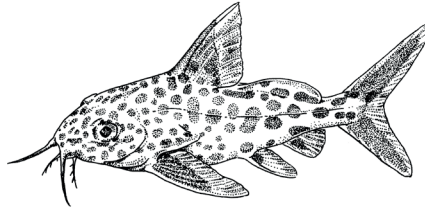


PART 7

PROSPECTS AND RECOMMENDATIONS



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The present book aims to summarise the current state of knowledge of the diversity of the parasites of freshwater fishes in Africa. It does not attempt to be an exhaustive monograph covering in detail every fish parasite group reported from freshwater ray-finned fishes (Actinopterygii) in Africa. The systematic chapter documents the progress achieved and reveals the existing gaps in our attempts to better define the parasite fauna of a continent that encompasses the whole Ethiopian (Afrotropical) zoogeographical region and the far southwestern part of the Palaearctic region. A simple comparison of the number of species and genera of helminth parasites listed in the current publication with those in two earlier checklists (Khalil 1971; Khalil & Polling 1997) shows a considerable increase over the last two decades. However, there is still much to discover.

The information summarised in the systematic chapter clearly demonstrates, as did the checklists of Khalil (1971) and Khalil and Polling (1997), how unbalanced the present knowledge of African fish parasites is in several aspects. First, attention paid to individual groups has been uneven, with the data available on protists and helminth larvae the most limited. Second, there are conspicuous differences in the number of studies on different fish hosts, with cichlids and catfishes the most intensively studied groups. Third, and probably most importantly, there are marked differences in the amount of data accumulated in the different regions and countries of Africa. The information for some regions such as the Nile Basin (Egypt and Sudan), African Great Lakes (especially Lake Victoria and Lake Tanganyika) and South Africa is reasonably representative but there are vast areas of Africa for which there is limited or no data.

Another important message that the editors would like to emphasise is in the methodological chapters. Though they may appear at first sight too succinct, the authors of individual chapters have used their long experience in parasite studies to present the most relevant information for processing fish parasites correctly and for the application of the best methods to ensure that valuable parasite material is available for subsequent morphological, taxonomic, histopathological, ecological, genetic and other studies. The book will serve as a guide to all principal steps including catching fish, their examination for different groups of unicellular and metazoan parasites and the appropriate processing of the parasites found.

The remaining chapters complement these two core parts of the book to provide a compendium of useful information for both advanced fish parasitologists and inexperienced beginners. However, the editors are aware that the present book represents only an initial attempt to support the advancement of fish parasitology in Africa. Therefore, any critical comments and suggestions for additional information are welcome and should be sent to the Editors.

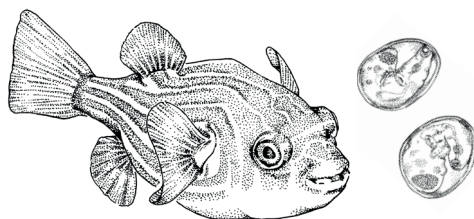
The future progress of African fish parasitology is difficult to predict as it depends on many factors, such as the economic situation in individual countries, sufficient funding for basic and applied research, the availability of human resources including the development of a new generation of fish parasitologists trained in the best methods of modern biological and veterinary research, and also in assessing ecosystem health and richness of aquatic habitats.

Several recommendations important for the further development of studies on the fish parasites in Africa are suggested below:

1. Any study of fish parasites should be preceded by a comprehensive literature search to avoid repetition of work already done.
2. The exact purpose of a new study should be established before the start. The availability of facilities, expertise and funding should be assessed realistically. A study that is too ambitious may result in methodological mistakes.
3. Only fresh or recently dead fish should be examined, including those in outbreaks of mass mortality in aquaculture.
4. Suitable methods and proper equipment should always be used, especially good quality optics and chemicals (as fixatives, etc.).
5. There should be a focus on quality rather than quantity. It is better to examine fewer fish correctly than many fish incorrectly. Inadequate examination will result in unreliable data.
6. Faunal surveys should be the first step in exploring fish parasites in a given region and vouchers of parasites found should always be preserved, preferably in an internationally accessible collection.
7. International cooperation with experts on individual parasite groups and research areas is strongly recommended (and often inevitable) but only properly processed parasite material should be used. Avoid making requests for the identification of parasites from poor quality pictures of improperly processed material.

The present book is the outcome of a long term international cooperation of more than two generations of fish parasitologists and other specialists from South Africa and several European countries. We hope that our efforts will facilitate the further advancement of fish parasitology in the African continent.

