



POISONOUS AMPHIBIANS AND REPTILES

RECOGNITION and BITE TREATMENT

This intelligently constructed,
reliably accurate, readable
little volume is the outcome of
a careful and considered
combing of the literature,
evaluated on the one hand by a
physician having daily contact
with college first-aid classes and
on the other by a herpetologist
of some twenty-five years of
experience in his field.

FLOYD
BOYS, M.D.

Associate Professor of
Health Education
University of Illinois
Urbana, Illinois

and

HOBART M.
SMITH, Ph.D.

Professor of
Zoology (Herpetology)
University of Illinois
Urbana, Illinois



The collaboration has pro-
duced a highly desirable,
balanced perspective not
evident in the somewhat
similar but far less inclu-
sive surveys written by
herpetologists alone or by
physicians alone.

CHARLES C. THOMAS • PUBLISHER
Springfield, Illinois

Poisonous Amphibians And Reptiles

RECOGNITION, AND BITE TREATMENT

By

FLOYD BOYS, M.D.

*Associate Professor of Health Education
University of Illinois
Urbana, Illinois*

And

HOBART M. SMITH, Ph.D.

*Professor of Zoology (Herpetology)
University of Illinois
Urbana, Illinois*



CHARLES C THOMAS • PUBLISHER
Springfield • Illinois • U.S.A.

CHARLES C THOMAS • PUBLISHER
BANNERSTONE HOUSE
301-327 East Lawrence Avenue, Springfield, Illinois, U.S.A.

Published simultaneously in the British Commonwealth of Nations by
BLACKWELL SCIENTIFIC PUBLICATIONS, LTD., OXFORD, ENGLAND

Published simultaneously in Canada by
THE RYERSON PRESS, TORONTO

This book is protected by copyright. No part of it may be reproduced in any manner without written permission from the publisher.

© 1959 by CHARLES C THOMAS • PUBLISHER

Library of Congress Catalog Card Number 58-12149

With THOMAS BOOKS careful attention is given to all details of manufacturing and design. It is the Publisher's desire to present books that are satisfactory as to their physical qualities and artistic possibilities and appropriate for their particular use. THOMAS BOOKS will be true to those laws of quality that assure a good name and good will.

Printed in the United States of America

Poisonous Amphibians
And Reptiles

P R E F A C E

The present account of venomous reptiles and amphibians is restricted in scope to those species inhabiting the United States and Canada. Much of the basic information reviewed is applicable to situations existing in other parts of the world, but it is of importance to emphasize that our primary concern is with the problems existing in North America.

It is recognized that in the geographic area with which we are here primarily concerned, the United States, relatively few persons in their lifetime will ever be exposed to the immediate danger of being bitten by a snake of any kind, and that, statistically speaking, the first aid problem of snake bite is not particularly significant. However, since an individual bitten by a poisonous snake is in serious danger of death, the problem becomes one of great personal importance to any individual so victimized.

Although the primary intent of this treatise is to discuss snakes, since these animals include most of the commonly encountered poisonous vertebrates, a general and brief survey of other poisonous animals is included in order to place snakes and their significance as venomous animals in proper perspective.

This summary is necessarily introductory and incomplete. Its perusal, nevertheless, should assist interested students in looking up more detailed supplementary reading, and in becoming better versed about the more *practical* facts relating to first aid procedure in snake bite cases. It is believed that the material presented is accurate as far as it goes, and that, in its synthesis of zoological and medical approaches, it represents a unique contribution to the extensive literature of this field.

ACKNOWLEDGMENTS

We are very grateful to two of the best qualified practitioners of snakebite treatment, Drs. Sherman A. Minton and Frederick A. Shannon, for critical reading of the medical section of this monograph, Part IX. To Mrs. Eleanor E. Buckley we are indebted for the privilege of pre-publication examination of abstracts of the papers appearing in the AAAS volume, *Venoms*, published in late 1956. Bibliographical assistance by Miss Clara Mechel, and by Miss Elizabeth Adkins, is gratefully acknowledged. Thanks are also to be expressed to Miss Alice Boatright and Mr. Lawrence D. Siler for doing part of the illustrative work.

F.B.
H.M.S.

