

BOOK REVIEW

The Bichir Handbook

Edited by Joshua Pickett,

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Bichirs are very special fishes. The only remaining descendants of a lineage isolated for c. 400 million years from all other actinopterygians, bichirs unite a set of archaically appearing characters with features quite unique among fishes. Their (supposed) primeval body shape and behaviour make them popular aquarium fishes. And their phylogenetic position as the sister group to all other actinopterygians makes them an important taxon for evolutionary studies not just for ray-finned fishes but also for vertebrates, in general. Therefore, it seems surprising that there are so few books specialized on the family Polypteridae. Until recently there was only the book by Schäfer (2004) whose major focus was on presenting images of bichir species. Thus, *The Bichir Handbook* seems to be a long-overdue publication exclusively focusing on this fascinating taxon.

Joshua Pickett has set his goal on providing an aquarist book replenished with state-of-the-art scientific knowledge. The renowned South African ichthyologist Olaf Weyl, a former editor for the *Journal of Fish Biology*, wrote the foreword for this book shortly before he died (Cowx *et al.*, 2021) and said that the book does an “excellent job in bridging the gap between the popular and scientific literature, and in providing the reader with concise and accurate information on these fascinating fishes” (Cowx *et al.*, 2021). The book principally is divided into four parts: first, a general introduction to the biology of bichirs; second, a general view on aquarist issues of bichirs; third, a section depicting each species separately; and finally, an insight into the extinct relatives of the polypterid lineage.

When starting with the evolution of bichirs, Pickett tries to summarize the present knowledge in a short factual report. Here, the different concepts of popular science books and strictly scientific publications become visible. The evolutionary history, phylogeny and ages of different branches is still much debated – even whether some of these branches are polypteriforms at all – but such disputes are not reflected and discussed in *The Bichir Handbook*. Many reported conclusions of supposed polypterid ancestry are based on very few fossil remains, like isolated scales or spines of certain taxa (see, e.g., Daget *et al.*, 2001). A statement that the genus *Polypterus* emerged 100.5 MYA and remained “relatively unchanged ever since” (p. 14) can hardly be substantiated on single scales and spines. A molecular study – admittedly not based on better evidence – dates the origin of the genus *Polypterus* to only around 20 MYA (Near *et al.*, 2014). In

summary, presently very little is known about the origin and age of the genus *Polypterus*, but this situation is not reflected in the respective chapter. Probably, such a shortcoming is a concession to the readability and length of the chapters, as *The Bichir Handbook* was never planned to be the definitive scientific reference book on the subject. Nevertheless, a general disclaimer stating that many issues in polypterid evolution, ancestry, phylogeny, and age of branches are part of the continuously changing scientific progress would have been appropriate.

A similar point of critic can be highlighted from the next chapter which presents polypterid anatomy. Here Pickett cites a “lecturer and veterinarian” who “defends an earlier hypothesis that suggest Polypteriformes could rather be sarcopterygians” (p. 18), suggesting to the reader that this is a hypothesis seriously discussed today among scientists – which is not the case. Two references are cited for this statement: Rocco *et al.* (2004) presented molecular results apparently based on very little molecular data and very few taxa included in the study. Since then, no other molecular phylogenetic study has produced similar results. The second reference, Graham *et al.* (2014), compares only the breathing behaviour and mechanics of polypterids with fossil sarcopterygians but never states a close relationship between both taxa. But for the rest of the chapter, Pickett provides a good overview of the anatomy of bichirs, highlighting their special characters in a short and easy-to-read manner.

After a section on sexual dimorphism, the book is augmented by a guest contribution of Emily Standen on her experiments on phenotypic plasticity of the locomotion apparatus of polypterids which were largely raised on land. For the scientists reading this section, it would have been appropriate to cite the respective research articles. Anyhow, such excursions, in which selected topics are highlighted, make the book entertaining and interesting to read. Similar excursions are the chapters on sustainable and ethical fishing, as well as the last part of the book on fossil relatives of bichirs.

In the second part of the book Pickett compiled a huge amount of information on aquarium keeping of bichirs, augmented with personal experience and practical knowledge of other aquarists enthusiastic about this fish group. This includes not only data on nutrition, tank size, possible diseases and suited tankmates but also detailed disquisition on certain topics, such as which substrate colour should be used for which species to receive a certain colour pattern. Until now, there is no other

publication summarizing so much helpful data on keeping polypterids. Unfortunately, a dedicated chapter on how to breed bichirs in captivity is missing – something fish keepers are usually very interested in.

A large part of the book is then used to present detailed species profiles, which are easy to read, informative and sometimes augmented by interesting “fun facts.” The systematics follows the latest revision (Moritz & Britz, 2019) and includes a well-chosen selection of live photographs giving an overview to the wild variability but also some captive breeds.

In the concluding section the book provides a perspective on the extinct relatives of bichirs. When keeping in mind that, “due to their limited fossil data, their immediate physical appearance is entirely speculative” (p. 119) which in fact also holds true for most of their biology, the chapter is an interesting excursion. The live reconstructions represent interesting ideas but, as mentioned before, are almost completely speculative.

The Bichir Handbook not only has a catchy cover but also is full of beautiful illustrations provided by Dorian Noël. These illustrations are of high quality and provide attention to details. They are very useful for scientists when identifying species, as for the determination of several taxa colour patterns are of importance. Already these illustrations make the book a must-have for aquarists and scientists with at least some interest in this fish group.

In conclusion, while *The Bichir Handbook* was probably not intended to be a book aimed principally at scientists, I think that Pickett has, nevertheless, used his best endeavours to provide a scientifically correct book. Addressed to the audience of fish keepers, it summarizes, in a very good way, a plethora of interesting facts on these fascinating fishes. The book comes with a poster and bookmark, both depicting the species drawings of the publication. In my view *The Bichir Handbook* is recommendable for anyone interested in fishes. It does justice to its objective, of highlighting

just how fascinating these fishes are and making that information accessible to a broad audience. It is easy to read, with the right level of detail that is largely of high-quality context, and is full of beautiful illustrations.

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