Environ Biol Fish
DOI 10.1007/s10641-016-0487-8

BOOK REVIEW

Living in obscurity: Danté Fenolio— life in the dark

2016 John Hopkins University Press, 317 pp., $39.95 (hardcover)

Aldemaro Romero Jr.

Received: 22 March 2016 / Accepted: 25 April 2016

The reduction and/or disappearance of phenotypic features is a biological phenomenon that has intrigued humans ever since prehistoric times. The earliest known anthropological representation of a creature showing the loss of phenotypic features dates back to ca. 22,000 YBP (Upper Paleolithic). It is a carved drawing of a wingless cave cricket, *Troglophilus* sp., on a bison (*Bison bonasus*) bone found in the *Grotte des Trois Frères* (Three Brothers Cave) in the central Pyrénées, France. Since then, we have witnessed how the study of organisms living in lightless environments went through a number of scientific historical periods. First was the age of exploration that characterized the Renaissance (ca. 1450–1650) in Europe and the Ming Dynasty (1368–1644) in China, followed by the inclusion of these organisms into list of species and "bestiaries," to using them as proof of Lamarckian ideas about "use and disuse" (an idea accepted by Darwin himself and his followers, particularly in North America and France), to more modern interpretations espousing evolutionary concepts established during the Modern Synthesis, to the evo-devo explanations being provided more recently (for a historical study of these biological thoughts see Romero 2009).

It is not surprising that the reduction and/or loss of phenotypic features has been perceived as an "oddity" because the intrinsic belief among many that evolution is a progressive process aimed at increasing complexity (Romero 1985). Yet, that phenomenon can be observed in multitude of organisms belonging to a great variety of taxa found in a great range of environments around the world. In fact, we could even argue that modern humans show some features that are the result of that process when compared with its primate ancestors. Examples include the loss of characters such the tail, body hair, the ability to synthesize vitamin C, and reductions in the size of teeth, the size of the vermiform appendix, the thickness of the skull, as well as the thickness of the bony brow ridges (Diamond and Stermer 1999). Yet, there are no better examples of these processes in action than among organisms living under lightless conditions.

Now comes Danté Fenolio with his book "Life in the Dark." With more than 200 first-class photographs accompanied by informative texts this author portrays the large diversity of these organisms living in lightless settings as well as pictures of these environments. Readers unfamiliar with most of these examples of fauna living under these conditions will think that many of these creatures are the figment of the imagination of a Hollywood artistic director who used CIG (Computed Generated Images) to produce mirages of creatures that many times can look both bizarre and creepy.

Fenolio is a rare combination of someone with a doctorate in biology but who happens to be one of the best wildlife photographers around. Since he was a college student he was already known for his photography of cave animals. For those of us who have tried to take pictures in lightless environments we know how

A. Romero Jr. (✉)
Weissman School of Arts & Sciences, Baruch College, City University of New York, New York, NY, USA
e-mail: Aldemaro.Romero@baruch.cuny.edu

Published online: 14 May 2016

difficult that is not only because the requirements for illumination are so special but also because of the organisms we try to portray lack, for the most part, pigmentation. But where most of us try in picturing these creatures in full splendor Fenolio succeeds. That is why Fenolio, who is currently vice president of conservation research at the San Antonio Zoo, deserves a lot of credit for his work. Not only his photographic skills are outstanding but also he has a strong scientific background as exemplified by an ample list of publications that encompasses articles on cave fauna, herpetology, conservation biology, and invertebrate biology.

To be sure his book is neither your typical coffee-table book with pretty pictures nor a scientific one in the classical sense of the word. Yes, it is oversized, it does contain a lot of scientific names and terminology, and many references to the scientific literature, but it is this combination what makes of "Life in the Dark" and exceptionally useful book for a great variety of audiences. Not only that but he also achieves the distinction of representing the whole range of examples both taxonomically and ecologically of organisms living under lightless conditions.

The book is divided into seven chapters. Chapter One is a general introduction about the diversity of life in lightless environments and their adaptations. Chapter Two is about abyssal life including some organisms of deep water milieus that can also be found in neritic areas. Three is about dark freshwater habitats. Four on fossorial (burrowing) wildlife. Five on hypogean (subterranean) life. Six about parasitic life condemned to live in obscurity, and Seven on conservation. The book has a useful glossary, a respectable list of literature cited, as well as an index of terms that include scientific names, common names, and other terminologies used in the book. It also has an appendix of a short bibliography on amphibian skin secretions and potential use by humans whose purpose is unclear to me within the context of the book.

The prose is scientifically accessible and narratively entertaining, making the experience of reading it a fulfilling one. For example, he includes some personal notes of his own experiences which help the reader feel more comfortable with the subject matter. Scientists reading it will not feel being sold out to oversimplified (an inaccurate) explanations and the lay readers will not feel overwhelmed by obscure accounts. Thus, readers who are unfamiliar with lightless habitats, regardless of their background, will find it both informative and pleasant. Despite the obvious cases of convergent evolution as represented by reduction of eyes and /or pigmentation among many of the species, the book demonstrates the tremendous diversity of adaptations to the lightless environments, some constrained by the phylogenetic history of the species in question as well as specific adaptations to their specific habitats. The book provides some striking information to many such as that although bioluminescence in deep oceanic waters is quite common it is very rare in underground environments. It also states facts that are true but defy some of the conventional wisdom among some biologists such as the recognition that not all caves are oligotrophic.

Sometimes the book goes beyond of what one might expect dealing, for example, with the coelacanth as well as terrestrial bioluminescent fungi. It is true that the coelacanth can be found associated with crevices but so do a lot of many other species of fishes and they do not show special adaptations to lightless environments. The same can be said about bioluminescent fungi, which are found in open environments but they just happen to emit light at night. I would have rather included pictures of the guácharo or oilbird (*Steatornis caripensis*) that although is mentioned in passing in the text for depositing guano in caves that serves as an energy source for both fish and invertebrates in the South American caverns they inhabit, have developed echolocation as an adaptation not only to nocturnal life but also to safely navigate in caves.

The inclusion of some other species surprised me such as the common snapping turtle (*Chelydra serpentina*). It is true that it can be found in some areas that are spring-fed, but so thousands of many other species and they do not show specific adaptations that one can relate to lightless environments. A few times the book becomes somewhat repetitive when talking about the same species in different sections of the book although using different photographs.

Besides these few minor criticisms, the book achieves its goal of portraying to a diversity of audiences the amazing biodiversity of creatures living in the dark. It is also clear that Fenolio cares about the long-term prospects of the species mentioned in his book. Many of them, particularly cave ones, are found represented by small populations sometimes from a single locality, so his conservation concerns are well-founded.

What I found as the most important contribution of this book is that it can be an inspiration to many to study these organisms. Probably because of their bizarre appearance they are usually portrait as "aberrations" in many other publications but Fenolio instills the sense of their uniqueness and serendipity, organisms that have much to tell us from many different fields of biology. Therefore, many, from established researchers to young readers, may find in it a motivation for research and conservation in the immediate future. If at least half dozens of people pursue a career in studying the biology and devote to the conservation of these creatures by reading this book, he would have achieved a great goal. As Horace Mann said, "Be ashamed to die until you have won some victory for humanity."

References

Diamond J, Stermer D (1999) Evolving backward. Discover 19: 64–68

Romero A (1985) Can evolution regress? Natl Speleol Soc Bull 47:86–88

Romero A (2009) Cave biology: life in darkness. Cambridge University Press, Cambridge, p. 291