students (and lecturers) that are interested in developing their knowledge of the morphology and taxonomy of fishes. In this respect, this book is an excellent and exceptionally accessible part of the 'toolbox of taxonomists' (Pante et al 2015).

A new student in taxonomy (or any new graduate student of ichthyology and morphology), will find a wealth of vital information on how to accurately describe and compare the various morphological characteristics that synonymise different families of fishes. For beginners, however, I would argue that there is utility in using this guide in conjunction with a well-illustrated field guide to provide a full sense of the major colour patterns that help to identify fish groups.

More experienced graduate student and early academics can use it a stepping stone to further their knowledge of the higher level taxonomy of fishes. In this respect, this was the first time I have seen the full oral and pharyngeal morphology of different fishes provided, which makes this is an excellent resource for examining the morphology of fishes by way of dissection. The book also makes excellent use of x-rays, with a range of full fish skeletons provided.

While this guide may not provide a substantial amount of new information for the senior ichthyologist, Hastings et al have included a much higher diversity of fishes than is usually encompassed within a guide book. The sheer diversity of deep water fishes, as well as descriptions and pictures of several obscure groups that are found in very specific habitats, makes this guide a useful

jumping off point for further research into such taxa.

While not shying away from using taxonomic language, the authors have provided excellent descriptions of each term, as well as clear pictures to illustrate where necessary. In this respect I found the book exceedingly useful – I remember being a young scientist starting out examining the morphology and ecology of small tripterygiid fishes in New Zealand and spending weeks searching obscure papers to compile a valid list of morphological characteristics (including internal bony structures) that could be used to compare between highly similar species. The authors done the work for us in this guidebook, providing an extensive array of morphological characters that can be usefully and easily utilised to compare the morphology of different fish species.

This book remains strictly within the confines of describing the adult form of all fishes listed. There would have been value in also illustrating and describing the body form, morphology and distinguishing characteristics of the juvenile and larval phases of all the fishes listed. I understand why the authors have chosen to restrict themselves to the adult life stage; juveniles have been woefully under-described, and are logistically harder to capture and curate (the same problems also manifest in curating and describing the larval forms of fishes). However, a guide to the diversity of fishes is lacking if it does not provide some description of their non-adult forms. Indeed, it is the larval stage on which the vast majority of research on tropical and temperate fishes has been focused, especially when attempting to understand the connectivity and dispersal of populations.

There is an acknowledged dearth of new, well trained and enthusiastic morphologists who can provide the necessary balance to the overwhelmingly use of molecular methods being used to determine the evolutionary relationships of

fishes. This imbalance is touched on within the introduction: “Too often, these molecular-based phylogenetic hypotheses are not supported by morphology, as the number of molecular-based hypotheses has far outpaced the ability of morphologists to fully explore them”. In this I agree wholeheartedly. We are now in an age where morphologists, and the vital taxonomic work that they do, are being outgunned by a new generation of molecular phylogeneticists. This book goes some way to make the morphological methods and analysis of fish taxonomy more accessible to a wide audience, and perhaps will inspire more to pick up a scalpel and tweezers and start delving into the diverse and exciting world of ichthyological morphology.

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Pante, E., Schoelinck, C., Puillandre, N. (2015) From integrative taxonomy to species description: one step beyond. *Systematic Biology* 64(1): 152-160.

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