

Rare and Endangered Biota of Florida

Peter C. H. Pritchard, SERIES EDITOR

Volume Three

Amphibians & Reptiles

Edited by Roy W. McDiarmid

Chairman, Special Committee on Amphibians and Reptiles

FLORIDA COMMITTEE ON RARE AND ENDANGERED PLANTS AND ANIMALS



Sponsored by the FLORIDA AUDUBON SOCIETY and FLORIDA DEFENDERS OF THE ENVIRONMENT

Published for the STATE OF FLORIDA GAME AND FRESH WATER FISH COMMISSION

by

UNIVERSITY PRESSES OF FLORIDA

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Publication funding provided by

U.S. FISH AND WILDLIFE SERVICE

FLORIDA POWER AND LIGHT COMPANY

and the

EDWARD BALL WILDLIFE FOUNDATION

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by

UNIVERSITY PRESSES OF FLORIDA

FAMU/FAU/FlU/FSU/FTU/UF/UNF/USF/UWF Gainesville

Series note: *Rare and Endangered Biota of Florida*, published under the general editorship of Peter C. H. Pritchard, in 1978 includes four volumes:

Volume 1 – Mammals, edited by James N. Layne

Volume 2 – Birds, edited by Herbert W. Kale II

Volume 3 – Amphibians and Reptiles, edited by Roy W. McDiarmid

Volume 4 – Fishes, edited by Carter R. Gilbert

In preparation for later publication in the series are three additional volumes dealing with plants, invertebrates, and recommendations and liaison.

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Typeset by Copy Grafix, Tallahassee

Printed by Douglas Printing Company, Jacksonville

Library of Congress Cataloging in Publication Data

Main entry under title

Rare and endangered biota of Florida.

Includes bibliographies.

CONTENTS: v. 1. Mammals. – v. 2. Birds. – v. 3. Amphibians and reptiles. – v. 4. Fishes.

1. Rare animals—Florida. 2. Rare plants—Florida. 3. Wildlife conservation—Florida. I. Pritchard, Peter Charles Howard, 1943— II. Florida Audubon Society. III. Florida Defenders of the Environment.

QL84.22.F6R37

596'.09759

78—12121

ISBN 0-8130-0619-8 (v.3)

University Presses of Florida, a Type I institute of the State of Florida University System, is the publishing agency for Florida's nine public universities: Florida A & M University, Florida Atlantic University, Florida International University, Florida State University, Florida Technological University, University of Florida, University of North Florida, University of South Florida, and University of West Florida. The publishing unit of the organization is located at the University of Florida, Gainesville.

Charged by Board of Regents policy with publication of "general works of particular interest and usefulness to the citizens of Florida," University Presses of Florida is pleased to be cooperating with the State of Florida Game and Fresh Water Fish Commission in the publication of this series.

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FOREWORD

When I reflect upon the concern for *all* wildlife that has developed in so many people in recent years, and view Rare and Endangered Biota of Florida as a significant milestone reflecting this progress, it is natural to reminisce about the days when things weren't so good in Florida. Those were the days when the phrase "endangered species" was, for all practical purposes, unheard of; when preservation and management of utilitarian species such as deer was the overwhelming concern of most conservationists; and when a few farseeing citizens such as Ernest P. Taylor of Tampa pressed me and others into service in the early 50's to preserve Corkscrew Swamp; and when Commissioner David C. Jones of Naples in 1958 fought an uphill battle in influencing other members of the Game and Fresh Water Fish Commission to protect the Florida panther, which, like all predators, was traditionally considered the arch-enemy of man.

This contrasts with the situation today when state and federal legislation recognizes endangered species; when a group of dedicated and knowledgeable scientists, under the leadership of James N. Layne, contribute their

time and knowledge to the production of this tremendous scientific work; and when private industry joins with state and federal wildlife agencies in making funds available for its publication.

Between these two periods lie many rocky trails strewn with memories of the gallant and effective efforts of such people as Archie and Marjorie Carr, John McQuigg, Hal Scott, Marjory Stoneman Douglas and their associates and supporters who have done so much to bring environmental awareness to the people of Florida.

Finally, let me admonish: we have won some important battles, but the war goes on. Eternal vigilance is the price.

On behalf of the Game and Fresh Water Fish Commission—of which I was Director during most of the effort culminating in this great series of publications—let me thank the many people who contributed to this work—either as authors, providers of funds, or counselors.

O. E. Frye, Jr.

PREFACE

The Florida Audubon Society and Florida Defenders of the Environment are exceedingly proud to present this volume of the *Rare and Endangered Biota of Florida*. It has been in preparation for more than three years, and is surely the most exhaustive work of its kind that has been produced for any state. The inventory is the work of the Florida Committee on Rare and Endangered Plants and Animals (FCREPA), a group of Florida biologists who have pooled their knowledge and their talents to produce this impressive compendium. The inventory, we are sure, will be of the greatest interest to academic biologists; but we are also confident that it will serve as a planning tool for state agencies and environmental consultants throughout Florida. We—the FCREPA Committee and the Florida Environmental Organizations—must not rest on our laurels now that the inventory has been prepared. Not only must it be constantly and carefully updated, but the next stage must be implementation of the recommendations for each species. In some cases this can be accomplished by the purchase of a few acres of habitat; in others, a major turnaround in man's attitude to his fellow creatures and his environment will be necessary. But we feel that the greatest value of the inventory will be as a reference to be consulted in the early stages of any planned development in Florida, so that sensitive habitats harboring endemic endangered species may be totally avoided, and in other, less sensitive areas, compatibility between human intrusion and rare or endangered species can be assured.

The present volume, No. 3 in the series and dealing with the amphibians and reptiles of Florida, would not have been possible without the dedicated efforts of many people. Foremost among these, of course, are Dr. James Layne, the Chairman of FCREPA, and Dr. Roy McDiarmid, Chairman of the Special Committee on Amphibians and Reptiles. They and all other members of the Committee donated freely their expertise, time, and energies to write the species accounts and ensure that they were correct, consistent, and ready for publication. Merlein King also deserves especial thanks for drawing the range maps for this and all volumes of the series. I should also like to express sincere appreciation to Don A. Wood, Endangered Species Coordinator, Florida Game and Fresh Water Fish Commission, for his valuable help in preparing the manuscripts for publication and for arranging and supervising the printing.

The series was originally published in an interim microfiche version through the courtesy of Eastern Airlines. This, the first printed version, represents a considerable updating and expansion in scope. Publication was made possible by grants from the U.S. Fish and Wildlife Service, with matching funds raised in Florida from the Florida Power and Light Company and the Edward Ball Wildlife Foundation. To these institutions we convey our grateful thanks.

Peter C. H. Pritchard
Series Editor

INTRODUCTION

The herpetofauna of Florida is extremely diverse and complex. It reflects the climatic diversity, geographic location, habitat complexity and biogeographic history of the state. There are 153 species of amphibians and reptiles known from the state. This compilation includes at least 12 introduced species of lizards and four introduced species of frogs. Nearly one-fifth (10 of 54 species) of the amphibians and more than one-third (35 of 99 species) of the reptiles in the state are considered by the Committee on Amphibians and Reptiles (see previous section) to fall into one of five status categories of concern (Table I). The common and scientific names of all species of amphibians and reptiles considered are grouped by category in the *Species List*.

The 45 species of amphibians and reptiles considered in this paper are distributed among the 67 counties of Florida as shown in Table II. In an ecological sense these political divisions are not meaningful units to the species. However, they are included to facilitate the decisions that local governmental agencies have to make with regard to the environmental impact of various kinds of disturbance and development.

When these 45 species are examined in terms of their natural geographic distribution, several patterns emerge. Interestingly, many of these patterns also are reflected in the distributions of the rare and endangered species of plants, some invertebrates, birds and mammals (see other volumes of this series). These broad patterns essentially fall in two groups: 1) distributional patterns associated with major terrestrial, wetland or aquatic habitats (e.g. sand pine scrub, mangrove swamp, sandhill, tropical hammock, flatwoods ponds) which are being modified or destroyed at a rapid rate, or with very specific habitats (e.g. caves, nesting beaches, muck deposits, sphagnaceous seepage slopes and acidic bogs) which are local and/or very restricted in the state; or 2) distributional patterns associated with biogeographic or physiographic provinces (e.g. Atlantic Coastal Plain, Central Florida Ridge, Florida Keys) in the state. Each of these patterns is discussed below.

Habitat and Distributional Analysis

The major terrestrial and wetland habitats of Florida are considered briefly by Hartman (see *Habitat Descriptions* in this volume). In general, these habitats adequately describe the ecological distributions of Florida's rare and endangered amphibians and reptiles. However, the habitat requirements of certain species are more specific than the broad categories of Hartman indicate. Two examples illustrate this point: the hillside seepage bogs and titi swamps described as a distinct variant of the hardwood swamps are critical breeding sites for *Hyla andersonii*; the bayhead ponds and sphagnum bogs that form the Florida habitat for *Stereochilus marginatus* also are recognized as a distinct variant of hardwood swamps.

In addition to the species found in the described terrestrial and wetland habitats, some rare and endangered amphibians and reptiles primarily are found in aquatic habitats which may or may not be independent of adjacent terrestrial and wetland habitats. To accommodate these species I have added 5 additional habitats to Hartman's original 14. These include: sphagnum

bogs, ponds and lakes, streams and rivers, subterranean waters and the marine habitat. With the exception of the marine environment, these additional habitats are described in sufficient detail in the appropriate species account, in the references listed in their inclusive bibliographies, or in Carr's classic work on the herpetology of Florida (Carr 1940).

The distributions of the amphibians and reptiles considered in this study by major terrestrial and aquatic habitats are shown in Table III. These distributions represent our best estimates based on current knowledge. If a species is reported from a habitat, it does not mean necessarily that all units of that habitat will contain populations of the species; likewise, the species occasionally will be found in a habitat not listed. What is meant is that these are the known habitats of the species and that the data in Table III, combined with distributional data presented in Table II and illustrated on the range maps, are currently the best summaries of the ecological distribution and likely occurrence of the rare and endangered amphibians and reptiles as determined by this Committee.

Xeric Habitats—Several species of amphibians and reptiles considered in this report are associated primarily with vegetation types that occur on the well drained soils characteristic of the Central Florida Ridge and certain coastal areas. Habitats referred to as sand pine scrub, and sandhill or longleaf pine-turkey oak are typical of these xeric areas. This kind of habitat has a high degree of endemism and is one that is rapidly giving way to agricultural, urban and residential development. Seven species, including the endangered Short-tailed Snake and the threatened Florida Gopher Frog, Gopher Tortoise, Blue-tailed Mole Skink and Sand Skink, essentially are restricted to these xeric habitats. Special consideration should be given to purchasing sections of scrub habitat off U.S. Highway 27, north of Sebring, as an immediate effort to save some of these species, especially the Blue-tailed Mole Skink.

Coastal Habitats—The coastal brackish water and marine habitats provide suitable area for several endemic Florida plants and animals. Two endangered Florida reptiles, the American Crocodile and the Atlantic Salt Marsh Watersnake are restricted to small areas of mangrove and salt marsh habitats and demand special consideration. The current pressure for waterfront property for development, especially in the Florida Keys, poses a real threat to the continued existence of the American Crocodile in Florida outside of Everglades National Park. Two other rare species of reptiles also are restricted to mangrove or salt marsh habitats. All four species need additional study to ascertain their population status and decide what, other than habitat protection, are the best conservation and management methods to use with these species.

Three species of marine turtles are endangered in Florida, another is threatened, and a fifth is rare. All of these except the Atlantic Ridley are known to nest in coastal strand vegetation on some Florida beaches. Rigid enforcement of existing laws protecting this habitat is needed. Beaches on major rookeries should be closed to vehicles during the nesting season. Illumination

Table I
The number of species of Florida amphibians and reptiles in the five status categories of concern.

		Endangered*	Threatened*	Rare*	Species of* Special Concern	Status* Undetermined	Totals
Amphibians	Salamanders	0	0	6	0	1	7
	Frogs	1	1	1	0	0	3
Reptiles	Crocodylians	1	0	0	1	0	2
	Turtles	3	4	6	0	2	15
	Lizards	0	3	2	0	1	6
	Snakes	2	5	4	1	0	12
Totals		7	13	19	2	4	45

* See definitions in later section.

of certain beaches should be restricted during the nesting season.

Freshwater Aquatic Habitats—Several species of Florida amphibians are found only in specific kinds of aquatic sites. Noteworthy among these are: Pine Barrens Treefrog (endangered), in seepage bogs in titi swamps; Florida Gopher Frog (threatened) and Striped Newt (rare), in upland and flatwoods ponds; and Many-lined Salamander and Carpenter Frog (rare), in sphagnaceous ponds in bay head or cypress stands in Baker County. With the exception of the Florida Gopher Frog, all have restricted geographic ranges. Specific breeding sites should be identified and protected. The best method is to increase the public ownership of these habitats. This is particularly critical for the Pine Barrens Treefrog (*Hyla andersonii*). Since this study began, nearly one-quarter of the known breeding sites of this interesting Florida frog have been destroyed; immediate purchase of the remaining sites is highly desirable and strongly recommended.

Seven species of turtles that occur in rivers in western and west central Florida are listed in three categories by this Committee. The Suwanee Cooter is the only threatened species; the Spotted Turtle, Barbour's Map Turtle, Alabama Map Turtle and Gulf Coast Smooth Softshell are rare; the Alligator Snapping Turtle and the Alabama Red-bellied Turtle are status undetermined. With the exception of the two map turtles, little information is available for these species. Studies on the others should be started immediately. Some of the pressure on these species is from hunting. Because of the late age at maturation for females of some of these species, they should be afforded complete protection in the state. Major disruption and changes in the ecology of certain streams in the Panhandle should be prohibited.

Atlantic Coastal Plain and other Northern Components—Many species included in this report are forms which are peripheral or marginal in the state, that is the bulk of their range lies outside of Florida. Most of these species are considered rare. Forms associated with the Atlantic Coastal Plain fauna include the Many-lined Salamander, the Pine Barrens Treefrog, the Carpenter Frog, and the Spotted Turtle. Immediate effort should be made to ascertain the total range of these

species in Florida and to purchase habitat that includes the known breeding sites of the species.

Several other species have the major portions of their ranges to the north of Florida with only peripheral populations in the state. Most of these are in the rare category and include the Seal Salamander, the Four-toed Salamander, the Suwanee Cooter, the Mole Snake, the Southern Copperhead and the Alligator Snapping turtle (status undetermined). Of this group with northern affinities, only the Suwanee Cooter is considered threatened. Populations of this turtle have been reduced considerably during the past decade. Detailed study of this species in Florida is needed; protective legislation should be considered.

Gulf Coastal Plain—Several species have their distributions along the Gulf Coastal Plain. Some of these are restricted to Florida while others occur further to the west as well. Included in the rare category in this group are the One-toed Amphiuma, Barbour's Map Turtle, the Alabama Map Turtle, the Gulf Coast Smooth Softshell and the Apalachicola Common Kingsnake. Species with Gulf Coastal Plain affinity that are considered in the status undetermined category include the Gulf Hammock Dwarf Siren, the Alabama Red-bellied Turtle and the Southern Coal Skink. These three species need detailed investigation to determine their distribution and population status in Florida.

Lower Florida Keys—Because of the restricted nature of the habitat (small islands) and because of the tremendous development of the Lower Keys, several terrestrial and fresh-water aquatic species of amphibians and reptiles in this area, including Key Mud Turtle, Florida Keys Mole Skink, Big Pine Key Ringneck Snake, Red Rat Snake, Florida Brown Snake and Florida Ribbon Snake are considered threatened. The first three of these species are endemic to the Lower Keys. Research is needed to ascertain the abundance and distribution and ecological requirements of the species so that suitable habitat can be purchased and set up as a preserve for these extremely interesting forms.

Three other species have very restricted ranges and specific habitat requirements and deserve special mention. The Miami Black-headed Snake is known only from a few localities near Miami and on Key Largo and is considered threatened. Special environmental consideration in terms of maintenance of natural habitat and

use of parks and green belts in open space design is needed. The Georgia Blind Salamander is rare and confined to subterranean waters in the Marianna Lowlands-Dougherty Plain physiographic region. It should be given the same consideration as other cave-dwelling forms. The Cedar Key Mole Skink is known only from the islands in the vicinity of Cedar Key. Efforts should be made to afford greater protection for the species in this area.

Detailed descriptions of each species, its range, habitat requirements, ecology and life history, together with a discussion of its status classification and recommendations are presented in the species accounts. A detailed distribution map of each species in Florida, together with its total range, also is shown. When available and practical, a photograph of a Florida specimen is included. We believe this list is accurate and currently represents our best estimate of the status of the species discussed. However, we recognize that our understanding of the distributions and ecologies of most of these species is limited. This is particularly true with reference to population dynamics of most amphibians and reptiles. As more data become available, we expect the status of some species to change. Some may be removed and others added to the list. One species which was not considered but may need to be listed is the Florida Pine Snake, *Pituophis melanoleucus mugitus*. Currently we are considering its status.

As with most terrestrial species of amphibians and reptiles, habitat preservation appears to be the key to survival. For a few species with very limited distributions, habitat acquisition is recommended as the only solution to insure their survival. In some instances, particularly with species of potential commercial value, legislation, and/or more rigid enforcement, appears to be the best way to halt their exploitation and insure their continued existence in Florida. For all the species discussed in this section more information is needed to provide the necessary baseline data against which the future status of these populations can be compared. Recommendations for management and preservation of species are only as good as the available data. The greater the data base, the better will be the recommendations. Together, these should provide for sound management and increase the likelihood that these species of amphibians and reptiles will remain an integral part of the Florida environment.

REFERENCE:

Carr, A.T. 1940. A contribution to the herpetology of Florida. Univ. Florida Publ. Biol. Sci. Ser. 3(1):1-118.

ACKNOWLEDGMENTS

This report would not have been possible without the efforts of many dedicated people who generously offered their time and expertise towards its completion. From its inception on a cold, wet weekend in December, 1973, in the Ocala National Forest, to its completion, the members and consultants of the Committee on Amphibians and Reptiles have made this report what it is, the most up to date compilation of data on forty-five species of Florida's amphibians and reptiles. From the preliminary drafts to the final manuscript, their time and effort have been given unselfishly. My congratulations and thanks for a job well done.

Several other people have contributed their time and effort to this work. Specifically I would like to mention: Dr. James N. Layne, who had much to do with the original organization of the Committee and the preparation of the format for the species accounts; much of the success of our work is due to his overall leadership of FCREPA; Dr. Daniel B. Ward who took time to correct many of our misspellings of plant names; Dr. Robert Simmons of Baltimore, Maryland, who graciously allowed us to use some of his excellent photographs of Florida amphibians and reptiles for the species accounts; Mrs. Merlien King, a volunteer for the Florida Audubon Society, who spent many hours reworking the distribution maps; and Brad Hartman for his contributions on Florida habitats.

I also would like to acknowledge the secretarial staff in the Department of Biology, University of South Florida, for the many hours of typing and retyping letters, drafts and the final manuscript. Jennifer Duggan helped with the geographical and habitat analysis. Steve Godley and Richard Callahan proofed the final manuscript.

Finally I would like to thank Dr. Archie F. Carr whose earlier work in and knowledge of the herpetology of Florida made our task much easier.

To all of these and many others unknown to me, thanks for your help.

Roy W. McDiarmid, Chairman
Committee on Amphibians and Reptiles

Table III. Distribution of amphibians and reptiles in the major terrestrial and aquatic habitats of Florida.

	HABITATS:																					
	Coastal Strand (6)*	Dry Prairies (1)	Pine Flatwoods (10)	Sand Pine (8)	Scrub Longleaf Pine-Xero-phytic Oak Woodland (8)	Mixed Hardwood Pine (2)	Hardwood Hammock (1)	Tropical Hammock (4)	Hardwood Hammock (9)	Swamps Cypress (5)	Swamps Cypress (1)	Swamps Mangrove (5)	Coastal Swamps (8)	Freshwater Marshes & Wet Prairies (5)	Sphagnum Bogs (9)	Ponds & Lakes (8)	Streams & Rivers (9)	Subterranean Waters (1)	Marine Waters (6)	Environments (9)		
AMPHIBIANS																						
Endangered																						
<i>Hyla andersonii</i>																						
Threatened																						
<i>Rana areolata aescopus</i>																						
Rare																						
<i>Amphiuma pholeter</i>																						
<i>Desmognathus monnicola</i>																						
<i>Haideotriton wallacei</i>																						
<i>Hemidactylum scutatum</i>																						
<i>Stereochilus marginatus</i>																						
<i>Notopthalmus persirriatus</i>																						
<i>Rana virgatipes</i>																						
Status Undetermined																						
<i>Pseudobranchius striatus lustricolus</i>																						
REPTILES																						
Endangered																						
<i>Crocodylus acutus</i>																						
<i>Chelonia mydas mydas</i>																						
<i>Eretmochelys imbricata imbricata</i>																						
<i>Lepidochelys kempii</i>																						
<i>Nerodia fasciata taeniata</i>																						
<i>Stilosoma extenuatum</i>																						

DESCRIPTION OF MAJOR TERRESTRIAL AND WETLAND HABITATS OF FLORIDA

Habitat types used here generally follow the General Map of Natural Vegetation of Florida by John H. Davis (1967. Agr. Exp. Sta., Univ. Florida, Gainesville), and descriptions of each habitat are based on published sources. Several of Davis' vegetation categories are grouped together. Marl prairies and Everglades sawgrass are combined with wet prairies and marshes while southern slash pine forests are included with flatwoods. Other categories are further subdivided or omitted for greater clarity or convenience.

