AMPHIBIAN & REPTILE

NATURAL HISTORY



Bradford D. Hollingsworth, Ph.D. Curator, Department of Herpetology San Diego Natural History Museum

DIVERSITY





Reptiles

Amphibians

http://web.me.com/chuckwalla1/NaturalHistory/

DIVERSITY





Reptiles Turtles, Lizards & Snakes

Amphibians

http://web.me.com/chuckwalla1/NaturalHistory/

DIVERSITY





Reptiles Turtles, Lizards & Snakes

Amphibians Frogs & Salamanders

http://web.me.com/chuckwalla1/NaturalHistory/



Founded in 1874 Newly Expanded Facilities

DEPARTMENT OF HERPETOLOGY



2003

2008

Amphibian and Reptile Collections

DEPARTMENT OF HERPETOLOGY



Over 73,500 Specimens
Amphibian and Reptile Collections

DEPARTMENT OF HERPETOLOGY



Information Systems

Amphibian and Reptile Collections

DEPARTMENT OF HERPETOLOGY

Biodiversity Distribution Habitat Preference Diet Reproduction Morphology **Parasites**



Natural History Specimen

Amphibian and Reptile Collections

DEPARTMENT OF HERPETOLOGY

Biodiversity

Distribution

Habitat Preference

Diet

Reproduction Morphology

Parasites



Field Guides

Author: Robert C. Stebbins

Amphibian and Reptile Collections

BIODIVERSITY CONSERVATION



BIODIVERSITY CONSERVATION

Indicator Species

BIODIVERSITY CONSERVATION

Western Toad
Arroyo Toad
Red-spotted Toad
Calfornia Treefrog
Pacific Treefrog
Western Spadefoot
Red-legged Frog
Mountain Yellow-legged Frog

BIODIVERSITY CONSERVATION

Western Toad	
Arroyo Toad	
Red-spotted Toad	
Calfornia Treefrog	
Pacific Treefrog	
Western Spadefoot	
Red-legged Frog	
Mountain Yellow-legged Frog	

BIODIVERSITY CONSERVATION

Western Toad	
Arroyo Toad	Endangered
Red-spotted Toad	
Calfornia Treefrog	
Pacific Treefrog	
Western Spadefoot	Problematic
Red-legged Frog	Locally Extinct
Mountain Yellow-legged FrogLocally Extinct	

DIVERSITY





Caudata

Anura

5 Native Species

8 Native Species

DIVERSITY





Caudata Salamanders

Anura

5 Native Species

8 Native Species

DIVERSITY





Caudata Salamanders

Anura Frogs

5 Native Species

8 Native Species

SALAMANDERS & FROGS



Laboratory Manual for Animal Diversity: An Evolutionary Approach (3rd edition). Adapted by Annalisa Berta. Originally written by Simpson, Gergus, McMillan

SALAMANDERS

LIFE CYCLE



Animal Diversity, 2nd Edition (Hickman, Roberts, and Larson)

SALAMANDRIDAE

BIOLOGY

- Generalized reproductive pattern
 - Aquatic eggs and larvae



California Newt (*Taricha torosa*)



SALAMANDRIDAE

BIOLOGY



PLETHODONTIDAE

LUNGLESS SALAMANDERS

- Terrestrial reproductive pattern
 - Terrestrial eggs laid in moist microhabitat





Garden Slender Salamander (Batrachoseps major) Arboreal Salamander (Aneides lugubris)

PLETHODONTIDAE

LUNGLESS SALAMANDERS

- Terrestrial reproductive pattern
 - Terrestrial eggs laid in moist microhabitat





Monterey Ensatina (*Ensatina eschscholtzii*)

Photo: © Bradford D. Hollingsworth

Large-blotched Ensatina(*Ensatina klauberi*)

NATURE NEWS

BREAKING RESEARCH



figure 17.5

Courtship and sperm transfer in the pygny salamander. Desmognethus wright. After judging the female's receptivity by the presence of her chin on his tail base, the male deposits a spermatophore on the ground, then moves forward a few paces. A, The white mass of the sperm atop a gelatinous base is visible at the level of the female's forelimb. The male moves ahead, the female following until the spermatophore is at the level of her vent. B, The female has recovered the sperm mass in her vent, while the male arches his tail, tilting the female upward and presumably facilitating recovery of the sperm mass.

