

This book is dedicated to Dr. Thomas L. Poulson, in appreciation for his pioneering and inspiring work on cave fishes and other subterranean creatures

Preface

Subterranean fishes are among the most instigating, scientifically relevant and yet fragile organisms. Their specialization to the selective regime typical of subterranean habitats, highly contrasting to epigeal (surface) ones, results in unique combinations of features, of which the most conspicuous are the reduction of eyes and dark pigmentation. Envisaged as bizarre creatures, cave fishes have been known and are the object of interest for centuries, but studies intensified after the 1920's, with the advent of modern genetics and, more recently, molecular biology, phylogeny and conservation.

Due to that selective regime, with permanent darkness as a major directive force throughout the hypogean realm, diverging rates of populations genetically isolated from their epigeal colonizers are generally high. At the same time, homoplastic evolution of cave-related characters is quite common, producing sets of convergent character states in more or less distantly related taxa. High divergence rates in relation to close epigeal relatives, homoplastic evolution of several characters, and the simplified nature of subterranean ecosystems, with fewer trophic levels, fewer species interacting and a tendency toward environmental stability (i.e. fewer varying abiotic factors), render subterranean organisms excellent subjects for evolutionary and ecological studies. Models of regressive evolution of characters, a rather frequent phenomenon among epigeal animals, as Darwin himself was aware of, may be tested using troglotic (exclusively subterranean) species. Likewise, physiological and behavioral models, in areas such as chronobiology and stoichiometry, benefit from the study of hypogean animals.

However, these characteristics, which we find so interesting, may impose serious problems for survival under conditions of unnatural environmental stress. Small population sizes due to geographic restriction and adaptations to cope with food scarcity, including K-selected life cycle traits and low population densities, result in low population turnovers and, consequently, a reduced capacity to recover from population losses.

Moreover, many troglobites, having evolved under relatively constant abiotic conditions, lost their ability to cope with environmental fluctuations, such as those provoked by human disturbance. A robust knowledge of the ecology and biology of these animals is a necessary and most urgent step for efficient actions that target their protection.

Knowledge about subterranean fishes progresses at a steady pace, with novelties arising every day. This book begins with an overview of the main evolutionary and ecological concepts applied to the study of subterranean fishes, in the context of a retrospective and prospective of the field (Chapter 1). In the following chapters, we present updated approaches, integrating new and previously known data, on general topics such as evolutionary genetics (Chapter 5) and development (Chapter 6), behavior (Chapter 7), biodiversity (Chapter 2), and conservation (Chapter 3). A worldwide checklist with 164 troglomorphic species represents a significant increase in relation to the most recent one, also by Proudlove (104 species described up to 2003) -- an increase that is mainly due to additions to the subterranean ichthyofauna of China and Brazil. Regional faunas, *in totum* or focusing on selected taxa, of countries such as China (Chapter 11), India (Chapter 12), Brazil (Chapter 9), Mexico (*Poecilia mexicana*; Chapter 8), and the African continent (Chapter 10), are discussed in terms of biodiversity and its causes, natural history and distribution, and ecology. A comprehensive chapter on the Amblyopsidae, a small North American family with one epigean, one troglophilic and four troglotic species, summarizes information on almost every aspect of the systematics and biology of this family, which are currently the best known cave fishes (Chapter 7).

The contributors to this book are from leading speleobiologists dedicated to the study of subterranean fishes around the world. The editors of this project acknowledge the prompt response and enthusiasm of these scientists, who were essential to its success as a new and vibrant publication showing the utmost progress in the field. We also thank the specialists who reviewed the texts, in particular Drs. David C. Culver and John Holsinger.

This book is dedicated to Dr. Thomas L. Poulson, who earned our deepest admiration and respect for his pioneering and inspiring work on amblyopsid fishes and other subterranean animals, always keeping a fresh enthusiasm for these wonderful creatures. Thank you, Tom, for being such an example of a scientist and a person.

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