The classification of Florida terrestrial and wetland habitats used in this report is as follows:

Upland habitats

Open habitats

1. Coastal strand
2. Dry prairies

Pine dominated forests

3. Pine flatwoods
4. Sand pine scrub
5. Longleaf pine-xerophytic oak woodlands (sandhill community)

Hardwood dominated forests

6. Mixed hardwood-pine
7. Hardwood hammocks
8. Tropical hammocks

Wetland habitats

Open wetlands

9. Coastal marshes
10. Freshwater marshes and wet prairies
11. Scrub cypress

Forested wetlands

12. Cypress swamps
13. Hardwood swamps
14. Mangrove swamps

1. Coastal Strand

The coastal strand includes beaches and the zoned vegetation of beaches and adjacent dunes or rock. This vegetation type is most commonly associated with shorelines subjected to surf and high winds but may sometimes be found bordering calmer bays and sounds.

The vegetation of the beaches and foredunes is characterized by pioneer plants able to establish themselves in the shifting sand. Typical species include beach morning glory, railroad vine, and sea oats. Inland from the foredune, saw palmetto, wax myrtle and dwarf scrubby oaks are found and, in southern Florida, sea grape and cocoplum as well. The vegetation tends to change from grassy to woody from the foredune inland to the more protected back dunes, and the vegetation of these back dunes is often similar to the sand pine scrub habitat found inland on old dunes.

Strand communities expend considerable energy in adapting to the severe stresses of shifting sands, a highly saline environment, and high winds. In some instances, salt spray plays a role similar to fire in other ecosystems by retarding succession indefinitely at a grass or shrubby stage. Strand plants are highly specialized to withstand natural stresses but are very sensitive to man-induced stresses. Trampling or crushing is especially damaging

and even light, localized human use can degrade dune vegetation.

2. Dry Prairies

Dry prairies are vast, treeless plains, often intermediate between wet grassy areas and the forested uplands. Scattered bayheads, cypress ponds, or cabbage palm hammocks often occur in prairie areas. The largest areas of dry prairies occur north and west of Lake Okeechobee.

This community is dominated by many species of grasses such as wiregrass, broomsedges, and several types of carpet grasses. Palmettos are the most common shrubby plant over large areas, with fetterbush, staggerbush, and blueberry common in places. A number of sedges and herbs are also found on the dry prairies.

Relatively little has been published on the ecology of dry prairies. They have often been compared to flatwoods minus the overstory trees, and the similar vegetative ground cover would seem to justify this idea. Vast areas of native dry prairies have been converted to improved pasture, and this trend is continuing. Eucalyptus plantations have also been established on some former dry prairie sites.

3. Pine Flatwoods

Pine flatwoods are characterized by one or more species of pine as the dominant tree species and occur on level areas. The soils of flatwoods are sandy with a moderate amount of organic matter in the top few centimeters and an acid, organic hardpan 0.3 to 1.0 m (1-3ft) beneath the surface. This hardpan reduces rainfall percolation, reduces the upward movement of water, and impedes root penetration during droughts.

Three major types of flatwoods occur in Florida: *Longleaf pine flatwoods* found on well-drained sites and characterized by having longleaf pine as the dominant overstory tree, *slash pine flatwoods* with slash pine as the dominant overstory species and usually in areas of intermediate wetness, and *pond pine flatwoods* with the pond pine as the dominant tree species and typically in poorly-drained areas.

A fourth type of flatwoods of more restricted distribution is *southern slash pine forest*. This type is found on the sand flatlands and rocklands of extreme southern Florida and is characterized by an overstory of the South Florida variety of the slash pine. This association often has tropical components in its understory.

Considerable overlap in understory plants exists among the three major types of flatwoods, with many species found in all three communities. Generally, however, gallberry and saw palmetto dominate the understory in slash pine flatwoods; wiregrasses and runner oaks are especially prevalent in longleaf pine flatwoods; and rusty lyonia and several of the bay trees are characteristic of pond pine areas. Flatwoods also often include intermingled cypress domes, bayheads and small titi swamps.

Fire and water are the two main determinants of flat-

woods ecology. Slash pine flatwoods are subject to the least moisture stress of the three types and have the highest species diversity. Fire is instrumental in reducing competition from hardwoods but does not occur often enough to kill the young, fire-sensitive slash pines.

Longleaf pine flatwoods are stressed by a relative lack of water which reduces the plant diversity. Fire is important in hardwood suppression and in making an area suitable for longleaf pine germination. The longleaf pine is particularly well adapted to fire and is immune to ground fires at almost all stages of growth.

Pond pine flatwoods are stressed by excess water and have the lowest diversity of the three communities. Periodic fire is still important for reducing hardwood competition and facilitating pine reproduction.

4. Sand Pine Scrub

Sand pine scrub is a plant community found almost exclusively in Florida on relict dunes or other marine features created along present and former shorelines or other marine features. The soil is composed of well washed and sterile sands.

This community is typically two-layered, with sand pine occupying the top layer and various scrubby oaks and other shrub species making up a thick, often clumped, understory. Little herbaceous ground cover exists, and large areas of bare sand occur frequently. Typical understory plants include myrtle oak, sand live oak, rosemary, Chapman's oak, scrub holly, and silkbay. Florida blue-stem grass also is a good indicator species of scrub communities.

The sand pine scrub is essentially a fire-based community. Ground vegetation is extremely sparse and leaf fall is minimal, thus reducing the chance of frequent ground fires so important in the sandhill community. As the sand pines mature, however, they retain most of their branches and build up large fuel supplies in the crowns. When a fire does occur, this fuel supply, in combination with the resinous needles and high stand density, ensures a hot, fast burning fire. Such fires allow for regeneration of the sand pine community which would otherwise pass into a xeric hardwood community. The minerals in the vegetation are deposited on the bare sand as ashes, and the pine seeds are released by the heat of the fire. This type of fire regeneration usually results in even-aged stands of trees.

Scrubs found primarily in the coastal portions of the panhandle have an overstory of the Choctawhatchee variety of sand pine which does require fire to release its seeds.

Scrubby flatwoods is a scrub-like association often occurring on drier ridges in typical flatwoods or near coasts. The understory species of this vegetation type are similar to those of sand pine scrub, but the sand pine is replaced by slash pine or longleaf pine. In some cases, pines may be absent.

5. Longleaf Pine-Xerophytic Oak Woodlands (Sandhill Communities)

Sandhill communities (the *longleaf pine-turkey oak* association being one major subtype of this community) occur on well-drained, white to yellowish sands. The

sands are usually deep and relatively sterile, but contain more organic matter than the soils of the sand pine scrub community.

Longleaf pines form a scattered overstory in mature natural stands. In many areas of this habitat at the present time, xeric oaks such as turkey oak, bluejack oak and southern red oak, which were originally small understory trees, now form the overstory as the result of cutting of the pines and prevention of fire. Although tree species diversity is low, there is a wide variety of herbaceous plants such as wiregrass, beggar's tick, partridge pea, yellow foxglove, milk pea, queen's delight and other plants which provide fairly complete ground cover. In the southern portion of the Lake Wales Ridge section of peninsular Florida, a variety of the sandhill community occurs which is characterized by having the south Florida slash pine as the dominant overstory species, rather than longleaf pine, and several species of shrubby oaks in the understory. This association, which is of limited distribution, is somewhat intermediate between sand pine scrub and sandhill vegetation in its species composition.

Fire is a dominant factor in the ecology of this community. The interrelationships of the sandhill vegetation types, particularly the longleaf pine/wiregrass relationship, are dependent on frequent ground fires. The longleaf pine is sensitive to hardwood competition, and wiregrass plays a major role in preventing the germination of hardwood seeds while insuring that there is sufficient fuel buildup on the floor of the community to carry a fire over large areas. The burrowing habits of many of the animals of this association play a significant role in recycling the easily leached nutrients to the surface. Without these animals, additional nutrients would be lost from the system.

6. Mixed Hardwood-Pine

The mixed hardwood and pine community is the southernmost extension of the Piedmont southern mixed hardwoods and occurs on the clay soils of the northern panhandle.

Younger growth may be primarily pine, with shortleaf and loblolly pine predominant. As succession proceeds the various hardwoods become dominant and constitute the natural climax vegetation of the area. The overstory is characterized by a high species diversity and includes American beech (an indicator species), southern magnolia, numerous oaks, sweetgum, mockernut hickory, pignut hickory, basswood, white ash, and spruce pine. The understory includes many young overstory species plus dogwood, red mulberry, hop hornbeam, blue beech, and redbud.

These forests occur where temperature is moderate, soil moisture is relatively high, and nutrient levels are adequate. There is probably no single dominant stress factor. Much of the energy of the vegetation is expended in competition for water, sunlight, and nutrients. In the mature system, very little of these elements goes unused because of the intricate mosaic of plants that captures almost all sunlight and effectively recycles nutrients through the system. During early periods of succession this community is characterized by a relatively low

species diversity and high net productivity. As the system attains maturity it changes to one of high diversity and low net productivity with complicated mechanisms for preventing the loss of nutrients from the system. Fire, which can retard succession and maintain the system in the pine state, is rare in mature communities, allowing many relatively fire intolerant plants to dominate.

7. Hardwood Hammocks

The hardwood forest or mesic hammock community constitutes the climax vegetation of many areas of northern and central Florida. Hardwoods occur on fairly rich sandy soils and are best developed in areas where limestone or phosphate outcrops occur. Hardwood forests are similar to the mixed hardwood and pine of the panhandle but generally lack the shortleaf pine, beech, and other more northern species. Southern magnolia, laurel oak, American holly, blue beech, and hop hornbeam are characteristic species of this association. Variations in the species composition of hardwood hammocks are partially due to differences in soil moisture.

There is no single dominant stress factor in most hardwood hammocks. The result is a high plant diversity, particularly in the mature successional stages of the more mesic hammocks. Fire does not normally play a major role in this community.

Major variations of this vegetative association include coastal hammocks and live oak-cabbage palm hammocks. *Coastal hammocks* are relatively wet hardwoods that occur in narrow bands along parts of the Gulf and Atlantic coasts and often extend to the edge of coastal marshes. *Live oak-cabbage palm hammocks* often border larger lakes and rivers and are scattered through the prairie region of central Florida. Either the oak or palm may almost completely dominate in any one area.

8. Tropical Hammocks

Tropical hammocks are found on many of the tree islands in the Everglades and on many of the Florida Keys. Remnants of these habitats occur north to Palm Beach on the east coast and Sarasota on the west coast.

Tropical hammocks typically have very high plant diversity, containing over thirty-five species of trees and almost sixty-five species of shrubs and small trees. Typical tropical trees are the strangler fig, gumbo-limbo, mastic, bistic, lancewood, the ironwoods, poisonwood, pigeon plum and Jamaica dogwood. Vines, air plants, and ferns are often abundant. Tropical hammocks of the Florida Keys contain a number of plants that are extremely rare in the United States, including mahogany, lignum vitae, thatch palms, and manchineel.

The tropical hardwood forest is the successional climax for much of the uplands of extreme south Florida. Because of frequent fires, this association is largely confined to islands or slightly wetter areas but may invade drier areas if fire is removed for any length of time. Its high plant diversity and efficient recycling of nutrients are important factors in the success of this system at maturity.

9. Coastal Marshes

Coastal marshes occur on low wave-energy shorelines north of the range of the mangroves and are also interspersed with the mangroves in many areas. Salt marshes may also extend into tidal rivers and occur as a narrow zone between the mangroves and freshwater marshes in the southern areas of the state.

Many areas of salt marshes are dominated by one plant such as saltgrass, smooth cordgrass, or blackrush. The species existing in any one area usually depends largely on the degree of inundation by tides.

Smooth cordgrass typically occupies the lower areas and often borders tidal creeks and pools. Blackrush occurs over vast areas, particularly along the Gulf coast, and is inundated less frequently, while the highest areas of the marsh are vegetated by saltgrass or such succulents as saltwort or glasswort.

Salt marshes are often similar to mangrove systems in their ecology. The tides are a major factor in their high productivity, providing free food delivery and waste removal to those organisms adapted to take advantage of this subsidy.

10. Freshwater Marshes and Wet Prairies

Freshwater marshes are herbaceous plant communities occurring on sites where the soil is usually saturated or covered with surface water for one or more months during the growing season.

Wet prairies are characterized by shallower water and more abundant grasses, and usually fewer of the tall emergents, such as bulrushes, than marshes. This category also includes the wet to dry marshes and prairies found on marl areas in south Florida.

Upwards of fifteen separate types of marshes or wet prairies have been described in Florida. Major ones include sawgrass marshes; flag marshes dominated by pickerel weed, arrowhead, fire flags and other non-grass herbs; cattail marshes; spike rush marshes; bulrush marshes; maidencane prairies; grass, rush, sedge prairies; and switch grass prairies dominated by taller grasses. Any single marsh may have different sections composed of these major types and there is also almost complete intergradation between the types.

Fire and water fluctuations, the two major ecosystem managers of Florida, are important in the maintenance of marshes and wet prairies. Fire is important in recycling nutrients back to the soil in the form of ashes during low water levels and "pruning" out old, relatively non-productive tissues. During high water levels, recycling is accomplished by herbivore-detritivore activities. Fire, especially when combined with seasonal flooding, serves to stress plants not adapted to these conditions and reduces competition from more upland species.

11. Scrub Cypress

Scrub cypress areas are found on frequently flooded rock and marl soils in south Florida. The largest areas occur in eastern Collier County and northern Monroe County. This is the characteristic association of the Big Cypress region of southwest Florida.

Scrub cypress forests are primarily marshes with scattered, dwarfed pond cypress. Much of the vegetation is similar to other marshes with scattered sawgrass, beakrushes, St. John's-wort and wax myrtle occurring commonly. Bromeliads as well as orchids and other epiphytes are often abundant on the cypress trees.

The lack of nutrients is probably the limiting factor for both plant and wildlife abundance and diversity. In addition, the seasonal extremes in water levels provide stresses which may further reduce plant diversity. Drainage of many areas of this habitat type with attendant greater damage from fire than under the former natural hydroperiod has increased the stress on this community.

12. Cypress Swamps

Cypress swamps are usually located along river or lake margins or interspersed through other habitats such as flatwoods or dry prairies. In addition, they also occur as strands along shallow, usually linear drainage systems. These swamps have water at or above ground level for a considerable portion of the year.

Bald cypress is the dominant tree along lake and stream margins and is often the only tree which occurs in significant numbers in these locations. Pond cypress occurs in cypress heads or domes which are typically found in flatwoods or dry prairies. Associated trees and shrubs include slash pine, blackgum, red maple, wax myrtle, sweetbay and buttonbush. Other plants include various ferns, epiphytes, poison ivy, greenbrier, and lizard's tail, with arrowhead, pickerel weed, sawgrass and other marsh plants often found in the open water within cypress swamps.

Cypress swamps provide an environment severely stressed by the submerged or saturated condition of the soil. Fire is an additional stress factor in drier cypress heads or domes. Both of these stress factors are also important in reducing competition and preventing the community from advancing to one dominated by evergreen hardwood trees (the bayhead community).

13. Hardwood Swamps

Deciduous hardwood swamps are found bordering rivers and lake basins where the forest floor is saturated or submerged during part of the year. Other names for this community include floodplain forest, bottomland hardwoods and river swamp.

The wettest portions of these forests are usually dominated by bald cypress, blackgum, and water tupelo. In slightly higher areas this community is characterized by such hardwoods as pop ash, red maple, water oak, overcup oak, sweetgum, and water hickory. On terraces or other higher portions of the floodplain, the over-

story includes a variety of more mesic species such as spruce pine, swamp chestnut oak, laurel oak, and pignut hickory. Understory trees and shrubs include dahoon holly, buttonbush, blue beech, and hop hornbeam. Ground cover is sparse in most types of swamp.

Two distinctive variations of this major habitat category are *bay swamps* (bayheads or baygalls) and *titi swamps*. The former are broadleaf evergreen swamps occurring in shallow drainage ways and depressions, particularly in pine flatwoods. Loblolly bay, red bay, and sweet bay are the major tree species. Water levels are relatively stable, and the soil is usually an acidic peat. Titi swamps are dominated by one or more of three titi species and occur as strands or depressions in flatwoods or along the borders of some alluvial swamps in north Florida.

The periodic flooding of the river swamps is a dominant factor in the operation of the system, and different communities will become established if these fluctuations are eliminated. The availability of nutrients and the many subhabitats often present result in fairly high species diversity. All species of this community must be able to withstand or avoid the periodic stresses imposed by high water.

14. Mangrove Swamps

Mangroves occur along low wave-energy shorelines on both coasts from Cedar Keys on the Gulf to St. Augustine on the Atlantic. Some of the best examples of mangrove forests are located in the Ten Thousand Islands area of southwest Florida.

Three species of mangroves dominate the composition of mangrove swamps. The red mangrove, with its stilt root system, is typically located on the outermost fringe with the most exposure to salt water. Further inland, but usually covered by water at high tide, are the black mangroves, with white mangroves yet further inland. Buttonwood trees are often found above the reach of salt water. Other plants commonly found among the mangroves include saltwort, glasswort and a variety of salt marsh species.

The mangrove community, a detritus based system, provides much of the driving force behind the productivity of bordering estuaries. Leaf fall from the mangroves provides food or substrate for countless organisms ranging from bacteria to large fish such as the striped mullet. Detritus-feeding organisms support much of the estuarine trophic structure in mangrove areas including such gamefish as snook, tarpon and spotted sea trout.

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DEFINITIONS OF STATUS CATEGORIES

Categories used to designate the status of the organisms included in the Florida List of Rare and Endangered Species are defined below. In the case of species or subspecies whose ranges extend outside the state, the category to which the form is assigned is based on the status of its population in Florida. Thus, a plant or animal whose range barely reaches the state ("peripheral species") may be classified as Endangered, Threatened, or Rare as a member of the Florida biota, although it may be generally common elsewhere in its range.

In the following definitions, "species" is used in a general sense to include: 1) full taxonomic species, 2) subspecies or varieties (plants), and 3) particular populations of a species or subspecies that do not have formal taxonomic status. This use of the term agrees with that of the Endangered Species Act of 1973.

Endangered. Species in danger of extinction if the deleterious factors affecting their populations continue to operate. These are forms whose numbers have already declined to such a critically low level or whose habitats have been so seriously reduced or degraded that without active assistance their survival in Florida is questionable.

Threatened. Species that are likely to become endangered in the State within the foreseeable future if current trends continue. This category includes 1) species in which most or all populations are decreasing because of overexploitation, habitat loss, or other factors; 2) species whose populations have already been

heavily depleted by deleterious conditions and which, while not actually endangered, are nevertheless in a critical state; and 3) species which may still be relatively abundant but are being subjected to serious adverse pressures throughout their range.

Rare. Species which, although not presently endangered or threatened as defined above, are potentially at risk because they are found only within a restricted geographic area or habitat in the State or are sparsely distributed over a more extensive range.

Species of Special Concern. Species that do not clearly fit into one of the foregoing categories yet warrant special attention. Included in this category are 1) species that, although they are perhaps presently relatively abundant and widespread in the State, are especially vulnerable to certain types of exploitation or environmental changes and have experienced long-term population declines and 2) species whose status in Florida has a potential impact on endangered or threatened populations of the same or other species outside the State.

Status Undetermined. Species that are suspected of falling in one of the above categories but for which available data are insufficient to provide an adequate basis for their assignment to a specific category.

Recently Extirpated. Species that have disappeared from Florida since 1600 but still exist elsewhere.

Recently Extinct. Species that have disappeared from the state since 1600 through extinction.