CONTENTS

	<i>Page</i>
<i>Preface</i>	v
<i>Acknowledgments</i>	vii

PART I

Taxonomy (Classification) of Venomous Animals.....	3
A. Meaning of the Terms Venomous and Poisonous..	3
B. Occurrence of Poisons in Animals.....	4
1. Invertebrates	4
2. Vertebrates	4
C. Classification of Amphibians and Reptiles.....	5
1. Amphibians	5
2. Reptiles	5

PART II

Poisonous Amphibia (Salamanders, Frogs, Toads).....	7
A. Location of Poison.....	7
B. Modes of Poisoning.....	7
C. Nature of Poison.....	8
D. Poisonous Species of North America.....	9
1. Toads	10
2. Red-legged Frogs	10
E. Recognition of this Emergency.....	11
F. First Aid Treatment.....	11

PART III

Poisonous Chelonia (Turtles).....	12
A. Poisonous Species.....	12

B. Nature of the Poison.....	13
C. Recognition of this Emergency.....	13
D. First Aid Treatment.....	14

PART IV

Venomous Lacertilia (Lizards).....	15
A. Kinds of Venomous Lizards in the United States..	15
B. Mode of Envenomation.....	16
C. Action of the Venom.....	16
D. Recognition of this Emergency.....	17
E. First Aid Treatment.....	17
F. Medical Treatment	19

PART V

Venomous Ophidia (Snakes).....	21
A. General Zoological Characteristics of the Suborder Ophidia	21
1. Size	21
2. Skeletal System	21
3. Locomotion	22
4. Skin	22
5. Rattles	23
6. Teeth	25
7. Ears	30
8. Eyes	30
9. Tongue	31
10. Pits	32
11. Body Temperature	32
12. Respiration	32
13. Bladder	32
14. Copulation and Breeding.....	33
15. Diet	33

16. Catching Their Prey.....	34
17. Deglutition (Swallowing Mechanism).....	34
18. Erroneous Beliefs About Snakes.....	35
B. Venomous Snakes in the United States.....	39
1. Kinds of Venomous Snakes.....	39
2. Proportion of Deadly to Non-Deadly Snakes in the United States.....	41
3. Mode of Envenomation.....	43
4. Mode of Spread of Venom.....	44
5. Composition of Snake Venoms.....	45
6. Over-all Actions of Venoms.....	48
7. Potency of the Venomous Bite.....	54
8. Cause of Deaths from Snakebite.....	59
9. After-Effects in Survivors from Snakebite....	60

PART VI

General Precautions Against Snakebites.....	61
A. Season of the Year.....	61
B. Time of the Day.....	61
C. Danger of Snake Den Areas.....	62
D. Observational Precautions.....	62
E. Importance of Companions.....	63
F. Value of Wearing Protective Garments.....	64
G. Snakebite Kits.....	64
1. Tourniquet.....	66
2. Antiseptic.....	67
3. Cutting Instrument.....	67
4. Suction Cups.....	68
H. Artificial Bodily Immunity Against Venom.....	69
I. Control.....	70

PART VII

Recognition of Poisonous Snakes and Their Bites.....	72
A. Examination of the Snake.....	72
1. Front Fangs	72
2. Pits	73
3. Rattles	73
4. Skin Color Patterns.....	73
5. Scale Pattern on the Under-Surface of Tail..	81
6. Shape of Head.....	81
7. Snake Noises.....	83
B. Examination of the Bitten Person.....	83
1. Bite Pattern.....	84
2. Pain	85
3. Swelling	86
4. Miscellaneous Symptoms	87

PART VIII

First Aid Measures in Treating Poisonous and Non-Poisonous Snakebite Cases	88
A. Keeping Bodily Metabolism at a Minimum.....	88
1. Position	88
2. Muscular Activity.....	89
3. Fear and Emotional Excitement.....	89
4. Alcohol	89
5. Food	89
B. Mechanical Removal of Venom from the Subcutaneous Tissues	90
1. Tourniquet	92
2. Multiple Incisions.....	93
3. Suction	96
C. Sending for Medical Assistance.....	98

D. Recommended General First Aid Procedure in Specific Case Situations	99
1. The Victim Is Alone.....	99
2. The Victim Has One Companion.....	101
3. The Victim Has Two or More Companions..	103

PART IX

Medical Treatment in Cases of Snakebite.....	106
A. General Recommendations (Summary).....	110
B. Continuation of Standard First Aid Measures.....	111
C. Antivenins	114
D. Anti-Shock Measures	121
1. General Measures	122
2. Blood Transfusion.....	122
3. Other Intravenous Injections.....	123
4. Miscellaneous Drugs.....	123
E. Calcium Supplements	125
F. Glycine	126
G. Neostigmine	126
H. Ascorbic Acid	127
I. Sedation	127
J. Artificial Respiration.....	128
K. Antibiotics	129
L. Purgatives	129
M. Antipruritics	130
N. Diet and Liquids.....	130
O. Cryotherapy (Local Tissue Refrigeration).....	130
P. Continued Care	131
Bibliography	132
Postscript	143
Index	145

Poisonous Amphibians
And Reptiles

PART I

TAXONOMY (CLASSIFICATION) OF VENOMOUS ANIMALS

A. MEANING OF THE TERMS VENOMOUS AND POISONOUS

A *venomous* animal is one possessing venoms of one or more kinds. A venom is a body fluid that contains one or more poisonous ingredients, and that is used primarily in exploitation of its deadly properties. Most animal venoms are highly complex, containing numerous poisonous as well as harmless biochemical fractions. Venoms are sometimes used aggressively, for the most part by biting, scratching, and stinging, and sometimes they are used passively, as for example the venomous hairs on certain caterpillars.