Spermatophores

Figure: Animal Diversity, 3rd Edition (Hickman, Roberts, and Larson)



First Video Footage

Video: © Tom Devitt, University of California, Berkeley



CALLING AMPHIBIANS



Important for Survival

STUDYING THEIR REPRODUCTIVE BIOLOGY



Generalized Life Cycle

Animal Diversity, 2nd Edition (Hickman, Roberts, and Larson)

STUDYING THEIR REPRODUCTIVE BIOLOGY



Generalized Life Cycle

Photos: http://www.vernalpool.org & © Bradford Hollingsworth

STUDYING THEIR REPRODUCTIVE BIOLOGY



Males vocalize to attract females

STUDYING THEIR REPRODUCTIVE BIOLOGY

Males vocalize to attract females

STUDYING THEIR REPRODUCTIVE BIOLOGY

Male - Male Encounter Release Call

STUDYING THEIR REPRODUCTIVE BIOLOGY

Male - Male Encounter Release Call

STUDYING THEIR REPRODUCTIVE BIOLOGY

Western Toads Loss of Advertisement Call

STUDYING THEIR REPRODUCTIVE BIOLOGY

Western Toads Loss of Advertisement Call

COMPLEX VOCAL REPERTOIRE

LOCAL FROG SPECIES

COMPLEX VOCAL REPERTOIRE

LOCAL FROG SPECIES









PLETHODONTIDAE

LUNGLESS SALAMANDERS

Stephen M. Deban, Ph.D. University of South Florida



Toads (Bufonidae)

NON-AVIAN REPTILES

CHELONIA



Laboratory Manual for Animal Diversity: An Evolutionary Approach (3rd edition). Adapted by Annalisa Berta. Originally written by Simpson, Gergus, McMillan

TURTLES



Lack teeth & Jaw is modified into a beak

hotos: gto.ncsa.uiuc.edu/pingleto

TURTLES





Carapace

Plastron

Shell modified from ribs and vertebrae

Photos: www.tortoise.com

TURTLES



Freshwater Turtles

TURTLES



Freshwater Turtles

TURTLES



Freshwater Turtles

TURTLES

Seaturtle

Video: © Bradford D. Hollingsworth

TURTLES



Seaturtle

Video: © Bradford D. Hollingsworth

TURTLES



Figs. 166a and 166b. The ecophagus and anterior stomach lining. The papillae that line the ecophagus are keratinized for most of the length of the ecophagus. They end abruptly; several flat, transitional papillae, lacking keratin line the

esophageal wall at the level of the gastroesophageal sphincter. Posterior to this sphincter, the stomach lining is very smooth and has no popilloe.

Image: Jeanette Wyneken, http://courses.science.fau.edu (2003)

TURTLES



Figure 3. Endoscopic appearance of the papillated segion of the esophagus of (A) a loggerhead sea turtle (turtle 3) and (B) a Malaysian giant turtle (turtle 4).

Image: Jeanette Wyneken, http://courses.science.fau.edu (2003)

NON-AVIAN REPTILES

SQUAMATA



Laboratory Manual for Animal Diversity: An Evolutionary Approach (3rd edition). Adapted by Annalisa Berta. Originally written by Simpson, Gergus, McMillan



LIZARDS & SNAKES



Caudal Autotomy Ability to lose tail

LIZARDS & SNAKES



Caudal Autotomy Caudal Vertebrae Fracture Planes

LIZARDS & SNAKES



Video: National Geographic Society

LIZARDS & SNAKES



Caudal Autotomy

Video: National Geographic Society













INTEGUMENT



figure 18.3

Section of the skin of a reptile showing overlapping epidermal scales and bony osteoderms in the dermis.