SPECIES LIST

Amphibians

ENDANGERED

Pine Barrens Treefrog ^{1, 3}

Hyla andersonii Baird

THREATENED

Florida Gopher Frog ³

Rana areolata aesopus Cope

RARE

One-toed Amphiuma
Seal Salamander
Georgia Blind Salamander
Four-toed Salamander
Many-lined Salamander
Striped Newt
Carpenter Frog

Amphiuma pholeter Neill
Desmognathus monticola Dunn
Haideotriton wallacei Carr
Hemidactylum scutatum (Schlegel)
Stereochilus marginatus (Hallowell)
Notophthalmus perstriatus (Bishop)
Rana virgatipes Cope

STATUS UNDETERMINED

Gulf Hammock Dwarf Siren

Pseudobranchius striatus lustricolus Neill

Reptiles

ENDANGERED

American Crocodile ^{1, 3}
Atlantic Green Turtle ³
Atlantic Hawksbill ^{1, 3}
Atlantic Ridley ^{1, 3}
Atlantic Salt Marsh Watersnake ^{2, 3}
Short-tailed Snake ³

Crocodylus acutus Cuvier
Chelonia mydas mydas (Linnaeus)
Eretmochelys imbricata imbricata (Linnaeus)
Lepidochelys kempii (Garman)
Nerodia fasciata taeniata (Cope)
Stilosoma extenuatum Brown (all subspecies)

THREATENED

Key Mud Turtle ⁴
Suwannee Cooter ⁴
Gopher Tortoise ⁴
Atlantic Loggerhead ⁴
Florida Keys Mole Skink ⁴
Blue-tailed Mole Skink ⁴
Sand Skink ⁴
Big Pine Key Ringneck Snake ⁴
Red Rat Snake ⁴

Kinosternon bauri bauri (Garman)
Chrysemys concinna suwanniensis (Carr)
Gopherus polyphemus (Daudin)
Caretta caretta caretta (Linnaeus)
Eumeces egregius egregius (Baird)
Eumeces egregius lividus Mount
Neoseps reynoldsi Stejneger
Diadophis punctatus acricus Paulson
Elaphe guttata guttata (Linnaeus)
(Lower Florida Keys populations)

Florida Brown Snake ⁴

Storeria dekayi victa Hay
(Lower Florida Keys populations)

Miami Black-headed Snake ⁴

Tantilla oolitica Telford

Florida Ribbon Snake ⁴

Thamnophis sauritus sackeni (Kennicott)
(Lower Florida Keys Populations)

RARE

Spotted Turtle
Barbour's Map Turtle
Alabama Map Turtle
Mangrove Terrapin
Gulf Coast Smooth Softshell
Atlantic Leatherback Turtle ¹
Florida Scrub Lizard
Cedar Key Mole Skink
Mole Snake
Apalachicola Common Kingsnake
Gulf Salt Marsh Watersnake
Southern Copperhead

Clemmys guttata Schneider
Graptemys barbouri Carr and Marchand
Graptemys pulchra Baur
Malaclemys terrapin rhizophorarum Fowler
Trionyx muticus calvatus Webb
Dermochelys coriacea Linnaeus
Sceloporus woodi Stejneger
Eumeces egregius insularis Mount
Lampropeltis calligaster rhombomaculata (Holbrook)
Lampropeltis getulus goini Neill and Allen
Nerodia fasciata clarki (Baird and Girard)
Agkistrodon contortrix contortrix (Linnaeus)

SPECIES OF SPECIAL CONCERN

American Alligator ^{1, 2, 4}
Eastern Indigo Snake ^{2, 4}

Alligator mississippiensis (Daudin)
Drymarchon corais couperi (Holbrook)

STATUS UNDETERMINED

Alligator Snapping Turtle
Alabama Red-bellied Turtle
Southern Coal Skink

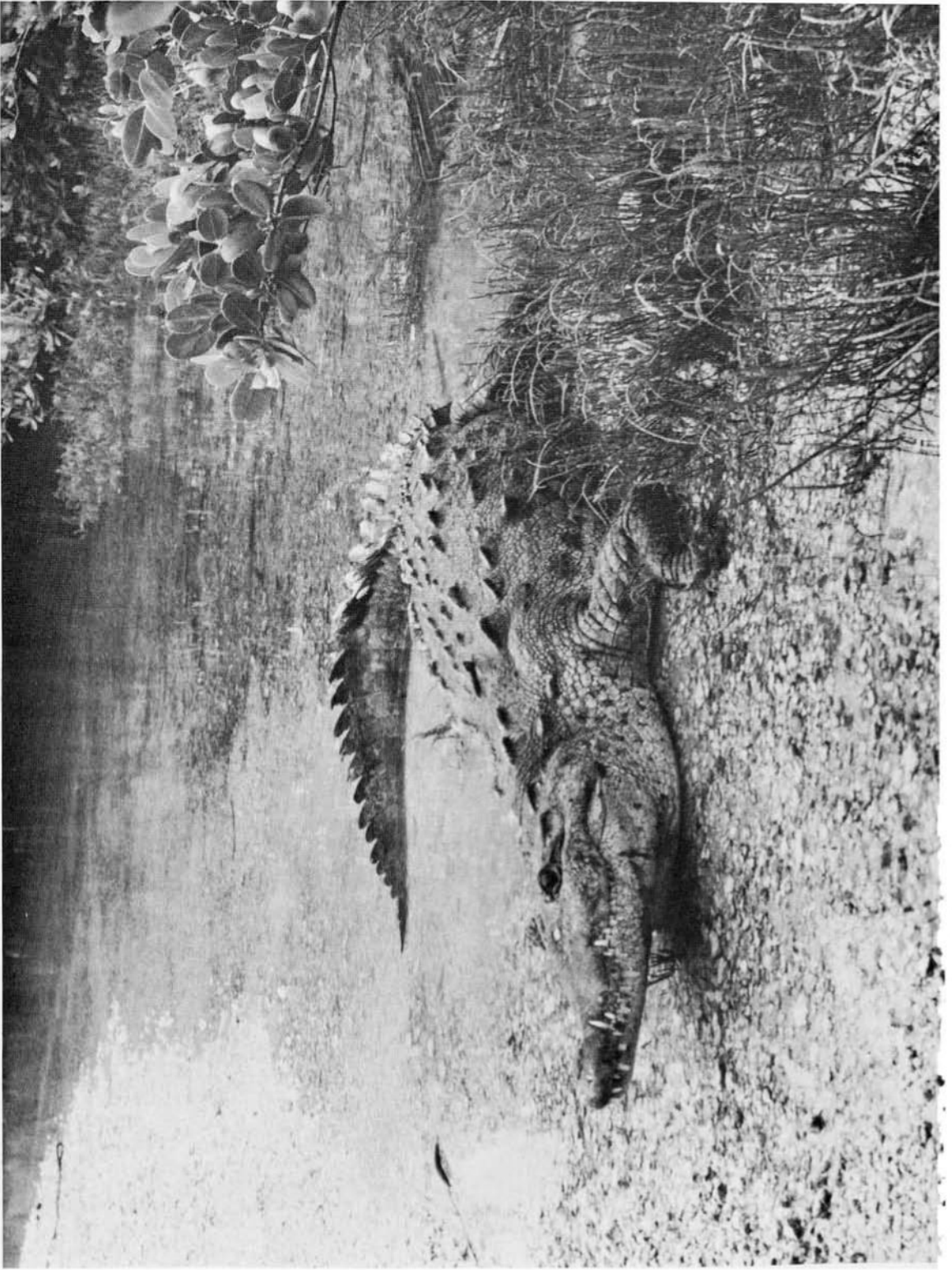
Macrolemys temmincki (Troost)
Chrysemys alabamensis (Baur)
Eumeces anthracinus pluvialis Cope

¹ Listed as Endangered in *Endangered and Threatened Wildlife and Plants*. U.S. Dept. of Interior, Fish and Wildlife Service. Federal Register, Vol. 42, No. 135: 36420-36431, 1977.

² Listed as Threatened in above publication.

³ Listed as Endangered in Wildlife Code, Florida Game and Fresh Water Fish Commission. Effective July, 1977.

⁴ Listed as Threatened in above publication.



Crocodylus acutus (photograph by Paul Moler)

AMPHIBIANS

Endangered
PINE BARRENS TREEFROG

Hyla andersonii Baird
Family Hylidae
Order Anura

OTHER NAMES: Anderson's Treefrog.

DESCRIPTION: Adults of the Pine Barrens Treefrog are small, green frogs (about 3.8 cm [1½ in] long) with round, expanded toepads for climbing. The pea-green color of their back and upper surfaces of the legs changes to dark olive-green under certain conditions of stress or weather. A chocolate-brown to plum-colored lateral band extends along the sides from the nostril to the hind limb and is set off from the green dorsum by a narrow lemon-yellow border. The granulated skin of the belly is white. In the armpit, on the inside surfaces of the hind legs, and along the lower sides there are several bright yellow-orange spots that are usually concealed unless the frog is in motion. Females are slightly larger than males and have a white chin. The darker chin and throat of males inflates into a rounded white vocal sac when calling. The call consists of a series of high-pitched notes repeated rapidly in sequence about 0.4 seconds apart for several seconds duration. Recently transformed and young frogs are miniatures of the adults.

Tadpoles may reach 3.8 cm (1½ in) in length and are dark olive with black spots scattered over the back. The belly is greenish yellow. The tail musculature, and to a lesser extent the tail crests, have well-defined dark blotches and spots. These are coalesced along the upper

sides of the tail musculature to form a distinctive black line with irregular borders that begins just behind the body and progresses uninterrupted about halfway down the tail.

RANGE: In Florida, the Pine Barrens Treefrog is presently known from less than 10 small sites in northern Okaloosa and western Walton counties (Yellow River drainage). The Florida populations appear to be isolated by approximately 928 km (580 mi) from the next definitely known populations in the upper Atlantic Coastal Plain at the border of North and South Carolina. These, in turn, are isolated from populations in the pine barrens of New Jersey. Together, these three small geographic areas make up the entire distribution of the species.

HABITAT: Florida habitats of this species are hillside seepage bogs of the broader, upland stream valleys. Usually, the boggy slopes are adjacent to small, first order streams and support a shrubby-herbaceous community always consisting of either or both titis (*Cyrilla racemiflora* and *Cliftonia monophylla*) and extensive sphagnum moss. In varying proportions, other plant species that have been found associated with this frog in Florida are Sweet Bay Magnolia, Sweet Pepperbush, Sparkleberry, Stinking Fetterbush, Red Maple, Tulip Poplar, Black Gum, Mountain Laurel, and others. Breeding sites and the larval habitats are small pools of clear seepage water along tiny rivulets on a bog hillside. The pools are shallow (usually less than 25 cm [10 in] deep) and contain a diverse aquatic flora of delicate plants (*Sphagnum* spp., sedges, small monocots, etc.).

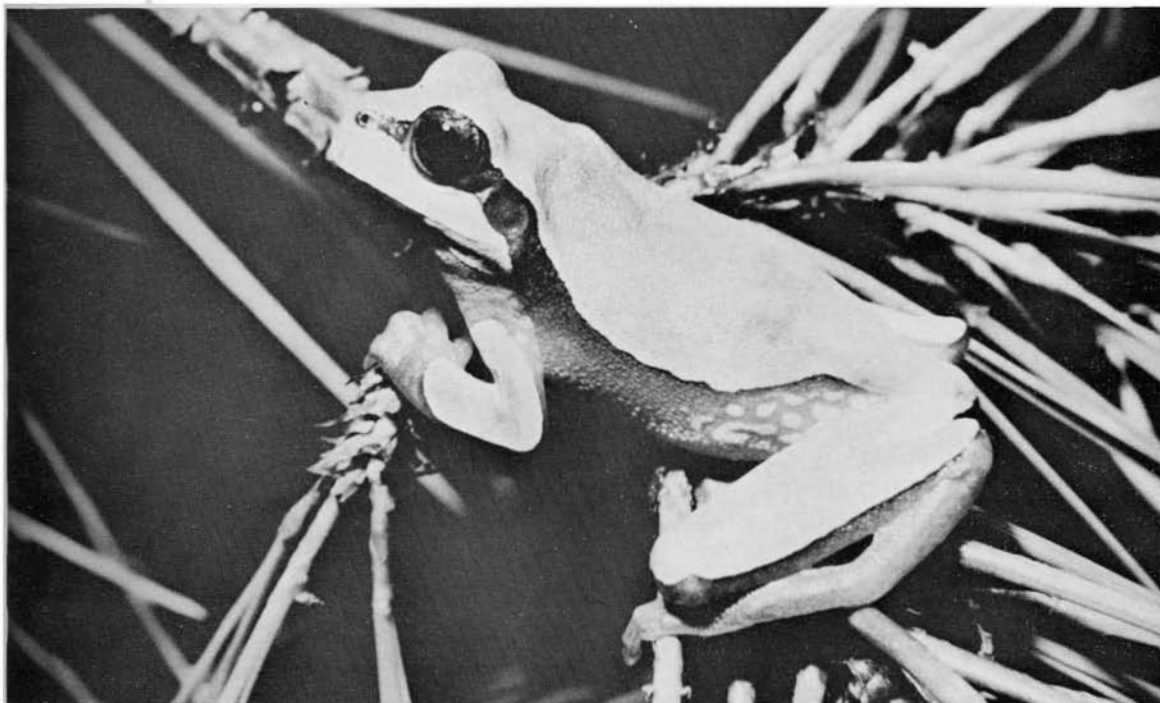


Fig. 1. *Hyla andersonii* from near Dorcas, Okaloosa County, Florida (photograph by R.S. Simmons)

LIFE HISTORY AND ECOLOGY: Calling males of the Pine Barrens Treefrog have been heard as early as the second week in April and as late as the third week in September in Florida. Larvae have been collected from mid-June to the last week in August. By the end of September, all larvae are probably transformed. Based on laboratory growth rates, larvae of one summer are capable of reaching adult size by the next, but this is not confirmed in the field. Males call from low perches (ground level to about 1.2 m high) in vegetation surrounding the breeding site.

Females deposit 200 or more eggs in batches of 4 to 9 while amplexed with a male who fertilizes the eggs as they are extruded. After hatching in 3 to 4 days, larvae soon begin an aquatic life grazing on algae and other plant matter. Tadpoles of both Florida and northern populations are very sensitive to their environment. Attempts to rear them in captivity in tap water or even water from the habitat almost always have failed. Captive Florida adults that are especially well cared for usually die after a few months or less. Choruses rarely exceed 10 males. A locality having audible males at one part of the breeding season may be silent at another even though the species is calling elsewhere.

All knowledge presently available for Florida *Hyla andersonii* is based primarily on information gained at breeding sites found by locating calling males. This may represent only a fraction of the life history and ecology of the species.

SPECIALIZED OR UNIQUE CHARACTERISTICS: In addition to being one of the most attractive of North American treefrogs, the Pine Barrens Treefrog has a remarkable distribution of disjunct populations, making its study valuable to biogeography. In addition, the Florida populations are significantly different from those along the Atlantic Seaboard in aspects of their morphology, ecology, and call structure. Such variation, coupled with geographic isolation, leads to species formation and thus is valuable to the study of evolution.

This species is highly specialized in its ecological preferences. Larvae seem to have a very narrow tolerance for aquatic environments, requiring a habitat type that is unique and rare in its own right. The ecology, distribution, and habitat of this species suggest that it was formerly more widespread during milder, wetter climates. If true, living populations of the Pine Barrens Treefrog could be considered as "physiological relicts," possibly adapted to Pleistocene glacial climates.

BASIS OF STATUS CLASSIFICATION: In the four years subsequent to the discovery of the Pine Barrens Treefrog in Florida, only 11 small sites were found to contain calling males. In five of these, larvae or amplexing pairs were obtained from wet areas less than 3 m in diameter. Two of these latter sites have since been obliterated by land development (one into a subdivision, the other a pasture). None of the remaining known localities are preserved from inadvertent disturbance or destruction by private landowners. In fact, all of these are adjacent to pastures, commercial timber stands, man-made stream impoundments,

powerlines, roads, or old-field successional communities. Survival of this species in Florida is endangered under present conditions.

RECOMMENDATIONS: Since the habitats are localized, small, and isolated within a small part of the state, habitat destruction poses the most serious threat to the continued existence of this species in Florida. Several breeding sites and surrounding habitat (less than 4 ha [10 a]) should be transferred from private to public ownership. Along with the instigation of proper habitat management and further research into the biology of the Pine Barrens Treefrog, this should be the necessary first step in retaining this valuable living resource as a part of Florida's natural heritage.

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PINE BARRENS TREEFROG (*HYLA ANDERSONII*)

**Threatened
FLORIDA GOPHER FROG**

Rana areolata aesopus Cope
Family Ranidae
Order Anura

OTHER NAMES: White Frog, Florida Crawfish Frog.

DESCRIPTION: This frog is rather stubby with a short, plump body, a large head, and relatively short legs. The males have lateral vocal pouches which are enormous when inflated, approaching the size of the frog's head. The coloration varies from creamy white to brown. The irregular markings on the smooth or slightly warty dorsum are black or dark brown and not encircled by light borders. The chin and throat are spotted and often the males have yellow on the dorso-lateral ridges, on the warts, along the upper jaw, and in the armpits and groin. The tympanum is not quite as large as the eye.

RANGE: The Florida Gopher Frog is found throughout the northern part of the state in appropriate habitats. In central Florida it is restricted to the Lake Wales Ridge and coastal xeric habitats.

HABITAT: The species is found in sandhill communities on Bluejack (*Quercus incana*) and Turkey Oak (*Quercus laevis*) ridges, and in Sand Pine scrub habitats.

LIFE HISTORY AND ECOLOGY: Although this species commonly shares the burrows of the Gopher Tortoise (*Gopherus polyphemus*), it has also been noted in the burrow of a mouse (*Peromyscus polionotus*), in stump holes, in the bottom of post holes, and in the mouths of crawfish holes. The frog is generally nocturnal but occasionally will venture from its burrow on damp, dark days.

The diet consists mainly of insects but it readily preys on toads (*Bufo* spp.)

During the breeding season, which lasts from early spring to late autumn, gopher frogs travel relatively great distances and congregate in shallow grassy ponds to breed. Their chorus is a very deep and distinctive snoring sound.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The species is unique in that it shares the burrow of the Florida Gopher Tortoise. This alone is quite a departure from the general life histories of the other Florida ranids.

BASIS OF STATUS CLASSIFICATION: The habitat of the Gopher Tortoise is rapidly disappearing in the face of encroaching development. There may be some evidence that the species may be overexploited by people killing it for food. Since the Florida Gopher Frog shares the habitat of the Gopher Tortoise and depends on the turtle for a "home", factors deleterious to the reptile will be experienced by the frog.

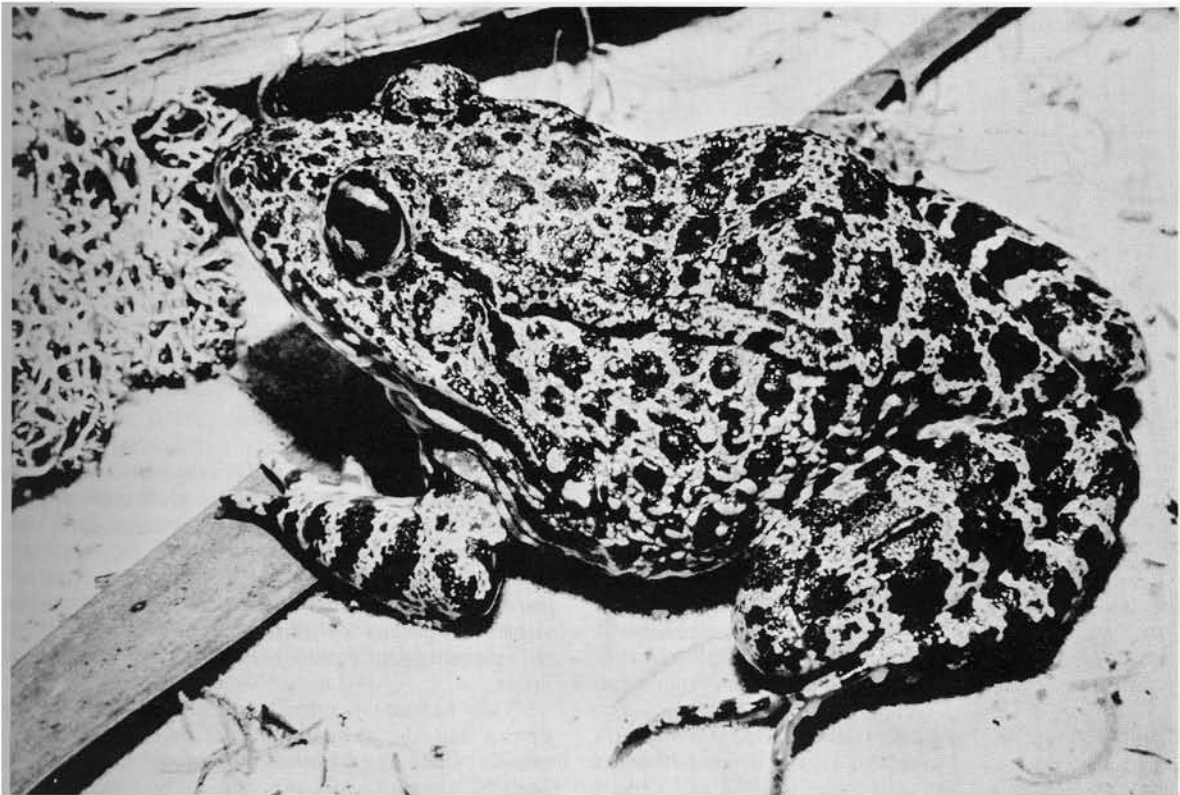


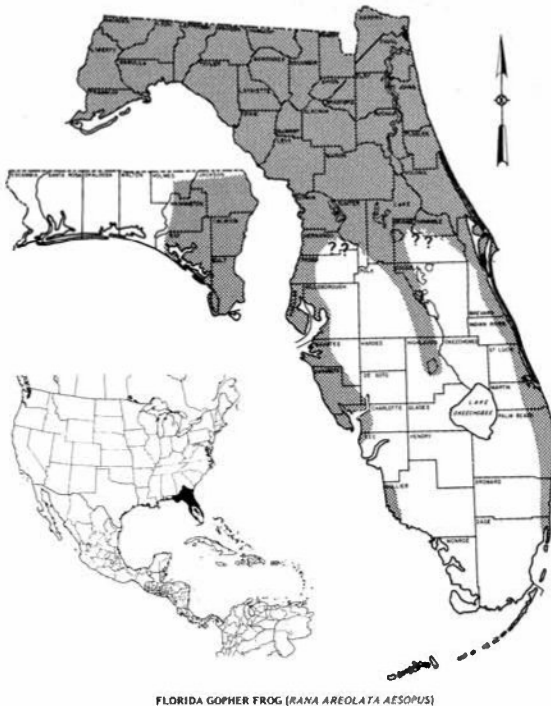
Fig. 2. *Rana areolata aesopus* from near Waldo, Alachua County, Florida (photograph by R.S. Simmons)

RECOMMENDATIONS: An objective appraisal should be made of the Gopher Tortoise population and the concurrent exploitation of the species (for food) and its habitat. The common practice of pouring gasoline into tortoise burrows to drive out rattlesnakes during snakehunts has been shown to be lethal to many burrow inhabitants, including the gopher frog. This practice should be stopped. Perhaps regulations are warranted regarding the present day killing of the tortoise for the "pot." Such efforts will be beneficial to the Florida Gopher Frog.