A *poisonous* animal is one that produces a poison by normal bodily processes. A poison is defined as any substance chemically producing an injurious or deadly effect when introduced into an organism. All venomous reptiles, including certain snakes as well as one species of lizard, are properly referred to as poisonous, since their venoms contain one or more poisons. Many other vertebrates, however, possess no venom as such, but are still poisonous, having body fluids which prove noxious when ingested by other animals. It may thus be said that all venomous animals are poisonous, but that not all poisonous animals are venomous. So far as snakes are concerned, either term is appropriate. The two are used interchangeably in this work. Nevertheless, the term venomous is more strictly accurate

for the poisonous snakes and lizards, and is thus, other factors being equal, the more preferable of the two terms.

B. OCCURRENCE OF POISONS IN ANIMALS

1. Invertebrates

Almost every phylum of invertebrates contains one or more species of animals poisonous in one way or another. Familiar examples are certain ticks, spiders, scorpions, flies, leeches, earthworms, jellyfish, beetles, wasps, bees, centipedes, and anemones.

2. Vertebrates

In all classes of vertebrates (birds excepted), certain species possess poison of some sort. Reptiles rank at the top of the list primarily because they include snakes, many species of which are notoriously venomous. Amphibians come next, followed in order by fishes and mammals. Venom is found among mammals in the saliva of shrews, and also is associated with the spur on the hind legs of the male of one primitive Australian mammal (duckbilled platypus). Venomous fishes include certain rays and catfishes, which possess bony spines associated with venom sacs in the skin.

A few vertebrates are known to be poisonous if eaten, but they are not venomous. A number of sharks, rays, ratfish, and bony fishes, both marine and freshwater, are poisonous when eaten. So also are marine turtles in certain regions. The liver of certain seals and bears is deadly poisonous, apparently because of a high concentration of vitamin A (Halstead, 1956: 23). The latter author provides an impressive account of the symptoms and treatment for all known poisonous marine animals. There is an astonishing and sobering array of animals dangerous to use as food.

C. CLASSIFICATION OF AMPHIBIANS AND REPTILES

1. Amphibians

Three orders of living amphibians are recognized:

- a. *Order APODA*—legless, earthwormlike animals (caecilians).

Of no interest to First Aiders. These amphibians are not seen in North America.

- b. *Order CAUDATA*—tailed, and with 2-4 legs (salamanders, newts).

Of no importance to First Aiders in the Western Hemisphere, because no species has a significantly strong skin poison. Some Eurasian forms do have powerful epidermal secretions.

- c. *Order ANURA*—no tail, always 4 legs (frogs, toads).

Many anurans have a strong skin poison capable of affecting humans. These shall be discussed later.

2. Reptiles

Living reptiles represent four orders:

- a. *Order RHYNCHOCEPHALIA*—the tuatara (a lizardlike animal) of New Zealand, the sole survivor of this Order.

This creature is of no interest to First Aiders as the reptile is not encountered in North America, and is not venomous.

- b. *Order CHELONIA*—turtles, terrapins, and tortoises.

No venom occurs in chelonians, although bites may be mechanically and infectiously dangerous. A very few species are dangerous through possession of a poisonous property to be discussed later.

- c. *Order CROCODILIA*—crocodiles, alligators, and caimans.

Most First Aiders will never be called upon to treat people bitten by members of this Order. Bites by these animals are dangerous mainly because of the dirty, severe wounds they may produce. In such rare instances, a First Aider would have to treat for massive hemorrhage, severe shock, etc. No venomous material *per se* is introduced into the victim.

- d. *Order SQUAMATA*—a group containing four suborders, three of which are still in existence.

Suborder LACERTILIA—lizards

The only member of this group in the world which First Aiders need be specifically concerned with, except for certain large species producing lacerations by their teeth, is the famed Gila Monster of Western North America. This species is discussed further in Part IV.

Suborder OPHIDIA—snakes

These reptiles are the most important animals for the First Aiders to study, as certain snakes constitute the bulk of venomous creatures known to attack and poison humans. Most of the following discussion pertains to this group.

Suborder AMPHISBAENIA—worm lizards

Of no interest to First Aiders. These animals are restricted to tropical and subtropical regions of the world, occurring in the United States only in Florida. They are not venomous, and are too small to bite humans painfully.