



# How to use this book

*Grzimek's Animal Life Encyclopedia* is an internationally prominent scientific reference compilation, first published in German in the late 1960s, under the editorship of zoologist Bernhard Grzimek (1909–1987). In a cooperative effort between Gale and the American Zoo and Aquarium Association, the series has been completely revised and updated for the first time in over 30 years. Gale expanded the series from 13 to 17 volumes, commissioned new color paintings, and updated the information so as to make the set easier to use. The order of revisions is:

- Volumes 8–11: Birds I–IV
- Volume 6: Amphibians
- Volume 7: Reptiles
- Volumes 4–5: Fishes I–II
- Volumes 12–16: Mammals I–V
- Volume 3: Insects
- Volume 2: Protostomes
- Volume 1: Lower Metazoans and Lesser Deuterostomes
- Volume 17: Cumulative Index

## Organized by taxonomy

The overall structure of this reference work is based on the classification of animals into naturally related groups, a discipline known as taxonomy—the science in which various organisms are discovered, identified, described, named, classified, and catalogued. Starting with the simplest life forms, the lower metazoans and lesser deuterostomes, in volume 1, the series progresses through the more complex classes of animals, culminating with the mammals in volumes 12–16. Volume 17 is a stand-alone cumulative index.

Organization of chapters within each volume reinforces the taxonomic hierarchy. In the case of the volume on Protostomes, introductory chapters describe general characteristics of all organisms in these groups, followed by taxonomic chapters dedicated to Phylum, Class, Subclass, or Order. Species accounts appear at the end of the taxonomic chapters. To help the reader grasp the scientific arrangement, each type of chapter has a distinctive color and symbol:

■ = Phylum Chapter (lavender background)

◆ = Class Chapter (peach background)

◇ = Subclass Chapter (peach background)

● = Order Chapter (blue background)

Introductory chapters have a loose structure, reminiscent of the first edition. Chapters on taxonomic groups, by contrast, are highly structured, following a prescribed format of standard rubrics that make information easy to find. These chapters typically include:

- Opening section
- Scientific name
- Common name
- Phylum
- Class (if applicable)
- Subclass (if applicable)
- Order (if applicable)
- Number of families
- Thumbnail description
- Main chapter
- Evolution and systematics
- Physical characteristics
- Distribution
- Habitat
- Behavior
- Feeding ecology and diet
- Reproductive biology
- Conservation status
- Significance to humans

- Species accounts
- Common name
- Scientific name
- Order (if applicable)
- Family
- Taxonomy
- Other common names
- Physical characteristics
- Distribution
- Habitat
- Behavior
- Feeding ecology and diet
- Reproductive biology
- Conservation status
- Significance to humans

Resources  
Books  
Periodicals  
Organizations  
Other

## Color graphics enhance understanding

*Grzimek's* features approximately 3,000 color photos, including nearly 110 in the Protostomes volume; 3,500 total color maps, including approximately 115 in the Protostomes volume; and approximately 5,500 total color illustrations, including approximately 280 in the Protostomes volume. Each featured species of animal is accompanied by both a distribution map and an illustration.

All maps in *Grzimek's* were created specifically for the project by XNR Productions. Distribution information was provided by expert contributors and, if necessary, further researched at the University of Michigan Zoological Museum library. Maps are intended to show broad distribution, not definitive ranges.

All the color illustrations in *Grzimek's* were created specifically for the project by Michigan Science Art. Expert contributors recommended the species to be illustrated and provided feedback to the artists, who supplemented this information with authoritative references and animal specimens from the University of Michigan Zoological Museum library. In addition to illustrations of species, *Grzimek's* features drawings that illustrate characteristic traits and behaviors.

## About the contributors

Virtually all of the chapters were written by scientists who are specialists on specific subjects and/or taxonomic groups. Sean F. Craig reviewed the completed chapters to insure consistency and accuracy.

## Standards employed

In preparing the volume on Protostomes, the editors relied primarily on the taxonomic structure outlined in *Invertebrates*, edited by R. C. Brusca, and G. J. Brusca (1990). Systematics is a dynamic discipline in that new species are being discovered continuously, and new techniques (e.g., DNA sequencing) frequently result in changes in the hypothesized evolutionary relationships among various organisms. Consequently, controversy often exists regarding classification of a particular animal or group of animals; such differences are mentioned in the text. Readers should note that even though insects are protostomes, they are treated in a separate volume (Volume 3).

*Grzimek's* has been designed with ready reference in mind, and the editors have standardized information wherever feasible. For **Conservation Status**, *Grzimek's* follows the IUCN Red List system, developed by its Species Survival Commission. The Red List provides the world's most comprehensive inventory of the global conservation status of plants and animals. Using a set of criteria to evaluate extinction risk, the

IUCN recognizes the following categories: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Conservation Dependent, Near Threatened, Least Concern, and Data Deficient. For a complete explanation of each category, visit the IUCN web page at <<http://www.iucn.org/themes/ssc/redlists/categor.htm>>.

In addition to IUCN ratings, chapters may contain other conservation information, such as a species' inclusion on one of three Convention on International Trade in Endangered Species (CITES) appendices. Adopted in 1975, CITES is a global treaty whose focus is the protection of plant and animal species from unregulated international trade.

In the Species accounts throughout the volume, the editors have attempted to provide common names not only in English but also in French, German, Spanish, and local dialects.

*Grzimek's* provides the following standard information on lineage in the **Taxonomy** rubric of each Species account: [First described as] *Epimения australis* [by] Thiele, [in] 1897, [based on a specimen from] Timor Sea, at a depth of 590 ft (180 m). The person's name and date refer to earliest identification of a species. If the species was originally described with a different scientific name, the researcher's name and the date are in parentheses.

Readers should note that within chapters, species accounts are organized alphabetically by order name, then by family, and then by genus and species.

## Anatomical illustrations

While the encyclopedia attempts to minimize scientific jargon, readers will encounter numerous technical terms related to anatomy and physiology throughout the volume. To assist readers in placing physiological terms in their proper context, we have created a number of detailed anatomical drawings that are found within the particular taxonomic chapters to which they relate. Readers are urged to make heavy use of these drawings. In addition, many anatomical terms are defined in the **Glossary** at the back of the book.

## Appendices and index

In addition to the main text and the aforementioned **Glossary**, the volume contains numerous other elements. **For further reading** directs readers to additional sources of information about protostomes. Valuable contact information for **Organizations** is also included in an appendix. An exhaustive **Protostomes family list** records all orders of protostomes as recognized by the editors and contributors of the volume. And a full-color **Geologic time scale** helps readers understand prehistoric time periods. Additionally, the volume contains a **Subject index**.

## Acknowledgements

Gale would like to thank several individuals for their important contributions to the volume. Dr. Sean F. Craig and Dr. Dennis A. Thoney, topic editors for the Protostomes

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volume, oversaw all phases of the volume, including creation of the topic list, chapter review, and compilation of the appendices. Neil Schlager, project manager for the Protostomes volume, and Vanessa Torrado-Caputo, associate editor at Schlager Group, coordinated the writing and editing of the

text. Dr. Michael Hutchins, chief consulting editor for the series, and Michael Souza, program assistant, Department of Conservation and Science at the American Zoo and Aquarium Association, provided valuable input and research support.