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FLORIDA GOPHER FROG (*RANA AREOLATA AESOPUS*)

Rare
ONE-TOED AMPHIUMA

Amphiuma pholeter Neill
 Family Amphiumidae
 Order Urodela

OTHER NAMES: None.

DESCRIPTION: One-toed Amphiumas are slender, eel-like amphibians that are uniformly dark brownish gray in color (the ventral surface may be slightly lighter) and reach a maximum length of 30.5 cm (12 in). They are unique among salamanders in possessing two pairs of minute, single-toed legs. Males and females are indistinguishable externally except on microscopic examination of the longitudinal vent. There is a small, oval gill opening at the side of the head, but no external gills, and the lidless eyes are flush with the skin of the head. The tail is slightly flattened laterally; the head is conical with the apex rounded at the nose. Larvae have not yet been found. The absence of a rayed fin around the tail distinguishes individuals from fish eels.



Fig. 3. *Amphiuma pholeter* (photograph by R.S. Simmons)

RANGE: Apart from two localities just above the Florida-Georgia border, this dwarf *Amphiuma* is known only from the state of Florida, between the Gulf Hammock region (type locality) and the Yellow River south of Crestview. It appears that the One-toed Amphiuma is a species native to the Florida Gulf Coastal Plain.

HABITAT: Probably the major reason this species was undiscovered prior to 1964 is its preference for deep, organic, liquid muck. The preferred muck sites, however, are relatively uncommon because they are found only in alluvial swamps of low-gradient second and third order streams, or in floodplain swampy terrace streams. The mucky sites are comprised mostly of decomposing deciduous hardwood and cypress leaf litter.

This habitat is subject to periodic flooding and drying, but the annual input of organic materials is greater than the rate of decomposition. Excessive accumulations of muck are removed by flooding due to surface runoff of heavy rains.

LIFE HISTORY AND ECOLOGY: The results of a four-year study of all aspects of the biology of this species are not yet available (Means, in preparation). However, field and laboratory observations suggest that egg-laying can occur in late spring and summer, courtship in winter and spring, and spermiogenesis in the fall. Very small young that were grown in captivity attained adult size in at least two years. Despite the presumed anaerobic nature of decomposing muck, there is a surprising wealth of resident invertebrate species, most of which probably figure in the diet of the One-toed Amphiuma. Invertebrates found in the gut include sphaeriid clams, earthworms of the genera *Sparganophilus* and *Diplocardia*, aquatic larvae or arthropods (diptera and odonates), and terrestrial beetles. Possible predators include raccoons, feral pigs, the Mud Snake, and the Two-toed Amphiuma.

Although the habitat is basically aquatic, this species is an air-breather. During dry periods when the muck loses its fluid consistency, healthy and active specimens have been excavated from burrows made by their bodies at the interface between muck and inorganic clastic sediments underlying it. These occur as singles or in groups of 4 to 5. It appears that the species is well adapted to the fluctuations of its environment. Specimens have been excavated from deeper in muck on cold days in winter, and are torpid.

SPECIALIZED OR UNIQUE CHARACTERISTICS:

The One-toed Amphiuma is one of, at most, 3 living species of an entire family of salamanders. The fossil history of this group extends back some 80 million years into the Cretaceous where remains of one known fossil form (*Proamphiuma cretacea* Estes) are almost identical to the same elements in the living *Amphiuma pholeter*. Cypress swamps of the southeastern United States are the descendant communities of more widespread Cretaceous swamplands, containing as they do, many other surviving animals (Alligator, gars, Bowfin, sirens) that have changed relatively little from their Cretaceous swampland ancestors.

BASIS OF STATUS CLASSIFICATION: The small geographic range of the species, isolated localities (14 known), and unusual habitat type justify considering this species to be rare.

RECOMMENDATIONS: At the present state of knowledge, it seems that this species will persist in Florida unless activities harmful to the habitat increase with this state's increasing human population. One unnatural mortality source that might be deleterious to individual populations is commercial collecting. Amphiumas have long been valuable in biomedical research. A "goldrush" by commercial collectors to supply specimens for comparative study may not be just a remote possibility. The fact that this species is nearly confined to Florida makes it even more valuable by virtue of being irreplaceable once lost.

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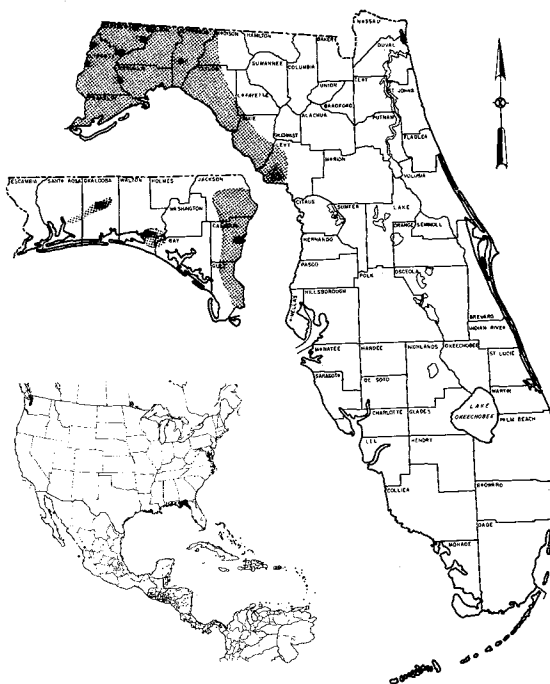
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ONE-TOED AMPHIUMA (*AMPHIUMA PHOLETER*)

**Rare
SEAL SALAMANDER**

Desmognathus monticola Dunn
Family Plethodontidae
Order Urodela

OTHER NAMES: The only other scientific name is *Salamandra phoca* Matthes. The common name, Seal Salamander, is derived from *phoca* which means seal; other common name—Appalachian Seal Salamander.

DESCRIPTION: Florida specimens of the Seal Salamander vary in size up to about 11.4 cm (4.5 in) total length. The body is lizard-like, but the skin is smooth and moist instead of dry and scaly. Large specimens

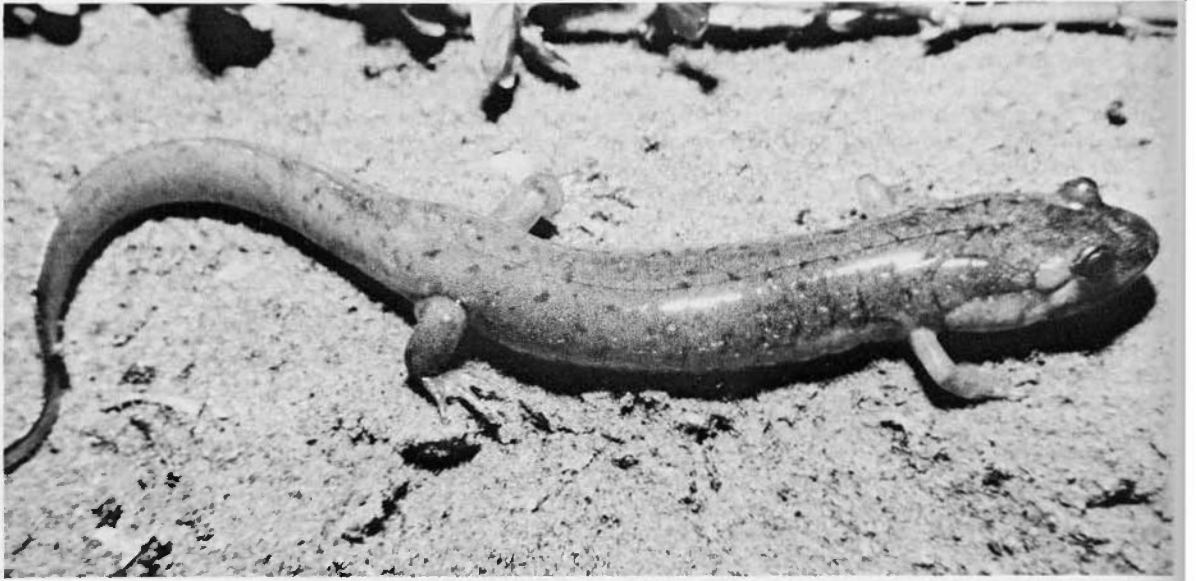


Fig. 4. *Desmognathus monticola* (photograph by R.S. Simmons)

are uniformly light brown with a few small dark dots dorsally; their bellies are white with a faint mottling of dark pigment. In juveniles and larvae there may be 10-12 paired spots down the back, light brown to tan in color, which may be set off from the brown dorsum by small patches of black; bellies are immaculate white. A distinctive row of small white spots occurs down the side of all individuals between the front and hind legs. Larvae (rarely larger than 2.5 cm [1 in] long) have 3 tiny, sticklike gills on each side of the head that are silvery-white; tails of larvae are flattened laterally, those of adults rounded.

RANGE: This species is known in Florida only from five small spring-seepage ravines on the south side of Canoe Creek, east of the town of Bluff Springs, Escambia County. The Seal Salamander is basically a southern Appalachian species ranging from southeastern Pennsylvania to northern Georgia and Alabama. However, a number of populations are known from the Red Hills of the southern Alabama coastal plain, occurring there as disjuncts from the main body of the geographic range of the species.

HABITAT: This salamander requires upland stream habitats, usually as steep-walled ravines that have rocky stream bottoms and permanent moisture throughout the year (or at least retain moisture under the streambed or in friable stream banks). In Florida and southern Alabama, such habitats contain only crumbly sandstone, clay, or sometimes limestone rocks. The clear water of such streams is seepage in origin except during surface runoff from recent rains; near seepage sources water temperatures remain around 70° F the year around. The vegetation in Florida habitats is mixed deciduous and evergreen hardwoods including American Beech, Southern Magnolia, Water Oak, Tulip Poplar, Sweet Bay Magnolia, American Holly and Star Anise.

LIFE HISTORY AND ECOLOGY: Aquatic and terrestrial arthropods in the leaf litter of the banks and stream bottom comprise most of the food of this species. A cluster of white eggs is laid attached to the undersurface of rocks in late summer and early fall and is attended until hatching by the female coiled below. Larvae hatch in early fall and probably all undergo metamorphosis by late spring or early summer. Sexual maturity is probably attained by males in about 2.5 years and by females about one year later. Courtship probably takes place in different pairs from fall to spring.

Larvae are fully aquatic, living in shallow water over small gravel bars along stream edges, and in seepage sites. Transformed juveniles live in shallow water at rocky stream edges, on seepage slopes, and in wet sites with larger gravel. Adults are found under rocks, in wet rocky sites, behind cracks in crumbly banks, and in burrows in the stream bank at or near the water's edge; they rest at night with their heads protruding from burrows or other hiding places to watch the surroundings for arthropods moving over the substrate.

Most of the energy that enters the habitat of the Seal Salamander arrives as leaf litter, twigs and other dead organic material. Seal Salamanders are top carnivores of their small ecosystems, feeding on invertebrates that eat the litter, or on arthropod predators (spiders).

SPECIALIZED OR UNIQUE CHARACTERISTICS: This species is one of a limited number of animals and plants whose small southern populations are disjunct from major population centers in the southern Appalachians. In almost every case the southern relief populations are morphologically distinct from their northern conspecifics. This fact, and possible population consequences due to differences in latitude and altitude, make this species valuable for study of evolution and comparative ecology.

BASIS OF STATUS CLASSIFICATION: The Seal Salamander is essentially known from a single locality (five adjacent ravines a few hundred meters apart) in the northern part of the westernmost county of Florida. The nearest known neighboring population occurs at least 48 km (30 mi) to the north across a probable physiographic barrier (Dr. Robert Mount. pers. comm.). The Florida population may thus be isolated from populations already considered relict. At the least, the Florida population represents the southernmost extent of the geographic range of the species.

RECOMMENDATIONS: Public ownership of the locality and maintenance as a wildlife refuge is the only long-term assurance against loss of this northern relict species from the state's natural heritage.

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Rare
GEORGIA BLIND SALAMANDER

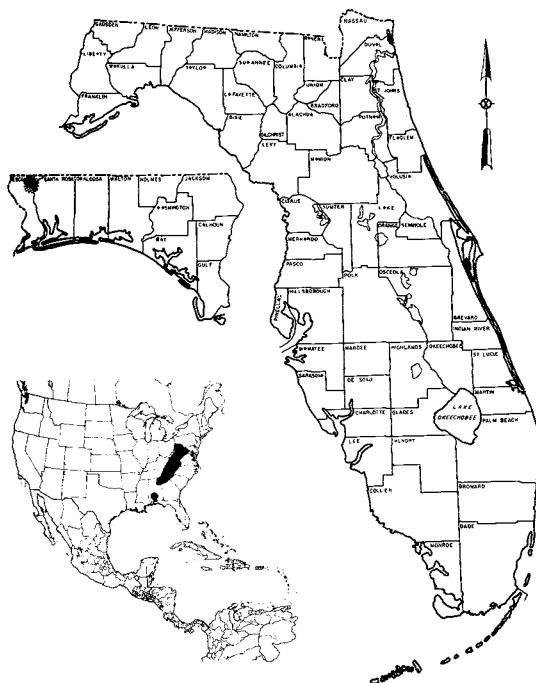
Haideotriton wallacei Carr
Family Plethodontidae
Order Urodela

OTHER NAMES: Haideotriton, Blind Cave Salamander. This blind cave species has the name "Georgia" Blind Salamander because for 19 years a deep well in Dougherty County at Albany, Georgia, was the only published locality. Although a cave in Grady County is now known to harbor it, the Georgia Blind Salamander primarily is known from about 10 caves near Marianna, Florida.

DESCRIPTION: The Georgia Blind Salamander is an aquatic troglobite (found only in subterranean waters and possessing specialized adaptations for cave life in the dark zone). Most specimens range between 2.5 and 5.0 cm (1 and 2 in) in total length and are juveniles, but adults may exceed 7.6 cm (3 in). The entire body is a slightly translucent, pinkish- to silverish-white color, usually having a faint wash of dark pigment in the form of small specks or almost imperceptible blotches. The legs are relatively long and slender. The head is depressed somewhat with tiny dark eyespots buried beneath the skin and a snout (truncated at the tip) that is longer than in most salamanders. The tail is flattened laterally and finned for use in aquatic propulsion. Bright red external gills on each side set off the head from the narrower neck region. The smallest individuals are essentially the same, proportionally, except that the dark pigment in the eyespots and over the dorsum tends to be more pronounced. Twelve to 13 costal grooves are rather prominent along the sides.

RANGE: This remarkable salamander is confined to subterranean waters in limestone sediments, probably throughout the Marianna Lowlands-Dougherty Plain physiographic region. Wherever caves permit access to groundwater in this part of Florida, it has usually been found. The Georgia Blind Salamander occurs sympatrically with a number of troglobite crustaceans, especially the Cave Crayfish (*Cambarus cryptodytes*).

HABITAT: In those caves where this species can be studied in its natural habitat, the Georgia Blind Salamander is found where underground water is exposed as subterranean streams or clear pools. The pools may be connected to deeper subterranean water or they may be stranded on the cave floor due to a drop in the water table. *Haideotriton* often is seen resting on bottom sediments in these pools and streams; individuals also occur on limestone sidewalls where they move over ledges or even rough, vertical faces.



SEAL SALAMANDER (*DESMOGNATHUS MONTICOLA*)

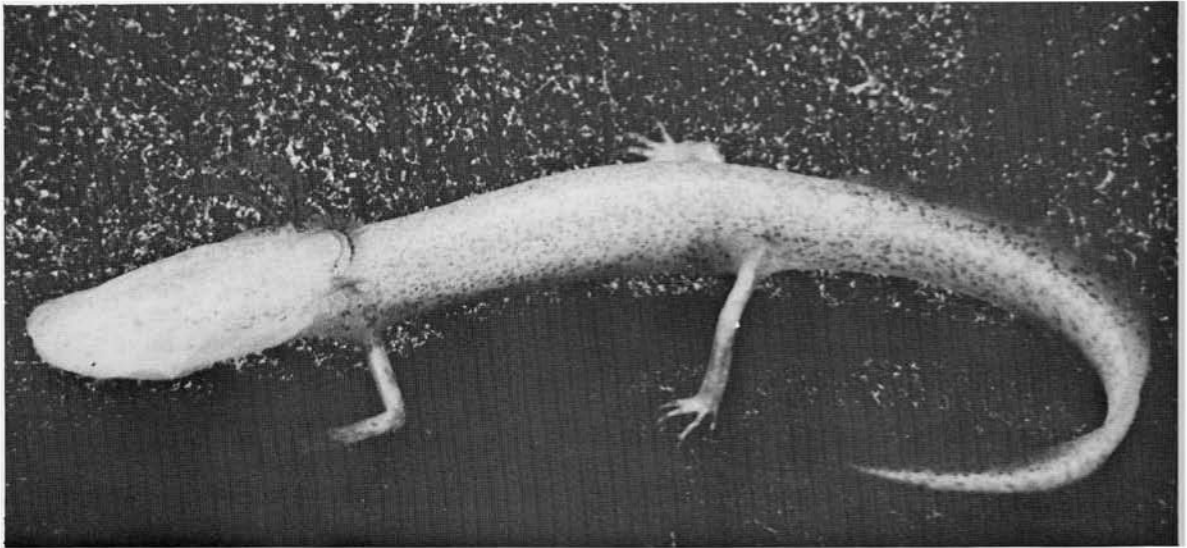


Fig. 5. *Haideotriton wallacei* (photograph by R.S. Simmons)

LIFE HISTORY AND ECOLOGY: The reproductive cycle is unknown except that gravid females have been collected in the third week in May and the second week in November. Generally, those individuals collected from caves are mostly immature. Observations made with SCUBA in caves suggests that younger, smaller individuals tend to be concentrated near the interface of water-air-cave floor in shallow water (where they would be more accessible to collection); older, mature individuals are more frequent on the floor of solution tunnels in deeper water (pers. obs.). Food of the Georgia Blind Salamander primarily consists of small troglobitic crustaceans. Their predators may include Cave Crayfish (*Cambarus cryptodytes*), the eel *Anguilla rostrata*, and each other.

SPECIALIZED OR UNIQUE CHARACTERISTICS:

As a fully cave-adapted species, it possesses many morphological, physiological, and behavioral specializations not often found in terrestrial or aquatic animals. This species might be a good biological indicator of water quality. It is one of the very few vertebrates inhabiting one of the earth's simplest, most discretely definable ecosystem types. Because of this, the Georgia Blind Salamander has great scientific value for the study of community ecology, evolution, and zoogeography. Also, because the geographic range is so small and most populations are known from Florida, it can almost be considered an endemic. This makes the continued existence of the species highly dependent on its preservation in Florida.