Body covered by scales containing both alpha and beta-keratin

Figure: Animal Diversity, 4th Edition (Hickman, Roberts, Keen, Larson, and Eisenhour)

INTEGUMENT



Figure: Animal Diversity, 4th Edition (Hickman, Roberts, Keen, Larson, and Eisenhour)

INTEGUMENT

Scale Types

Scales, Plates, Scutes, Shields, Laminae, Lamellae, Scansors, and Tubercules



INTEGUMENT



INTEGUMENT



INTEGUMENT



INTEGUMENT



INTEGUMENT



INTEGUMENT



COLORATION

 Lizards Cryptic coloration Sexual dichromatic

Snakes
Cryptic coloration
Warning colors





NATURAL SELECTION

ADAPTATIONS



Phrynosoma coronatum **Coast Horned Lizard**

NATURAL SELECTION

SKELETAL ORNAMENTATION



Horned Lizard Skulls

DigiMorph

http://digimorph.org

NATURAL SELECTION





Horned Lizard Skulls DigiMorph

http://digimorph.org
NATURAL SELECTION



NATURAL SELECTION

- BLOOD SQUIRTING IN RESPONSE TO CANID PREDATORS
- CAPILLARY BED IN CORNER OF EYE RUPTURES
- OLFACTORY WARNING
 AND DISTRACTION



SNAKES

- Evolved from lizards
- Loss of limbs and external ears
- Elongate body
- Loss of left lung
- Internal organs elongate
- Predators
- 2,987 species



SNAKES



SNAKES



Haasiophis terrasanctus

J. Paleont., 77(3), 2003, pp. 536–558



SNAKES



J. Paleont., 77(3), 2003, pp. 536–558

Haasiophis terrasanctus

SNAKES



Anaconda

J. Paleont., 77(3), 2003, pp. 536–558

SNAKES



Highly Kinetic Skull

Photos: © Stephen J. Montgomery

SNAKES



Highly Kinetic Skull

Photos: © Stephen J. Montgomery

RATTLESNAKES



SNAKES



Movie: Brad Riney photographer; Bradford Hollingsworth editor

SNAKES



Highly Kinetic Skull

Digital Zoology©The McGraw-Hill Companies, Inc.

RATTLESNAKES



Digital Zoology©The McGraw-Hill Companies, Inc.

RATTLESNAKES

Red Diamond Rattlesnake



Plate 1388. Hemorrhagic blebs and swelling six hours after a Crotalus rater bite to the long finger. The patient experienced a severe decrease in his platelet count. Photo by Sean Bush.



Plate 1389. Tissue necrosis seven weeks after a Crotalus ruber bite, same patient as Plate 1388. Photo by Sean Bush.

Image: Campbell, J. A. and W. W. Lamar. 2004. The venomous reptiles of the Western Hemisphere. Cornell University Press, Ithaca, New York.

DEFENSIVE BEHAVIOR



RATTLE



RATTLE



The rattle from a western diamondback rattlesnake, Crotalus atrox. This string contains six segments; it has lost some of the older segments from its tip and so the button is missing.

RATTLE



REPRODUCTION



FANGS



Fig. 191. Sulcare aspect of right hemipenis of Crotalas name (UTA R-4536). From McCranie, 1988. Published by permission of the Herpetologists' League.

Figure 191: Campbell, J. A. and W. W. Lamar. 2004. The venomous reptiles of the Western Hemisphere. Cornell University Press, Ithaca, New York.

REPRODUCTION



Male - Male Combat

REPRODUCTION



Male - Male Combat

REPRODUCTION



Male - Male Combat

REPRODUCTION



Male - Male Combat

REPRODUCTION



Male - Male Combat

REPRODUCTION



Male - Male Combat

REPRODUCTION



Male - Male Combat

REPRODUCTION



Male - Male Combat

Thanks

BIOLOGICAL DIVERSITY IS THE KEY TO THE MAINTENANCE OF THE WORLD AS WE KNOW IT. E.O. WILSON THE DIVERSITY OF LIFE 1992