ACKNOWLEDGEMENTS



Preparation of this book was primarily supported by the Czech Science Foundation – program of centres of excellence (project P505/12/G112 “European Centre of IchthyoParasitology”; P.I.M. Gelnar; Co-P.Is. T. Scholz and P. Jurajda). In addition, support of the following institutions and grant agencies is acknowledged: Institute of Parasitology, Biology Centre of the Czech Republic, České Budějovice, Czech Republic (IPCAS; RVO: 60077344), Institute of Vertebrate Biology, Czech Academy of Sciences, Brno, Czech Republic (IVB; RVO: 68081766), Czech Science Foundation (16-00291S; P.I.M. Reichard), Royal Belgian Institute of Natural Sciences (CEBioS program: Capacities for Biodiversity and Sustainable Development, funded by the Belgian Directorate-General for Development Cooperation and Humanitarian Aid).

This volume would not have been possible without the help and contributions of a very large number of people and institutions that contributed to our knowledge of freshwater fish parasites in Africa. Each of them are hereby dully acknowledged and thanked. Special thanks are due to Miloslav Jirků for providing extensive material of African fish helminths, František Moravec (both IPCAS) for advice regarding fish nematodes, Radim Blažek (IVB) and Alain de Chambrier (Natural History Museum, Geneva) for providing photographs from field trips, and staff of the Royal Museum of Central Africa in Tervuren, Belgium for help during stay of T. Scholz (supported by EU-SYNTHESYS project BE-TAF Project n° 5671). Technical help of Blanka Škoríková (IPCAS) is also much appreciated. The editors and authors are also much obliged to Arlene Jones and Peter Wightman, both formerly CAB International, Wallingford, UK, for critical evaluation of the text and for language corrections, respectively.

Profile of the editors



Tomáš Scholz

Tomáš has been studying helminth parasites for the past 30 years (defended his PhD on fish tapeworms in 1989). He deals with the systematics, phylogenetics and life cycles of parasitic flatworms, especially tapeworms (Cestoda) and trematodes (Digenea) including causative agents of fish-borne diseases. He is the Co-Principal Investigator of the European Centre of IchthyoParasitology (ECIP) project and was the leading Editor of the book.



Maarten P.M. Vanhove

Maarten is an ECIP researcher studying molecular and morphological diversity of (monogenean) parasites in an evolutionary and policy-relevant context, focusing on Africa and the Mediterranean. He teaches at Hasselt University. While preparing this book, he worked on capacity building in Africa as a biodiversity policy scientist at the Royal Belgian Institute of Natural Sciences, and as curator of worms at the Finnish Museum of Natural History.



Nico Smit

Nico's research focuses on the biodiversity, taxonomy and ecology of parasitic Crustacea and blood protozoa of African marine and freshwater fishes. Recently he has been the first South African aquatic parasitologist to be rated by the South African National Research Foundation as an internationally acclaimed scientist. He is currently the Director of Research and Professor of Ecology at North-West University, South Africa.



Zuzana Jayasundera

Zuzana is PR manager of Faculty of Science, Masaryk University in Brno, including the ECIP project. She was responsible for images as Graphics Editor. She is studying her Ph.D. in Philosophy of Science at Faculty of Arts, Masaryk University, concerning on popularisation of science and scientific communication.



Milan Gelnar

Milan works on organismal and structural diversity, morphology, biology and ecology of monogeneans. He has also dealt with parasite population and community ecology, parasite specificity, specialisation and microhabitat distribution, host-parasite co-evolution, evolutionary ecology and epidemiology of fish parasites. Milan is the Principal Investigator of the ECIP project, responsible for scientific, economic and personnel management.

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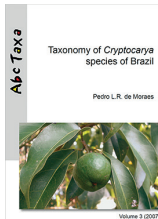
Volume 1

SAMYN, Y., VANDENSPIEGEL, D. & MASSIN, C. 2006. Taxonomie des holothuries des Comores. *AbcTaxa* 1: 130 pp.



Volume 2

DE PRINS, R. & ROUR, E. 2007. Détérioration des collections de coquilles. *AbcTaxa* 2: 60 pp.



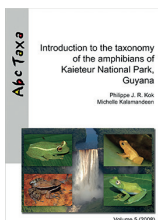
Volume 3

DE MORAES, P.L.R. 2007. Taxonomy of *Cryptocarya* species of Brazil. *AbcTaxa* 3: 191 pp.



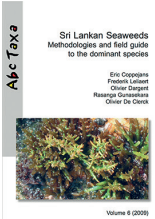
Volume 4

DIAZ, L. & CADIZ, A. 2007. Guía taxonomica de los anfibios de Cuba. *AbcTaxa* 4: 294 pp.