BASIS OF STATUS CLASSIFICATION: That this species is commonly found in caves does not necessarily imply that caves are the major habitat of the Georgia Blind Salamander. Underground solution channels, especially in recharge areas around sinkholes, may support populations equally. However, it makes ecological sense that density of individuals will be

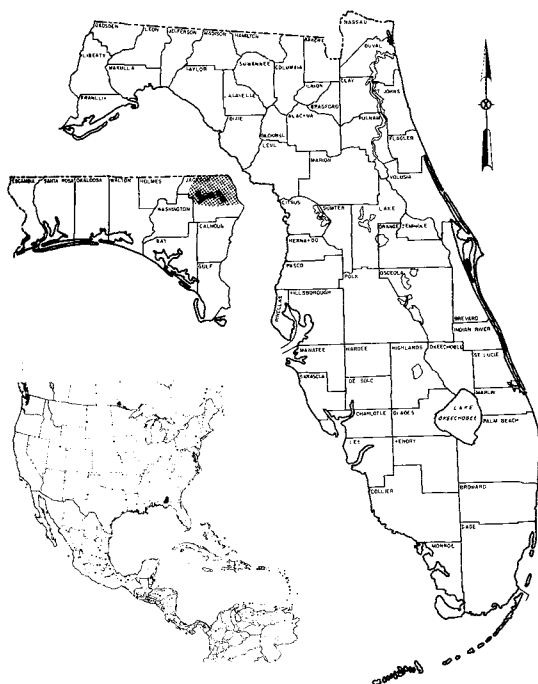
greatest near greatest food abundances. Food of all the aquatic troglobites may well be highest in caves, sinkholes and other areas where the energy (in the form of plant detritus, bat guano, etc.) that supports the ecosystem first enters. Since those cave and sinkhole localities where this species is known to occur number less than about 10 in Florida, and 12 overall, it merits "rare" status.

RECOMMENDATIONS: The most serious human threat to the Georgia Blind Salamander is alteration of its aquatic habitat by pollution from agricultural practices or by changes in the water table. The latter effect can be produced either by stream impoundment, which elevates the water table above ground level (e.g., Jim Woodruff Dam), or by depressing the water table below its present subsurface level because of demand from wells. At least 2 sites are under the protection of Marianna Caverns State Park. Other cave localities are on adjacent private property, or within a few miles of the park.

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GEORGIA BLIND SALAMANDER (HAIDEOTRITON WALLACEI)

**Rare
FOUR-TOED SALAMANDER**

Hemidactylum scutatum (Schlegel)
Family Plethodontidae
Order Urodela

OTHER NAMES: None.

DESCRIPTION: Three characteristics serve to identify this small (adults about 6.3 cm [2.5 in] in length), lungless salamander from all others: it has a constriction at the base of the tail, four toes on all feet, and an enamel-white ventral surface that is dotted with intensely black, distinct spots. The back is rusty to reddish-brown and may have numerous small black specks; the top of the tail is yellowish-brown and speckled with black. Larvae are unknown from Florida, but are small (1.3 to 2.5 cm long), short-lived, and have the dorsal tail fin extending onto the back.

RANGE: In Florida, the Four-toed Salamander is known only from a few specimens collected from the upper Ochlockonee River drainage and from Basin Bayou in Walton County. Another individual was taken from near the confluence of the Chattahoochee and Flint rivers in southwestern Georgia. The distri-

bution of the species is a classic example of disjunction. The main body of its range is primarily the northern Appalachians and the Great Lakes region to the east and west of, and including, Michigan. But outlier populations occur as disjuncts throughout the surrounding physiographic regions from the Atlantic Coastal Plain to the Interior Highlands.

HABITAT: Florida specimens of the Four-toed Salamander have been found on sphagnaceous seepage slopes of mature stream floodplains (2 localities) under small wood debris, and under a soggy log in sparse woodland (1 locality) near the shore of Lake Talquin (a man-made impoundment of the Ochlockonee River). In general, the habitat of this species is hardwood forests near sphagnaceous, boggy areas. Such habitats in Florida are mostly found in floodplains.

LIFE HISTORY AND ECOLOGY: Eggs are probably laid in March or April in Florida along edges of boggy streams where (with the female coiled under them) they are only an inch or two above water and most likely nested in mossy, hepatic vegetation. Upon hatching, they wriggle down to water to take up an estimated 6-weeks-long aquatic larval life before transforming into small terrestrial juveniles. Adults live under debris on the moist woodland floor, possibly taking refuge in densely matted mosses, litter and roots, or in friable soil a few inches below the surface during dry periods and in winter. The food of adults consists largely of arthropods of the soil litter.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The Four-toed Salamander is one of a number of species of animals and plants whose disjunct Florida populations are probably relicts of a formerly more continuous geographic distribution. Most of these species are presently more commonly found to the north (usually in the southern Appalachians). All evidence seems to point to the historical expansion of their ranges during glacial periods, followed by contraction and subsequent isolation into relict populations during warmer and drier interglacial stages. Study of relict populations can lead to advances in the understanding of evolution, ecology, and biogeography.

BASIS OF STATUS CLASSIFICATION: Where this species lives in the northeastern United States, it occurs in much greater local densities than appears to be the rule for Florida populations. Although 3 localities are known in the upper Ochlockonee River valley, they have produced all of only 4 specimens from the state. Such small numbers forces the conclusion that the Four-toed Salamander is rare in Florida.

RECOMMENDATIONS: Basic study is needed on this species in Florida before much can be said about insuring its survival as part of the native fauna. The impoundment of Lake Talquin almost certainly reduced the range of the species in this state, unbeknownst to anyone at the time. Any further disturbance of the Ochlockonee River valley (by impoundment, sedimentation from construction activities, or

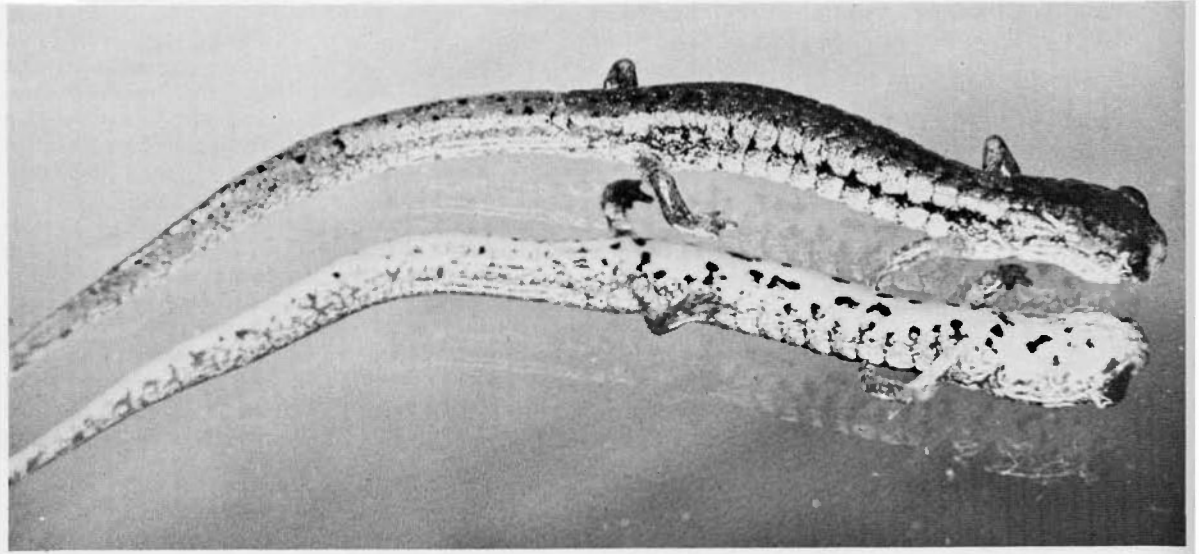


Fig. 6. *Hemidactylum scutatum* (photograph by R.W. McDiarmid)

from channelization) would probably have a deleterious effect on the remaining populations of the Four-toed Salamander.

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PREPARED BY: D. Bruce Means, Tall Timbers Research Station, Route 1, Box 160, Tallahassee, Florida 32303.



FOUR-TOED SALAMANDER (*HEMIDACTYLIUM SCUTATUM*)

**Rare
MANY-LINED SALAMANDER**

Stereochilus marginatus (Hallowell)
Family Plethodontidae
Order Urodela

OTHER NAMES: Margined Salamander.

DESCRIPTION: The Many-Lined Salamander is a small, brownish, rather nondescript aquatic salamander. The ground color may be dull yellow to yellowish-brown. There are several rows of indistinct, narrow lines on the sides of the body. These begin near the head, and end on the tail where they sometimes break up to give a mesh-like appearance. The total length of adults is about four inches. There are no external gills in adults, although the salamander is totally aquatic.

RANGE: In Florida, the Many-Lined Salamander is known from one locality in northern Baker County, at the edge of the Okefenokee Swamp. Elsewhere, it ranges on the Coastal Plain as far north as Petersburg,

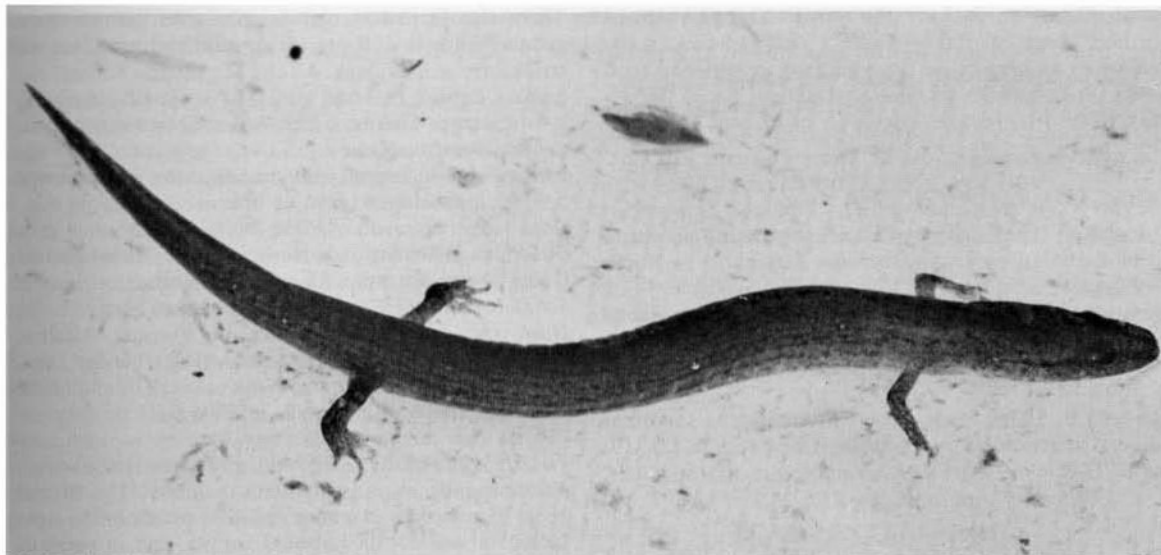


Fig. 7. *Stereochilus marginatus* from S.R. 2, Baker County, Florida (photograph by Roy W. McDiarmid)

Virginia. There is a possibility that *Stereochilus* may eventually turn up in the Osceola National Forest in central Baker County.

HABITAT: *Stereochilus marginatus* is found in Bald Cypress swamps, bayheads, and gum swamps throughout its range. In Florida, it is known only from acidic (pH=4-5) bayhead ponds surrounded by pine flatwoods and scattered Bald Cypress stands. The salamander is seldom observed as it spends most of its time under water in the sphagnum moss or leaf litter at the bottom of the ponds.

LIFE HISTORY AND ECOLOGY: Both adults and larvae are entirely aquatic. Females lay an average of 57 eggs in small clumps often above the water level, usually in rotten logs. Mating takes place in the fall, eggs are laid in the winter, and hatching in the spring. The Many-Lined Salamander goes through a larval period with external gills before transforming into an adult. The larval period may last from one and a half to three years. Sexual maturity is usually attained within a year after metamorphosis. The feeding habits of the Many-Lined Salamander are unknown.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The Many-Lined Salamander reaches the end of its geographic distribution in extreme northern Florida. It is an element of the Atlantic Coastal Plain fauna which includes several interesting species, most of which apparently do not reach into Florida. *Stereochilus* is interesting from a scientific viewpoint because of its presumed phylogenetic position as a primitive plethodontid salamander. It is unusual among gill-less salamanders in being fully aquatic.

BASIS OF STATUS CLASSIFICATION: Because Florida populations of *Stereochilus marginatus* are at the very periphery of the natural range of the species,

these populations are subject to fluctuation and possible extinction. If the sphagnum ponds in Baker County were to be drained for pasture use, or if logging operations were to destroy the bayheads, *Stereochilus* could not survive in Florida.

RECOMMENDATIONS: It is recommended that the appropriate agencies try to enlarge the Osceola Na-



tional Forest to include the practically uninhabited northern part of Baker County. In addition, some guarantee of protection from logging operations both within and outside the national forest would be required to insure the survival of *Stereochilus* in Florida.

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PREPARED BY: Steven P. Christman, *National Fish and Wildlife Laboratory, 412 N.E. 16th Avenue, Gainesville, Florida 32601.*

**Rare
STRIPED NEWT**

Notophthalmus perstriatus (Bishop)
Family Salamandridae
Order Urodela

OTHER NAMES: None.

DESCRIPTION: This is a small, aquatic, olive or brownish salamander with a parallel pair of red stripes running down the back and terminating on the tail.

There is a juvenile terrestrial phase (eft) in which the ground color is dull orange or reddish brown, but the stripes are still evident. Adults are aquatic but may not possess reddish external gills. The Striped Newt reaches a total length of from 5.1 to 7.6 cm (2 to 3 in); the eft is usually about half the adult size. The larva is uniformly brown with a line of light dashes along each side and has well developed gills; it attains the size of efts.

RANGE: The Striped Newt occurs in southeastern Georgia and northern Florida, south to the vicinity of Orlando, and west to Tallahassee. It has been recorded from the following counties in Florida: Alachua, Columbia, Dixie, Duval, Gilchrist, Hernando, Leon, Marion, Orange, Putnam, Seminole, St. John's, and Wakulla. The type locality is in Georgia.

HABITAT: Adults are found most frequently in flatwoods ponds in pine-palmetto habitats. The Striped Newt also occurs in many sinkhole ponds in the Apalachicola and Ocala national forests, and in ponds in scrub or sandhill areas. The terrestrial efts are usually found in rather well-drained sandy areas, under debris. The Striped Newt only occasionally occurs in the same ponds with the Spotted newt (*N. viridescens*).

LIFE HISTORY AND ECOLOGY: The life history of the Striped Newt is imperfectly known. Adults feed heavily on aquatic dipteran larvae, but will eat almost anything of appropriate size, including frog eggs. Central Florida populations may be neotenic, retaining the gills as adults. Terrestrial efts are not easy to find in the field, but during fall and winter rains they migrate to and from ponds, often across adjacent roads. Population densities vary considerably between ponds. Breeding takes place in the early spring, when males develop a fleshy tail fin and black, horny pads along the under-surface of the hind legs for use during courtship. Hatchlings first appear in April from eggs deposited in



Fig. 8. *Notophthalmus perstriatus* (photograph by R.S. Simmons)

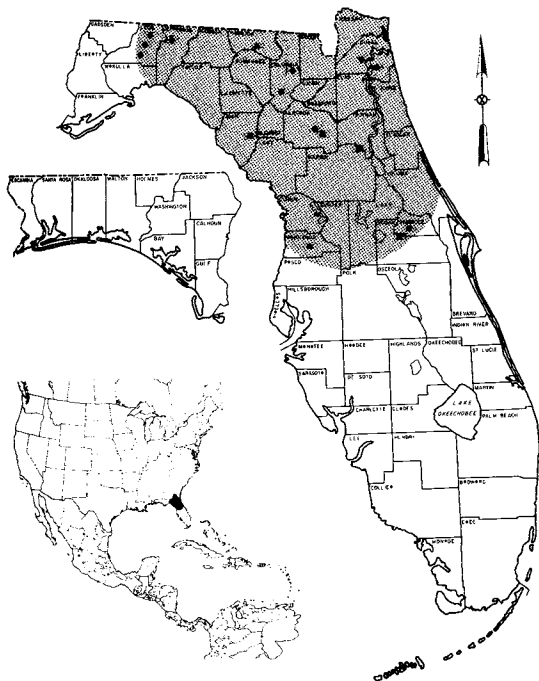
March. Larvae can be found in ponds from April through December.

SPECIALIZED OR UNIQUE CHARACTERISTICS:

The Striped Newt is of special scientific interest because of its small geographic distribution. It may represent a relict of a formerly more widespread species, or it may have evolved in the southeastern United States during periods of isolation, perhaps during a higher sea level stage of the Pleistocene. It is the smallest member of the genus, and one whose geographic range is largely confined to Florida.

BASIS OF STATUS CLASSIFICATION: The local distribution of this salamander is spotty, making it vulnerable to local habitat disturbance. Since Striped Newts occur sporadically and sometimes in very small numbers, local extirpation is a likely possibility in the event of agricultural modification, drainage practices or other human land development activities.

RECOMMENDATIONS: More research is needed before we can be sure what should be done to ensure the survival of this species. Because Striped Newts are attractive and easily maintained in captivity, they might be particularly vulnerable to collectors of the aquarium trade. Their spotty geographic distribution and occasional low population densities force us to the opinion that while collecting should not necessarily be banned, the sale of Striped Newts ought to be.



STRIPED NEWT (*NOTOPHTHALMUS PERSTRIATUS*)

SELECTED REFERENCES:

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PREPARED BY: Steven P. Christman, *National Fish and Wildlife Laboratory, 412 N.E. 16th Avenue, Gainesville, Florida 32601*, and D. Bruce Means, *Tall Timbers Research Station, Route 1, Box 160, Tallahassee, Florida 32303*.

**Rare
CARPENTER FROG**

Rana virgatipes Cope
 Family Ranidae
 Order Anura

OTHER NAMES: Sphagnum Frog, Cope's Frog.

DESCRIPTION: As an adult, the Carpenter Frog is a rather small ranid (3.8-6.3 cm [1.5-2.5 in] in body length) having a generally dark brown dorsum broken up by four light brown longitudinal stripes. The overall dark appearance is due to many dark brown to blackish spots that overlie a medium brown color between each pair of stripes. Two stripes are dorsolateral in position, falsely suggesting the presence of dorsolateral skin folds found in other ranids. The remaining two stripes occur mid-laterally and separate the more uniform dorsal coloration from a variously unmarked to strongly dark brown mottled venter that is white or pale yellow in ground color. Males are obviously distinguishable from females only by the possession of paired vocal sacs found at the angle of the gape; when not inflated, these are greyish patches.

RANGE: This is an exclusively Atlantic Coastal Plain species, ranging from the pine barrens of New Jersey to the Okefenokee Swamp of southeastern Georgia and northern Florida. Its Florida range as presently known is northern Baker and Columbia counties along the Georgia-Florida border.

HABITAT: In Florida and other Okefenokee Swamp localities, the Carpenter Frog is found in sphagnumaceous, boggy areas with water depths of 30 to 75 cm, cypress trunks and knees, patches of floating and rooted vegetation and floating logs. The water is darkly stained with organic acids and has low pH.

LIFE HISTORY AND ECOLOGY: In Florida, the Carpenter Frog breeds from the end of April until the end of August, with eggs hatching 3 to 5 days after being laid. Most larvae grow during the fall and winter

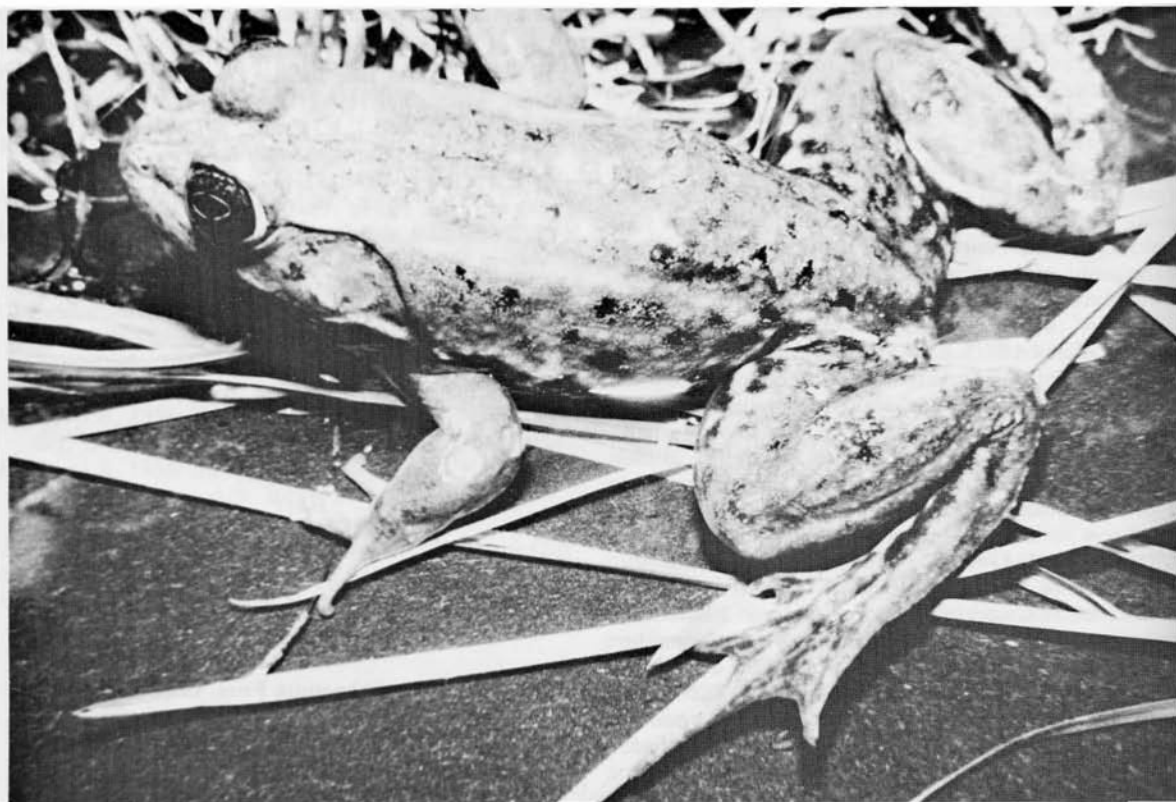


Fig. 9. *Rana virgatipes* (photograph by R.S. Simmons)

and transform in the early spring, but a few continue on into August. Those that transform early may be sexually mature by the end of the summer. Males mostly call from out of the water at the bases of cypress trunks, on knees or emergent logs and other vegetation. The call is a loud, double note repeated 3 to 5 times in succession. It resembles a carpenter hammering, hence the common name. Natural enemies include water-snakes, owls, raccoons, fish such as the Redfin Pickerel, Bowfin, and centrarchids, the Congo Eel, and other larger ranid frogs. Although not known exactly, the diet of adult Carpenter Frogs probably consists of aquatic and flying arthropods.

SPECIALIZED OR UNIQUE CHARACTERISTICS:

The Carpenter Frog shares the distinction with the Pine Barrens Treefrog and the Many-lined Salamander of being an Atlantic Coastal Plain autochthone associated with sphagnaceous, boggy habitats, acid in pH and swampy in nature. The tadpoles, and to a certain extent the adults, are probably important in the diet of certain game fish and wading birds.

BASIS OF STATUS CLASSIFICATION: This species is considered rare in Florida because it is known from a very small part of the state, and because physiographic boundaries limit its probable occurrence elsewhere.



CARPENTER FROG (*RANA VIRGATIPES*)

RECOMMENDATIONS: Since the Okefenokee Swamp is maintained as a National Wildlife Refuge, it is doubtful that the Carpenter Frog will ever become extirpated from the Florida herpetofauna. Only by draining or altering the wet, boggy habitat, or by polluting it with pesticides or other substances would this be likely. Hence, at this time no recommendations are deemed necessary.

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**Status Undetermined
GULF HAMMOCK DWARF SIREN**

Pseudobranchius striatus lustricolus Neill
Family Sirenidae
Order Caudata

OTHER NAMES: None.

DESCRIPTION: The Gulf Hammock Dwarf Siren is a small (up to 21.6 cm [8.5 in] in length), permanently aquatic, eel-like salamander with lungs and external gills. The only other salamanders likely to be confused with *Pseudobranchius* are two species of *Siren* which attain a much larger size. The two genera comprise the modern sirenids and are readily distinguishable from all other amphibians in possessing only pectoral appendages. *Pseudobranchius* has three toes per appendage, whereas *Siren* has four. The pattern of *Pseudobranchius* consists of many lateral stripes persisting throughout life. In contrast, juvenile *S. lacertina* have a prominent light stripe on the side of the body and juvenile *S. intermedia* have a red band across the snout and along the side of the head. These markings disappear with age and both species become uniformly gray or black at sexual maturity.

The Gulf Hammock Dwarf Siren differs from the other four subspecies of *Pseudobranchius striatus* in having more than 10 distinct stripes and a black venter with white mottling. Three light dorsal stripes are sharply defined and the lateral stripe is very broad and orange-brown. The ventrolateral stripe is wide and

silvery-white. The ground color is black with white flecks.

RANGE: The genus *Pseudobranchius* occurs only in the southeastern United States, being restricted to the Coastal Plains of South Carolina, Georgia and all of Florida except the westernmost areas of the panhandle. *Pseudobranchius striatus lustricolus* is known to occur in the Gulf Hammock region of Florida at the junction of the peninsula and the panhandle. Despite extensive collecting in this region specimens are known only from three localities in Citrus and Levy counties.

HABITAT: *P.s. lustricolus* occurs in weed-choked cypress and flatwood ponds, drainage ditches and smaller floodplain lakes, independent of major terrestrial plant associations. The tangled roots of the introduced Water Hyacinth (*Eichhornia crassipes*) now form the principal habitat of *P. striatus* in Florida. This plant is uncommon throughout most of the range of *P.s. lustricolus* and W. T. Neill has suggested the animal is benthic in its habits. Here, *P.s. lustricolus* takes up a vertical position with the head directed upward and the tip of the snout below the top of the muck layer. Upon disturbance the salamander immediately retreats deeper into the substratum. This may explain why *P.s. lustricolus* is difficult to collect by seine or dipnet.

LIFE HISTORY AND ECOLOGY: The natural history of the Gulf Hammock Dwarf Siren is poorly known and the following is a generalized account for the species. *Pseudobranchius striatus* is a secretive form, frequently inhabiting thick vegetation and mud, hence information on its life history and ecology is difficult to obtain. Data on the reproductive biology of *P. striatus* are especially fragmentary. Nothing is known of the courtship or mating behavior. In Florida, spawning is believed to occur throughout the spring months and ripe females may contain over a hundred fully developed eggs. The eggs are laid singly, attached to aquatic plants, and often spaced several meters apart. Embryonic development lasts 3 to 4 weeks and hatchlings average 1.5 cm total length.

The main food items of the genus are chironomid larvae, amphipods, aquatic oligochaetes and ostracods. During prolonged drought *Pseudobranchius*, like *Siren*, become encased in dried mud below the pond's former bottom and can survive such conditions for over 2.7 months. Deep mud is also the site of hibernation.

SPECIALIZED OR UNIQUE CHARACTERISTICS: *P.s. lustricolus* is a distinctive population whose affinities are not well understood and which is of extreme interest for evolutionary and comparative ecological studies.

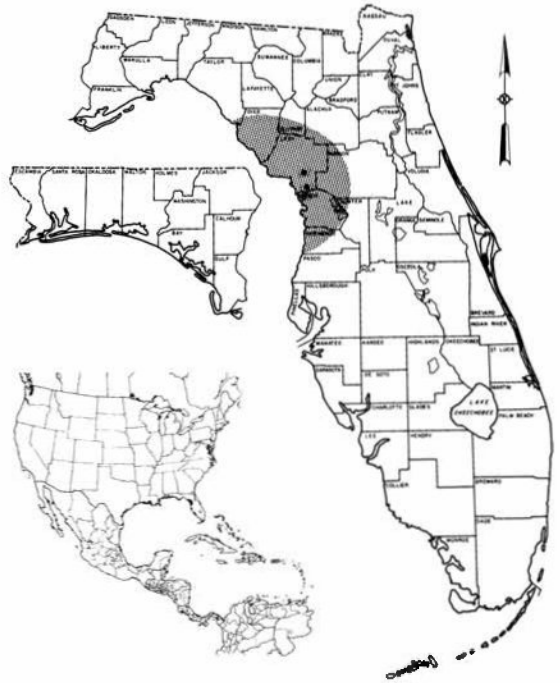
BASIS OF STATUS CLASSIFICATION: *Pseudobranchius striatus* from the Gulf Hammock region of Florida have proven elusive. The geographic extent of this race is unknown. No specimens have been reported within 12.8 km (80 mi) north or south of the type localities. At present the form is believed rare and restricted, but the status is unknown.

RECOMMENDATIONS: Much of the known range of *P. s. lustricolus* is contained within the Gulf Hammock Wildlife Management Area and is not presently endangered. Future work should define the geographic limits and affinities of the subspecies and determine its ecological requirements. Data on population size, structure and turnover are especially needed.

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PREPARED BY: J. Steve Godley, Department of Biology, University of South Florida, Tampa, Florida 33620.



GULF HAMMOCK DWARF SIREN (*PSEUDBRANCHIUS STRIATUS LUSTRICOLUS*)

REPTILES

**Endangered
AMERICAN CROCODILE**

Crocodylus acutus Cuvier
Family Crocodylidae
Order Crocodylia

OTHER NAMES: None.

DESCRIPTION: The crocodile is a lizard-shaped reptile, grey-brown or green-brown in color, mottled with black. Crocodiles range in length between 22.8 cm (9 in) at hatching to approximately 4.6 m (15 ft) for the larger males. The dorsal surface is covered by several rows of keeled, bony scales, and the ventral surface by smooth, whitish scales. Compared to the more common alligator, the crocodile is a slimmer animal, with a longer, more tapering snout, and shows a large, exposed fourth tooth on each side of the lower jaw when the mouth is closed.

RANGE: The American Crocodile occurs primarily in coastal swamps and rivers in extreme southern Florida, Cuba, Jamaica, Hispaniola, and both coasts of Mexico from Sinaloa and Tamaulipas south through Central America to Ecuador and Colombia.

Crocodiles formerly occurred in Florida as far north as Lake Worth, Palm Beach Co. (probably breed there, *vide* Gil Voss), but presently are fairly well restricted to

Dade and Monroe counties. They occur from extreme southern Biscayne Bay south and west along the mainland and Key Largo shores of Card Sound and Barnes Sound, Lake Surprise, the Blackwater and Buttonwood sounds, and through eastern and central Florida Bay as far west as a line drawn from upper Plantation Key through Russell Key, Samphire Keys, to McCormick Creek on the mainland. There also is an apparently disjunct group of crocodiles in the lower Florida Keys, primarily within the Key Deer National Wildlife Refuge, centered around Big Pine Key, Little Pine Key, and Howe Key (*vide* Jack Watson). I do not know of any information which supports the contention that crocodiles ever were resident and breeding in western Florida Bay, the Cape Sable region, or anywhere on Florida's west coast, although they occasionally wander into these regions.

HABITAT: Crocodiles in Florida occur in coastal mangrove swamps, brackish and saltwater bays, brackish creeks, and abandoned coastal canals and rock pits. The primary nesting sites in Florida Bay are either in the edge of hardwood thickets at the heads of small sand beaches, or on relatively high marl banks of narrow, coastal creeks. On northern Key Largo several nests are on abandoned canal banks back in mangrove swamps. Crocodiles apparently prefer quiet water, but larger animals routinely enter deeper bays, especially at night, probably after mullet, etc.

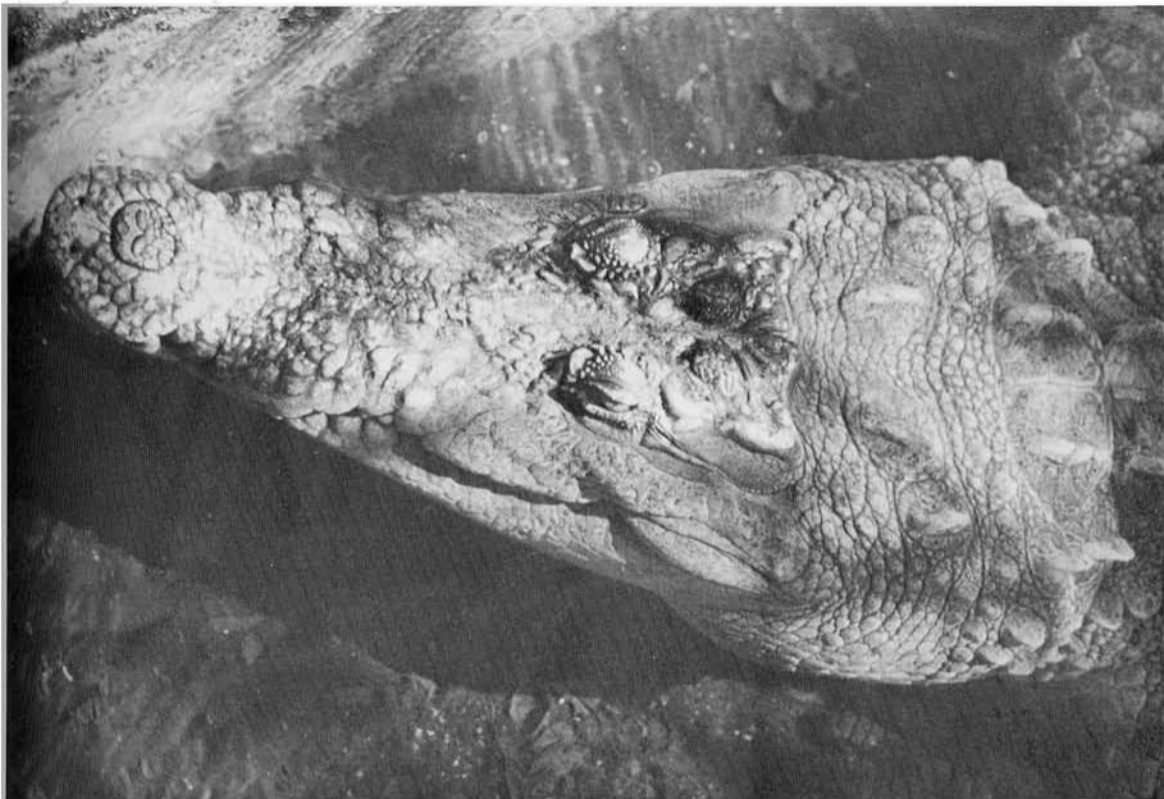


Fig. 10. *Crocodylus acutus* (photograph by P.C.H. Pritchard)

LIFE HISTORY AND ECOLOGY: In Florida Bay, female crocodiles often use the same nest mounds for several consecutive years, although most females also maintain one or more alternate nest mounds close by the main site, which may contain eggs some years. Nests vary considerably in size, with eggs buried below ground level or buried in mounds of sand or soil up to 0.6 m (2 ft) high and 6.1 m (20 ft) in diameter. Adult crocodiles spend 1 to 3 weeks digging and re-digging nest sites during April, and lay 20 to 80 eggs in late April or early May. The young hatch in late July or early August, and usually are dug out of the nests by an adult, presumably the female. There probably is a relationship between newly hatched young and the female for several days or weeks after the hatch, whereby the young receive some protection from predators. About one-half of Florida Bay nests fail to hatch each year, either due to raccoon predation on the eggs, or low nest temperatures causing embryonic mortality. Adult crocodiles often maintain dens near nest sites; most I have seen were burrows which extended 3.0 to 9.1 m (10 to 30 ft) at right angles into creek banks, with the entrance at the waterline or just below.

The primary food of adult crocodiles is fish. Smaller crocodiles, especially juveniles, largely feed on a wide variety of aquatic invertebrates. Little is known of the range of individual crocodiles, although there probably is a fair amount of wandering by adults during non-breeding seasons, perhaps prompted by local or seasonal changes in abundance of fish.

SPECIALIZED OR UNIQUE CHARACTERISTICS: Crocodiles in southern Florida represent a disjunct population at the extreme northern edge of the species' range, and are the only crocodiles in the United States.

BASIS OF STATUS CLASSIFICATION: The American Crocodile is classified as "endangered" by the International Union for the Conservation of Nature and Natural Resources (1968. Red Data Book for Amphibia and Reptilia).

There have been no accurate surveys of the total number of crocodiles remaining in Florida, although a rough estimate is between 200 and 400. There probably are not more than 25 breeding females in this population. Most crocodiles and their habitat from Biscayne Bay northward have been lost due to human development along the coast, and the favorable habitats on Key Largo, Plantation Key, and the extreme southeastern Dade County are presently being steadily removed (Turkey Point Power Plants, Ocean Reef and Basin Hills developments, etc.). It is unlikely that many crocodiles will remain outside of Everglades National Park (Florida Bay) or the Key Deer Refuge in another 10 years. The crocodiles in Florida Bay are presently being studied (1973), and do appear stable. These Florida Bay crocs likely can be maintained as a viable breeding population so long as there is proper protection and habitat management by the National Park Service.

RECOMMENDATIONS: An on-going study of crocodiles in Florida Bay likely will result in management recommendations for protection and possibly increas-



AMERICAN CROCODILE (*CROCODYLUS ACUTUS*)
(Nesting range 1965-1975)

ing the number of crocodiles there. In the other protected part of their range, the Key Deer Refuge, little is known of the numbers, nesting results, etc., of those crocodiles, thus some survey is needed. Some consideration should be given towards establishing crocodiles in southern Biscayne National Monument, where they almost surely once occurred, by making releases of juveniles or subadults. Outside of these protected lands, major attention needs to be directed towards protection of habitats on northern Key Largo, in the face of developments already underway. Protection of these habitats should result in survival of a viable crocodile population, assuming that present low level of direct disturbance to crocodiles by humans (tampering with nests, killing of adults, etc.) does not increase.

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PREPARED BY: John C. Ogden, National Audubon Society, P.O. Box 231, Tavernier, Florida 33070.

Endangered
ATLANTIC GREEN TURTLE

Chelonia mydas mydas (Linnaeus)
Family Cheloniidae
Order Testudinata

OTHER NAMES: Greenback Turtle.

DESCRIPTION: Carapace generally is brownish with olive or dark brown spots and streaks, while the plastron is white. Head is rather small in proportion to body with borders of scales frequently yellow in color. This turtle has four pairs of costal scutes and one pair of prefrontals. Mature females measure from 0.94 to 1.12 m (37 to 44 in) in carapace length and weigh 113.6 to 129.5 kg (250-285 lb).

RANGE: The Green Turtle is a world-wide species with several subspecies named. Although the green turtle was once abundant in the Caribbean, the only major nesting grounds today are confined to Tortuguero, Costa Rica, and Aves Island in the East Caribbean, with dispersal from these sites throughout much of the Caribbean. While probably once widespread in Florida, nesting is today confined to the east coast between Cape Canaveral and Palm Beach with Jupiter Island and Hutchinson Island having the greatest nesting. Nesting is occasionally reported from the lower west coast of the state.

LIFE HISTORY AND ECOLOGY: The Green Turtle is chiefly herbivorous and highly migratory in seeking feeding areas often quite distant from nesting beaches. The turtle nests every 2-3 years, with the Florida season being May through August. As many as seven clutches of eggs may be laid in a season. Nests in Florida contain an average of 134 eggs.

SPECIALIZED OR UNIQUE CHARACTERISTICS: This species is the source of most turtle steak and turtle soup and has been intensively exploited for centuries in the Caribbean. Recently, commerce in flipper skins for leather and the oil for cosmetics also have developed.

BASIS OF STATUS CLASSIFICATION: While once probably abundant in Florida, the current population is estimated to contain no more than 50 mature females. The species, like all sea turtles, is now legally protected within Florida waters, but an active fishery exists in much of the Caribbean.

RECOMMENDATIONS: The Florida population of the Green Turtle must be considered highly endangered. Tight enforcement of existing protective laws is urgent. Captive rearing should be maintained on only a restricted scale and nests on suitable beaches should be permitted to hatch undisturbed. Transplanting of nests in an attempt to restock former rookeries should be discouraged unless it can be proven that remnant population is sufficiently stable to tolerate the loss of eggs.

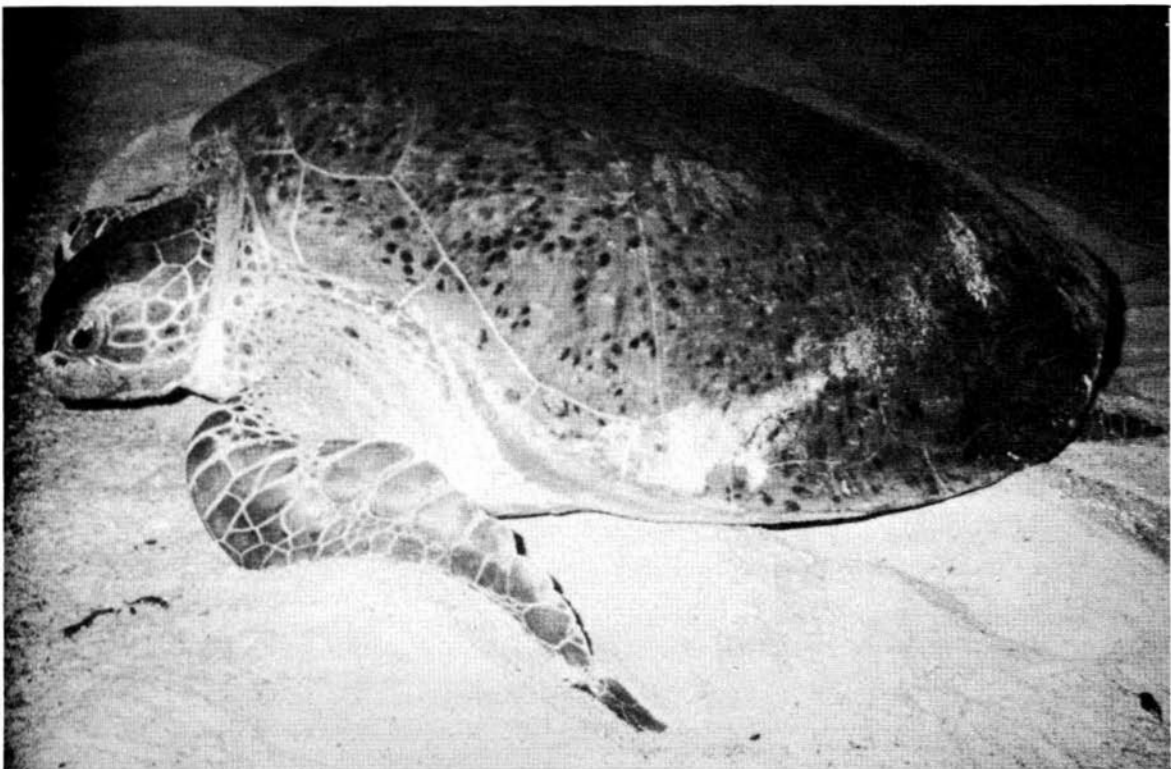


Fig. 11. *Chelonia mydas mydas* (photograph by P.C.H. Pritchard)

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PREPARED BY: Frank Lund, P.O. Box 541, Jupiter, Florida 33458.