Volume 5

KOK, P.J.R. & KALAMANDEEN, M. 2008. Introduction to the taxonomy of the amphibians of Kaieteur National Park, Guyana. *AbcTaxa* 5: 278 pp.



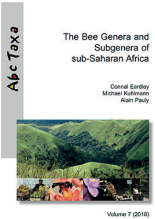
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Volume 6 (2009)

Volume 6

COPPEJANS, E., LELIAERT, F., DARGENT, O., GUNASEKARA, R. & DE CLERCK, O. 2009. Sri Lankan Seaweeds – Methodologies and field guide to the dominant species. *AbcTaxa* 6: 265 pp.



The Bee Genera and Subgenera of sub-Saharan Africa

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Michael Kuhlmann
Agnès Pauly

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Volume 7

EARDLEY, C., KUHLMANN, M. & PAULY, A.. 2010. The Bee Genera and Subgenera of sub-Saharan Africa. *AbcTaxa* 7: 138 pp.



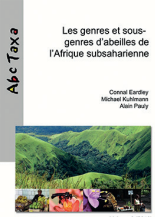
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J.J. Monje, Y. Samyn and D. Vandenspiegel

Volume 8, part 2 (2010)

Volume 8

EYMAN, J., DEGREEF, J., HÄUSER, C., MONJE, J.C., SAMYN, Y. & VANDEN SPIEGEL, D. 2010. Manual on Field Recording Techniques and Protocols for All Taxa Biodiversity Inventories. *AbcTaxa* 8: part 1: 1-330; part 2: 331-635.



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Conrad Eardley
Michael Kuhlmann
Agnès Pauly

Volume 9 (2010)

Volume 9

EARDLEY, C., KUHLMANN, M. & PAULY, A. 2010. Les genres et sous-genres d'abeilles de l'Afrique subsaharienne. *AbcTaxa* 9: 143 pp.



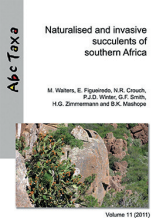
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Hugues Eyi Ndong
Juliana Degreef
André De Kesel

Volume 10 (2011)

Volume 10

EYI NDONG, H., DEGREEF, J. & DE KESEL, A. 2011. Les champignons comestibles de l'Afrique centrale. *AbcTaxa* 10: 253 pp.



Naturalised and invasive succulents of southern Africa

M. Walters, E. Figueiredo, N.R. Crouch,
P.J.D. Smith, G.F. Zimmermann,
H.G. Zimmermann and B.K. Mshope

Volume 11 (2011)

Volume 11

WALTERS, M., FIGUEIREDO, E., CROUCH, N.R., WINTER, P.J.D., SMITH, G.F., ZIMMERMANN, H.G. & MSHOPE, B.K. 2011. Naturalised and invasive succulents of southern Africa. *AbcTaxa* 11: 370 pp.



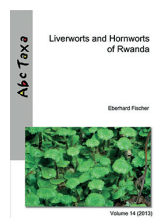
Volume 12

MARTIN, P. & BOUGHROUS, A.A. 2012. Guide taxonomique des oligochètes dulçaquicoles du Maghreb. *AbcTaxa* 12: 194 pp.



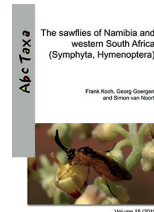
Volume 13

ANDRÉ, H.M. & N'DRI, J.K. 2013. Bréviaire de taxonomie des acariens. *AbcTaxa* 13: 200 pp.



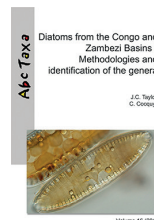
Volume 14

FISCHER, E. 2013. Liverworts and Hornworts of Rwanda. *AbcTaxa* 14: 552 pp.



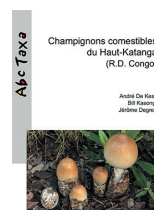
Volume 15

KOCH, F., GOERGEN, G. & VAN NOORT, S. 2015. The sawflies of Namibia and western South Africa (Symphyta, Hymenoptera). *AbcTaxa* 15: 262 pp.



Volume 16

TAYLOR, J.C. & COCQUYT, C. 2016. Diatoms from the Congo and Zambezi Basins – Methodologies and identification of the genera. *AbcTaxa* 16: 364 pp.



Volume 17

DE KESEL, A., KASONGO, B. & DEGREEF, J. 2017. Champignons comestibles du Haut-Katanga (R.D. Congo). *AbcTaxa* 17: 296 pp.