Endangered
ATLANTIC HAWKSBILL

Eretmochelys imbricata imbricata (Linnaeus)
 Family Cheloniidae
 Order Testudinata

OTHER NAMES: None.

DESCRIPTION: One of the smaller marine turtles, mature females from the Atlantic averaging a little over 45 kg (100 lb). This species generally is recognized

by the long bird-like beak from which the name is taken and the two pairs of prefrontal scales. Scutes on carapace overlap on all but very young or old specimens. Carapace and plastron of younger specimens have a keeled appearance. Carapace shows radiated patterns of reddish-brown, yellow, brown, or black. Mature females in Costa Rica range from 74.9 to 91.4 cm (29.5 to 36 in) in carapace length.

RANGE: The hawksbill is found worldwide in tropical waters and nests on scattered islands and shores throughout the Caribbean. Only two nests have been recorded in Florida although younger specimens are infrequently observed on reefs off the southeast coast and the Florida Keys.

LIFE HISTORY AND ECOLOGY: The hawksbill is the least studied of the marine turtles and the life history is poorly known. The turtle is generally associated with reef communities. Adults are omnivorous, feeding largely on molluscs, crustaceans and marine algae. The turtle is a solitary nester, only rarely forming aggregations common to the other species of marine turtles. The number of nests within a season and years between re-nestings are unknown. In Costa Rica, the average clutch contained 161 eggs.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The hawksbill is the source of "tortoiseshell," used in jewelry and inlay work, for which it has been sought intensively for centuries. Despite the development of plastic substitutes, the demand for real shell has recently increased and the turtle is threatened worldwide.

BASIS OF STATUS CLASSIFICATION: The hawksbill is considered endangered throughout most of the world after centuries of exploitation. Its solitary nesting habits and wide range make both adequate census and protection impossible unless done on an international basis. The current demand for hawksbill products is increasing and turtles previously considered too small to furnish shell are being stuffed and entered into the tourist market.

RECOMMENDATIONS: The existence of more than an occasional nesting hawksbill in Florida is doubtful. One old published record can only be supplemented with a single nesting observed on Jupiter Island in 1974. While all nesting turtles are protected by Florida law, turtles in state waters should be given total legal protection to prohibit the collection of small specimens for curio purposes. The state should actively discourage the sale of hawksbill products already prohibited by federal law.

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Fig. 12. *Eretmochelys imbricata imbricata* (photograph by P.C.H. Pritchard)

PREPARED BY: Frank Lund, P.O. Box 541, Jupiter, Florida 33458.

OTHER NAMES: Mexican Ridley, Kemp's Ridley, Bastard Turtle, Lora Turtle.

DESCRIPTION: A marine species characterized by a carapace extremely broad in relation to its length—sometimes even broader than long. Inframarginals have a pore at rear border. Carapace coloration varies from olive-green to black or grey-brown. The carapace range is 58.4 to 71.1 cm (23-28 in) with a maximum weight of 45.4 kg (100 lb).

RANGE: Mature *Lepidochelys kempii* are restricted to the Gulf of Mexico while immature specimens have been collected along the Atlantic coast of the United States and infrequently along European shores. Virtually the entire population nests on approximately 10 miles of beach between Rancho Nuevo and Boca San Vicente in the State of Tamaulipas, Mexico. Recapture of tagged females indicates a dispersal pattern around the Gulf of Mexico from Key West, Florida, to Isla Mujeres on the Yucatan Peninsula, and Cuba. Immature specimens are found seasonally in the Cedar Keys-Crystal River region.

LIFE HISTORY AND ECOLOGY: At least a percentage of the females nest annually. Between April and June the turtles appear off Tamaulipas where, following a strong wind, they crawl ashore to nest.

Nesting occurs in the daylight hours, with a maximum of three nestings each season. Nests contain an average of approximately 110 eggs.

SPECIALIZED OR UNIQUE CHARACTERISTICS: Entire world population utilizes one small nesting beach; the range is restricted to Gulf of Mexico and North Atlantic.

BASIS OF STATUS CLASSIFICATION: When first seen in 1947, the nesting aggregation at Tamauli-



ATLANTIC HAWKSBILL TURTLE (*ERETMOCHELYS IMBRICATA IMBRICATA*)
(Dots indicate nesting records)

**Endangered
ATLANTIC RIDLEY**

epidochelys kempii (Garman)
Family Cheloniidae
Order Testudinata



Fig. 13. *Lepidochelys kempii* (photograph by P.C.H. Pritchard)

pas was estimated to contain 40,000 individuals; by 1970 only about 2,000 remained. The total world population today is estimated to contain only 3,000-5,000 females.

Reasons for decline include excessive egg collection and slaughter of adults as well as very high predation on unmolested nests. The worst problem today is the drowning of large numbers in shrimp nets.

RECOMMENDATIONS: Research into the life history of *Lepidochelys* must be continued. Importance of Cedar Keys-Crystal River area to immature turtles needs further study. Species needs total protection in Florida and throughout its range.

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PREPARED BY: Frank Lund, P.O. Box 541, Jupiter, Florida 33458.



ATLANTIC RIDLEY TURTLE (*LEPIDOCHELYS KEMPII*)

Endangered
ATLANTIC SALT MARSH SNAKE

Nerodia fasciata taeniata (Cope)
Family Colubridae
Order Squamata
Suborder Serpentes

OTHER NAMES: East Coast Striped Water Snake, Salt Water Snake.

DESCRIPTION: The Atlantic Salt Marsh Snake is a slender, heavily keeled water snake with a pattern of stripes that are variously broken into blotches. The dorsal ground color is pale olive, patterned with a pair of dark brown stripes running down the back and enclosing a pale mid-dorsal stripe. These dark stripes usually become fragmented posteriorly into a series of elongate blotches. There is also a row of dark blotches along the lower sides of the body, which may merge to form stripes in the neck region. The ventral surface is black with a median series of yellowish spots. The Atlantic Salt Marsh Snake is not known to exceed 60.9 cm (2 ft) in length.

RANGE: The Salt Marsh Snakes (*Nerodia fasciata taeniata*, *N. f. compressicauda* and *N. f. clarki*) occur in brackish areas along the coast from the vicinity of Corpus Christi, Texas, to the Atlantic Coast of central Florida. The Atlantic Salt Marsh Snake is restricted to the coastal areas of Volusia, Brevard and Indian River counties, Florida, and has been observed at approximately six localities. The type locality is National Gardens, in Volusia County.

HABITAT: The Atlantic Salt Marsh Snake has been found in tidal creeks and salt marshes where it is usually

associated with Fiddler Crab burrows and glassworts (*Salicornia*).

LIFE HISTORY AND ECOLOGY: *N. f. taeniata* is apparently most active at night during periods of low tide, when it feeds on small fish in the shallow water. There is some evidence to suggest that it may seek shelter in Fiddler Crab burrows. Although nothing is known of the life history of this snake, it is probably much like that of the closely related Gulf Salt Marsh Snake. Females of this Gulf Coast race produce from two to fourteen young, which are born alive, usually in mid-summer. Nothing is known about population dynamics of the Atlantic Salt Marsh Snake.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The Salt Marsh Snakes are the only North American snakes restricted to a brackish environment. The striking similarity between *taeniata* and the *compressicauda* X *clarki* hybrids from the Florida west coast suggests that *taeniata* may actually be the product of past hybridization involving *clarki* and *compressicauda* prototypes. Although today *Nerodia fasciata clarki* occurs in Florida only along the West Coast, it is believed that during the Pleistocene, when the geography of Florida was different due to changing sea levels, *compressicauda* and *clarki* may have had adjacent distributions near what is now the range of *taeniata*. The Atlantic Salt Marsh Snake thus appears to be a relictual population of hybrids between two forms that no longer occur in the area.

BASIS OF STATUS CLASSIFICATION: Progressive destruction of coastal marshes in Volusia, Brevard and Indian River counties is threatening the habitat of the Atlantic Salt Marsh Snake. Continued drainage of coastal wetlands will further limit the range of this already restricted reptile. Furthermore, habitat distur-

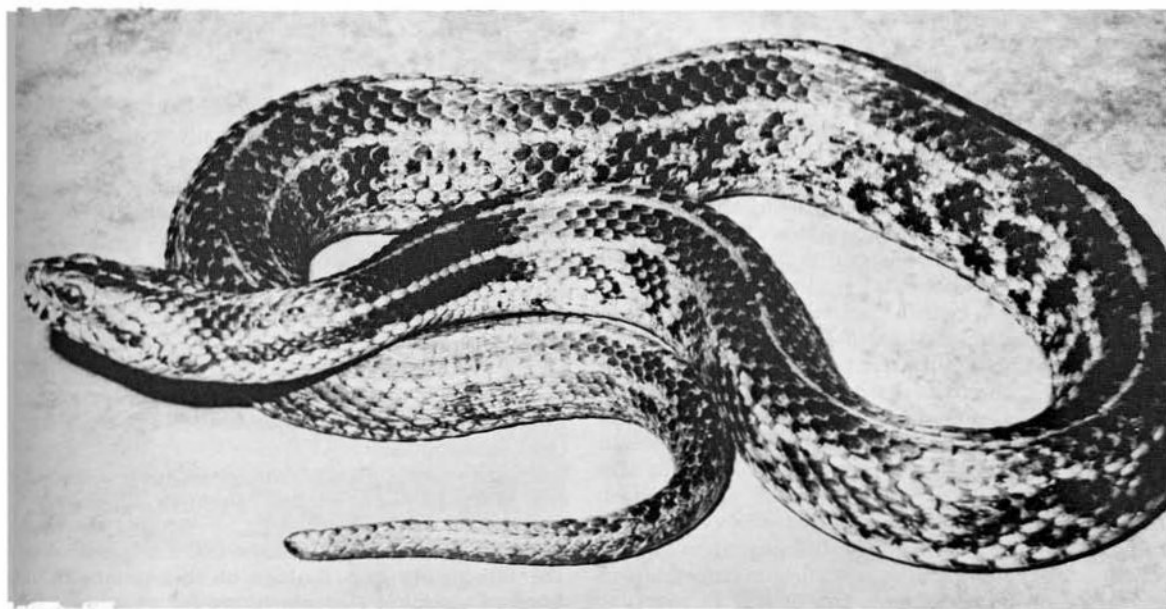


Fig. 14. *Nerodia fasciata taeniata* from Volusia County, Florida (photograph by S.P. Christman)

bance in these regions may already be responsible for increased genetic interchange between *taeniata* and the freshwater snake, *Nerodia fasciata pictiventris*. Such interchange can only lead to obliteration of the *taeniata* phenotype by the much larger *pictiventris* gene pool.

RECOMMENDATIONS: Much future study is needed to determine the present status of this seldom observed water snake. Further disturbance of coastal salt marshes in Volusia, Brevard and Indian River counties should be discouraged. Snake collecting on the Merritt Island National Wildlife Refuge and at Tomoka River State Park should be prohibited, and that prohibition enforced.

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ATLANTIC SALT MARSH SNAKE (*NATRIX FASCIATA TAENIATA*)

**Endangered
SHORT-TAILED SNAKE**

Stilosoma extenuatum Brown
(all subspecies)
Family Colubridae
Order Squamata
Suborder Serpentes

OTHER NAMES: None.

DESCRIPTION: A slender, smooth-scaled snake, with a cylindrical body form. Head not distinct from body. Tail tapers abruptly and represents no more than 10 percent of the body length. Dorsal ground color is a silvery gray with a series of 50-80 dark brown dorsal blotches separated by yellowish, orange or red interspaces and with a series of lateral blotches alternating with the dorsal series. The belly is strongly blotched. The cylindrical body form, blotched pattern with colored interspaces, and short tail will separate this species from all other Florida snakes.

RANGE: Endemic to Florida. Occurs from Suwanee and Columbia to Hillsborough, Orange and Highlands counties. The type locality of the species is Lake Kerr, Marion Co., Florida.

TAXONOMIC VARIATION: Three subspecies of *Stilosoma extenuatum* are recognized, based on differences in number of dorsal blotches and average scale characteristics. *S. e. extenuatum* is distributed in S.E. Putnam Co., N.E. Marion Co., east of the Oklawaha River, and south through Lake, Orange, Polk, Highlands and Seminole counties. Type locality as above. *S. e. arenicola* is known from Citrus, Hernando, Hillsborough, Pasco, Pinellas and Sumter counties. Type locality is Lecanto, Citrus County. *S. e. multistictum* is known only from Alachua, Columbia and Suwannee counties. Type locality, 3.7 miles N., 4.2 miles W. Gainesville, Alachua County.

HABITAT: Restricted chiefly to Longleaf Pine/Turkey Oak plant associations. Occasionally found in upland hammock and Sand Pine scrub, but usually closely adjacent to Longleaf Pine/Turkey Oak stands. Two specimens were dug from a sphagnum bog adjacent to a stand of the typical habitat (Carr, 1940 and pers. comm.).

The ecological factors, other than preferred habitat distribution, which limit the distribution of this species are not known. Preliminary laboratory data indicate that the species selects Norfolk, Blanton fine, and St. Lucie soils over a variety of other types for burrowing when placed in choice situations. The extensive stands of Longleaf Pine/Turkey Oak habitat (now chiefly Turkey Oak) in Marion and Lake counties still maintain populations, and stands of apparently acceptable habitat still exist scattered elsewhere throughout its original range.

LIFE HISTORY AND ECOLOGY: Little is known of the life history and ecology of this species. It is a burrower, seldom seen above ground except in spring and fall (April and October). Its chief ecological char-

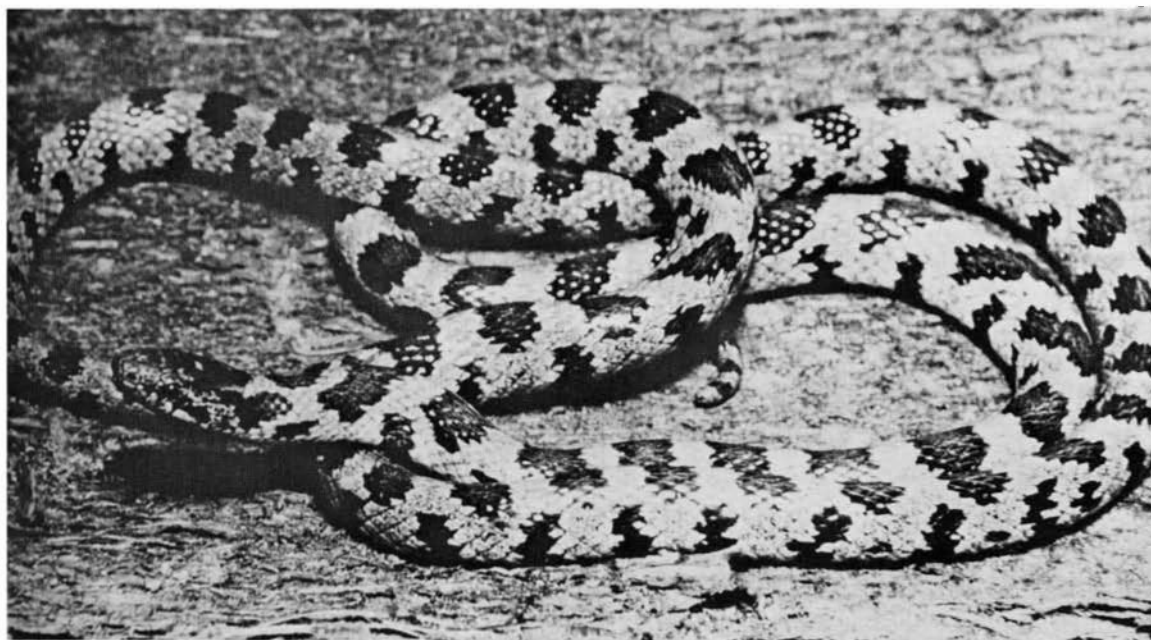


Fig. 15. *Stilosoma extenuatum* from near Ocala, Marion County, Florida (photograph by R.S. Simmons)

acteristic of concern is its restriction to a rapidly disappearing habitat type.

SPECIALIZED OR UNIQUE CHARACTERISTICS:

Stilosoma is generically endemic to Florida and monotypic, one of very few such forms. Its relationships to other snakes are poorly known. While possessing little esthetic appeal except to aficionados, its zoogeographic and biosystematic importance to scientists would rate it among the most interesting of North American snakes.



Fig. 16. *Stilosoma extenuatum* habitat in Longleaf Pine-Xerophytic Oak Woodland near Silver Springs, Marion County, Florida (photograph by H.W. Campbell)

Its ecological role in the habitat is unknown but not necessarily insignificant and deserves further study.

BASIS OF STATUS CLASSIFICATION:

Stilosoma extenuatum is seriously threatened by competition with man for habitat. The well-drained soils on which this species occurs are under intensive development pressure for citrus production and building sites and the habitat is rapidly being lost. Harvest of the Longleaf Pine and subsequent timber management, or conversion of the habitat to pure Turkey Oak, also appears to severely affect the species. Clearcutting and other timber management programs in sand-pine scrub may be of serious concern. Few areas in which this species occurs appear secure from serious threat in the immediate future.

RECOMMENDATIONS:

Preservation of the Longleaf Pine/Turkey Oak and Sand Pine scrub habitats is required for *Stilosoma*. The Ocala National Forest currently contains one of the largest blocks of appropriate habitat remaining and all efforts should be made to prevent disruption of the critical habitat in this area. Peripheral populations, representing distinct subspecific taxa, should be protected by habitat acquisition or ecological design of developments in Citrus, Sumter, Hernando, Pasco and Pinellas counties (subspecies *S. e. arenicola*) and Alachua and Suwannee counties (subspecies *S. e. multistictum*). This species appears able to coexist with man as long as development is not too intense. Zoning of developments in critical habitat to require one acre homesites which retain the native plant and animal species, or agricultural or industrial developments which provide equal amenities, may provide for the continued existence of this species even in areas subject to necessary development. Care should be taken in such

developments to preserve the invertebrate and small vertebrate fauna on which this species probably depends.

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SHORT-TAILED SNAKE (*STILOSONA EXTENUATUM*)

**Threatened
KEY MUD TURTLE**

Kinosternon bauri bauri (Garman)
Family Kinosternidae
Order Testudinata

OTHER NAMES: Striped Mud Turtle.

DESCRIPTION: A small turtle whose adult carapace length seldom exceeds 10.2 cm (4 in). The skin and unkeeled carapace are dark. The characteristic carapacial stripes are faint. The lower jaw is plain or weakly streaked with dark pigment. The plastron is broad and has two transverse hinges. Males are smaller than females, have longer, thicker tails and two small, rough areas of projecting scales on the inner surface of each rear leg. There are no other small aquatic or semi-terrestrial turtles in the range of this subspecies. A single specimen of *Terrapene carolina bauri* was found on Key West but it is believed to be a pet transported from the mainland.

RANGE: The species is widespread throughout Florida and ranges north into southeastern Georgia. Two subspecies are recognized but only *Kinosternon bauri bauri*, which is confined to the lower, oolitic keys is threatened. Collections are known from Big Pine Key, Key West, a point 30 miles north of Key West, and Stock Island. The turtle is relatively abundant on Big Pine Key but less so further west on Key West.

HABITAT: The turtle is primarily aquatic, preferring permanent and temporary sloughs and ponds with soft bottoms. However, it readily enters brackish water and is found in mangrove swamps, and often forages on land.

LIFE HISTORY AND ECOLOGY: Most life history information for this species is based on *Kinosternon bauri palmarum*. Relatively little field information is available for *Kinosternon bauri bauri*. The turtle is omnivorous, eating Cabbage Palm nuts, juniper leaves, insects and cow dung. While some diurnal foraging is practiced, the turtle apparently is mostly crepuscular.

Nests are built in sand or piles of vegetation from April to June, and may contain up to four eggs. Females produce as many as three clutches a season. The eggs are resistant to both hydration and desiccation. Hatchling growth is rapid, as witnessed by carapace length increases of as much as 20% in a three month period following hatching. Alligators prey on adults while many vertebrates eat eggs and young.

SPECIALIZED OR UNIQUE CHARACTERISTICS: Members of this subspecies are in part scavengers. Their "specializations" are really adaptations of a general nature which allow them to forage on land, in fresh and brackish water, and to eat a variety of food items. It is the only freshwater turtle known from the keys.

BASIS OF STATUS CLASSIFICATION: Previous nomenclatural confusion and lack of information make

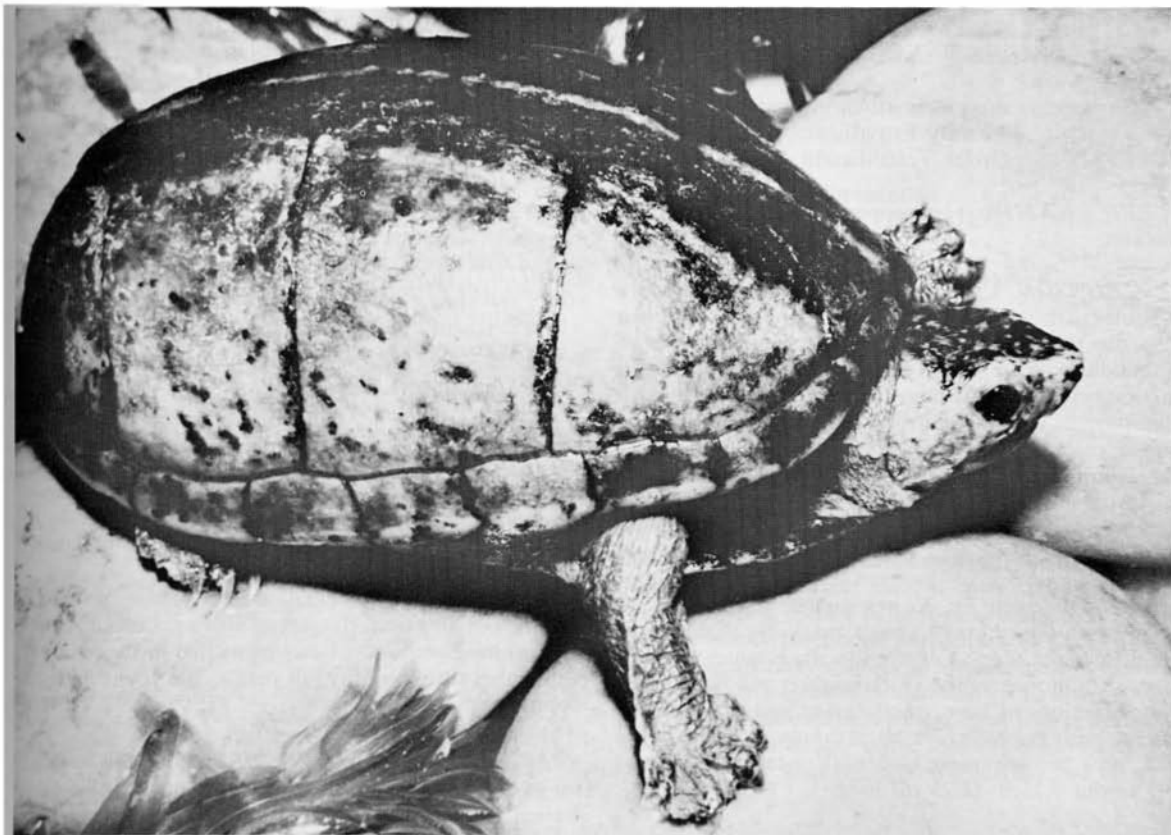


Fig. 17. *Kinosternon bauri bauri* (photograph by R.S. Simmons)

comparisons of past and present populations tenuous. Existing populations seem to be stable. However, the recent rapid and uncontrolled housing and recreational development of the Lower Keys threatens to replace the swamps and quiet water pools essential for the turtles' continued existence.

RECOMMENDATIONS: The first protective step has been made — placing this animal on a threatened species list. Efforts should be made to conserve specific areas of the Lower Keys that include the turtle's habitat. Definitive measures may lag due to the lack of ecological information. Therefore, I suggest that a field evaluation of the turtle be conducted on Big Pine Key where the turtles are still common.

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KEY MUD TURTLE (*KINOSTERNON BAURI BAURI*)

**Threatened
SUWANNEE COOTER**

Chrysemys concinna suwanniensis (Carr)
Family Emydidae
Order Testudinata

OTHER NAMES: Suwannee Turtle, Suwannee Chicken.

DESCRIPTION: Upper shell low when compared to most other turtles, smoothly vaulted with a streamlined effect due to the greatest height being found in front of the middle. Size to approximately 40.6 cm (16 in), with females being slightly larger than males. Males with long, straight toenails on front feet and a long tail. The ground color of the upper shell darker than in most other Florida cooters, often nearly black, with a faint reticulated pattern. Head also dark, usually with five faint yellowish-white stripes between the eyes; others on the sides of the head, neck and chin. Two or three stripes on the front surface of the front leg; none on the outer surface of the hind leg. Lower shell yellow to orange-yellow, with dusky gray to black markings that tend to follow the scute edges. Young generally brighter in color; upper shell more greenish, with brighter yellow reticulations; markings of lower shell darker and more clearly defined, with ground color often orange. Stripes on the head, neck and legs more evident. Upper shell of hatchlings about 3.2 cm (1.25 in) long.

RANGE: The species is found from Maryland south to central Florida and east to Texas. Two subspecies are

found in Florida: *C. c. mobilensis* and *C. c. suwanniensis*. The former occurs in bays, estuaries and the lower parts of streams from just west of the Apalachicola River delta west to eastern Texas; the latter from the delta southeast along the west coast of the peninsula to the Alafia River. Even in this area, *C. c. suwanniensis* is absent from most small rivers whose headwaters are below 7.6 m in elevation.

HABITAT: The Suwannee Cooter is restricted to certain rivers and spring runs draining into the Gulf of Mexico, where it reaches its highest densities in areas with heavy growth of *Najas* and *Sagittaria*, including grassy flats off of river mouths. It is apparently very tolerant to broad variations in salt concentrations.

LIFE HISTORY AND ECOLOGY: It is almost completely herbivorous, feeding primarily on *Najas*, *Sagittaria* and *Ceratophyllum*. In brackish water habitats it feeds largely on Turtle Grass, *Thalassia testudinum*. Young are omnivorous.

Very little reproduction data are available. Seventeen to nineteen elliptical, flexible-shelled eggs about 3.8 cm (1.5 in) long are laid in nests excavated in the soil from September through May (all year?). The young hatch in approximately 2.5 months.

SPECIALIZED CHARACTERISTICS: Highly adapted for swimming, and perhaps the swiftest of all turtles in the United States. One of the few almost purely grazing fresh water turtles in the world. Almost entirely restricted to Florida.



Fig. 18. *Chrysemys concinna suwanniensis* (photograph by P.C.H. Pritchard)

BASIS OF STATUS CLASSIFICATION: The status of the present populations in its entire range is considered threatened because of considerable reduction in population density during the past decade. Only a few individuals are seen today in areas where hundreds could be seen just a few years ago. Though there is no organized market for them, they are continually captured and eaten. The high density of sport boats on the rivers makes these conspicuous turtles particularly susceptible to exploitation and harassment. The habitat has been degraded in several rivers with the result that food plants have diminished or disappeared almost entirely.

RECOMMENDATIONS: Present population densities and distribution should be established quite concisely so that base line information would be available from which to deduce population changes. Further decimation may suggest protective legislation in the future.



SUWANNEE COOTER (*CHRYSSEMYIS CONCINNA SUWANNIENSIS*)

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PREPARED BY: Walter Auffenberg, Florida State Museum, University of Florida, Gainesville, Florida 32601.

Threatened GOPHER TORTOISE

Gopherus polyphemus (Daudin)
Family Testudinidae
Order Testudinata

OTHER NAME: Gopher.

DESCRIPTION: The Gopher Tortoise is a medium-sized turtle, set off from all others in Florida by its flattened forelimbs which are used for digging. The toenails of the front feet are broad and short. The back feet are stubby and elephantine, with the toes inconspicuous. The tail is remarkably short for the size of the turtle. The wide, muscular head is covered with scales. The upper shell is brown or tan, sometimes with light centers in each of the plates, particularly in the young. Growth rings are very evident in smaller sizes, but the shell becomes very smooth in old adults. The lower shell is usually clear yellow, though marbled with black or gray in some populations. Large specimens have a shell length of about 30.5 cm (12 in) and when hatched about 3.8 cm (1.5 in).

RANGE: Relict, scattered populations occur in suitable habitats in southern peninsular Florida from Cape Sable and Cutler Ridge (south of Miami) northward along both coasts as far as the general level of Sarasota and Fort Lauderdale. From these two points northward it is more widely distributed, occurring generally over the entire peninsula in suitable habitats. Northward it extends to a few outlying populations in central South Carolina. Relictual populations occur along the Fall Line from central South Carolina to Mississippi, with an outlier in southeastern Louisiana. The main body of the more or less continuous portion of the range is in southern Georgia, southeastern Alabama, the panhandle of Florida and the northern and central parts of the peninsula. Three closely related species are found in northern Mexico and southwestern United States.

HABITAT: Dry, well-drained soils seem to be a prime requisite. Major xeric habitats utilized are beach scrub, Sand Pine, Longleaf Pine-Turkey Oak and Live Oak hammock, as well as old field successional stages leading to any of these. Specific sites selected are usually well provided with herbaceous cover of several types.

LIFE HISTORY AND ECOLOGY: The Gopher Tortoise feeds primarily on grasses of several different types. However, fallen leaves of several species of trees (particularly some of the oaks) and herbs are eaten, as well as occasional wild fruits and berries. Grazing by these tortoises is usually extremely habitual with the result that paths and small clearings are maintained by con-

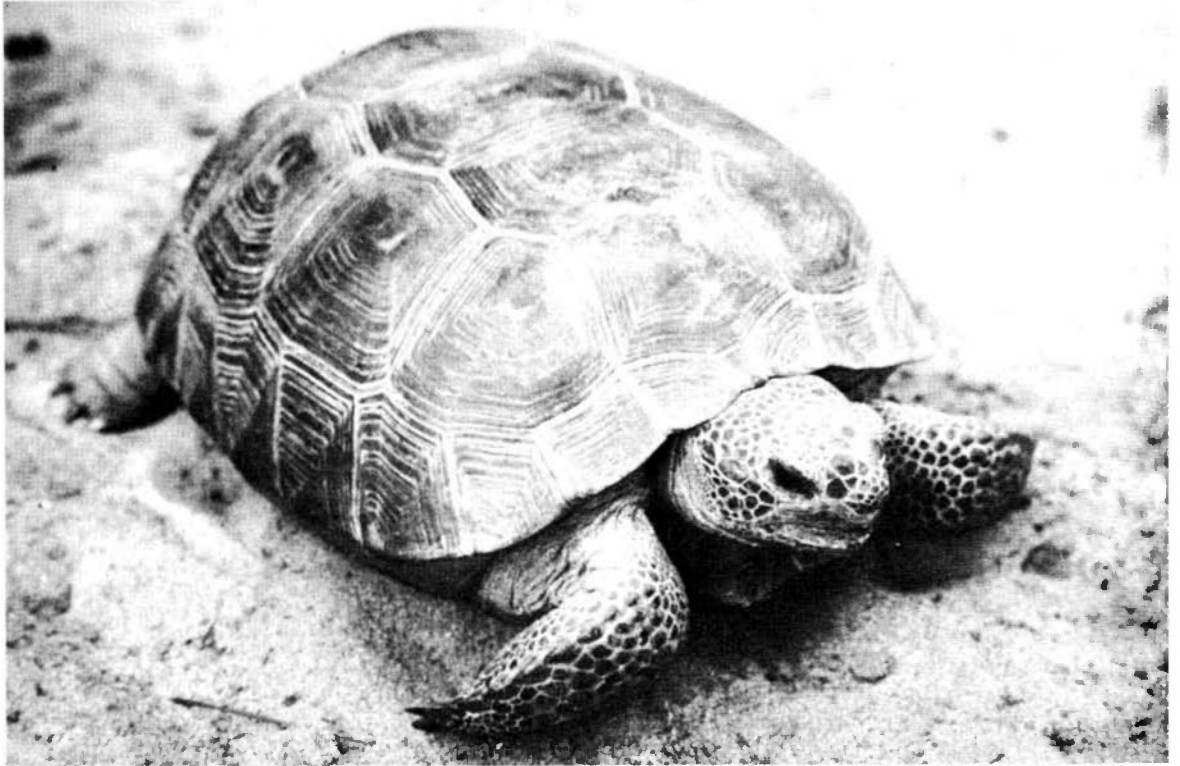


Fig. 19. *Gopherus polyphemus* (photograph by P.C.H. Pritchard)

stant cropping in an otherwise developed herbaceous layer. The young are omnivorous and will eat carrion. Under certain circumstances adults will feed on dead insects or the flesh of vertebrate animals, and their bones.

Of all the habits of the Gopher Tortoise, the most important is that it excavates a long burrow, occupied semi-permanently and used by both the tortoise and a host of other organisms for both protection from enemies and unfavorable climatic conditions. Large burrows may extend to a length of up to 9.1 m (30 ft) and a depth of nearly 3.7 m (12 ft). Burrow depth is determined largely by soil moisture, and its conformation by obstacles encountered. Commensals found in the burrows include a large number of invertebrates, of which most are arthropods. Almost three dozen species are found in the burrows, some of which are known from no other habitats. While many different vertebrates have been found in the burrows, the most important are the Pine Snake, Indigo Snake, Florida Mouse and Gopher Frog. These species are peculiar to the habitat shared with the tortoise and, in some cases, are also placed in the threatened category.

Up to 15 eggs are laid in the sand often near or in the sand mound at the burrow mouth. The eggs hatch in about 65 days, and the young remain in the general area for several years. Burrows are constructed shortly after hatching, usually by enlarging an existing burrow of a mouse or other small creature. Maturity is apparently reached in about 5 to 7 years. There is a definite tendency for the formation of breeding colonies, show-

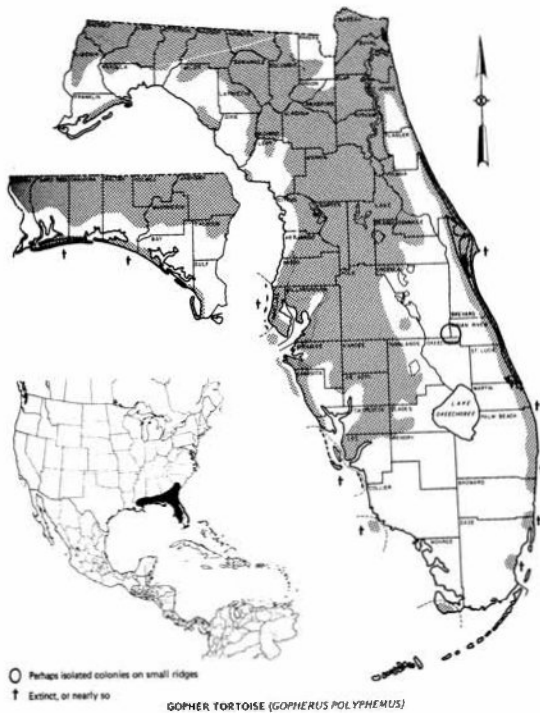
ing non-random distributions, even in fairly uniform environments.

SPECIALIZED OR UNIQUE CHARACTERISTICS: Its burrow and commensal fauna.

BASIS OF STATUS CLASSIFICATION: Though common in the central parts of the peninsula, studies conducted over the last 15 years show very clearly that peripheral, isolated populations in both west and southern Florida have either already disappeared, or are in a stage of rapid deterioration. In central Florida the combination of extensive land modification for citrus and more recently for land development in conjunction with tourism and urban growth have reduced the colonies markedly. In northern Florida the modification of xeric communities in preparation for upland Slash Pine plantations and the highly shaded surface that eventually results from the growth of the pines run counter to maintaining viable colonies. During the last decade the improving economy has greatly reduced the extent to which these tortoises are eaten by rural folk. However, hunting for gophers to supply additional meat for the table is still practiced, particularly in the panhandle and the northwestern part of the peninsula. Large, organized yearly rattlesnake hunts are undoubtedly deleterious to gophers. Current studies should provide data on the kind and extent of damage.

RECOMMENDATIONS: In view of the continuing destruction of habitat, due to several different kinds of

activities, it is important that this distinctive animal, now largely restricted to the Florida area, be placed on the protected list. At present the State of Florida has passed an Act forbidding sale, intended largely to discourage wholesale capture for the meat market. However, complete protection is warranted. Research into all aspects of its biology should be continued and high priority should be given to studies of the commensal fauna.



arthropods found in the burrows of the Florida gopher tortoise. Florida Entomologist 22:53-62.

PREPARED BY: Walter Auffenberg, Florida State Museum, University of Florida, Gainesville, Florida 32601.

Threatened ATLANTIC LOGGERHEAD

Caretta caretta caretta (Linnaeus)
 Family Cheloniidae
 Order Testudinata

OTHER NAME: None.

DESCRIPTION: This turtle is characterized by a large head with blunt jaws. Carapace and flippers are a reddish-brown color, while plastron is yellow. Mature turtles weigh 68-90 kg (150-200 lb); large specimens may reach 136.7 kg (300 lb). The shell frequently accumulates a heavy layer of barnacles. *Caretta* has five pairs of costal scutes and four prefrontals (sometimes with a central zygous scale).

RANGE: The loggerhead is found in temperate and subtropical waters worldwide, with major nesting beaches in eastern Australia, southeastern Africa and the southeastern United States. In the U.S., nesting occurs on suitable sandy beaches from North Carolina through Florida and to a lesser extent on islands off the Gulf states. Most important nesting beaches in the U.S. are on the east coast of Florida between Cape Canaveral and Palm Beach. Hutchinson Island and Jupiter Island are major rookeries within this area.

LIFE HISTORY AND ECOLOGY: Nesting season in the U.S. extends from May until September. Females typically nest every 2-3 years and deposit an average of 5 clutches in a season. Clutches contain an average of 120 eggs.

Following the nesting season, most of the population disperses. Nesting turtles tagged in Florida have been recovered in South Carolina, Georgia, Alabama, Louisiana, Cuba and the Bahama Islands.

SPECIALIZED OR UNIQUE CHARACTERS: *Caretta*, like most species of marine turtles, exhibits considerable site fixity in returning to the same beach to re-nest. This turtle nests further from the Equator than any other marine turtle.

BASIS OF STATUS CLASSIFICATION: The loggerhead population in the U.S. is currently estimated to number 25,000-50,000 individuals. A recent census of *Caretta* nests indicates about 22,000 nests are dug each year in the U.S. Assuming 3.5 nests per turtle and 2.5 years between nesting, the U.S. population consists of about 15,714 adult female turtles; it can be estimated that 19,895 nests are dug in Florida each year by an adult population of 14,210 females. Thus the Florida popula-

SELECTED REFERENCES:

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- Auffenberg, W. and W.G. Weaver. 1969. *Gopherus berlandieri* in southeastern Texas. Bull. Florida State Mus. 13(6):141-203 (comparative study of related species).
- Carr, A.F. 1952. Handbook of turtles: turtles of the United States, Canada and Baja California. Cornell Univ. Press, Ithaca. 542 pp.
- Goin, C.J. and C.C. Goff. 1941. Notes on the growth rate of the Gopher Turtle, *Gopherus polyphemus*. Herpetologica 2:66-68.
- Gourley, E.V. 1969. Orientation of the Gopher Tortoise, *Gopherus polyphemus* (Daudin). Ph.D. Thesis, University of Florida. 126 pp.
- Hallinan, T. 1923. Observations made in Duval County, Florida on the gopher tortoise (*Gopherus polyphemus*). Copeia 1923 (1):11-20.
- Woodbury, A.M. and R. Hardy. 1948. Studies of the Desert Tortoise, *Gopherus agassizii*. Ecol. Monog. 18:145-200 (comparative study of related species).
- Young, F.N. and C.C. Goff. 1939. An annotated list of the



Fig. 20. *Caretta caretta caretta* (photograph by P.C.H. Pritchard)

tions of *Caretta* represent more than 90% of the total U.S. population. Excessive nest destruction by raccoons as well as confusion caused by beachfront lighting are responsible for the loss of large numbers of young. Erosion and ocean-front development have rendered former nesting beaches unsuitable. Shrimping activities off nesting beaches drown many adults and subadults. Both range and population size appear to be decreasing in Florida.

RECOMMENDATIONS: Existing long-term population studies should be continued. Turtles should be given legal protection by the state, and commercial utilization discouraged. Bright illumination of beaches during nesting season and use of vehicles on beaches at night should be restricted on major rookeries.

SELECTED REFERENCES:

- Baldwin, W.P. and J.P. Lofton. 1959. The loggerhead turtles of Cape Romain, South Carolina. Pages 319-348 in D.K. Caldwell and A.F. Carr, coordinators. The Atlantic Loggerhead Sea Turtle, *Caretta caretta* (L.) in America. Bull. Florida St. Mus. 4(10):320-348.
- Carr, A.F. 1952. Handbook of turtles: turtles of the United States, Canada, and Baja California. Comstock Pub. Assoc., Ithaca, N.Y. 542 pp.
- Gallagher, R.M., M.L. Hollinger, R.M. Ingle and C.R. Futch. 1972. Marine turtle nesting on Hutchinson Island, Fla. in 1971. Fla. Dept. Nat. Res. Spec. Sci. Report No. 37, 11 pp.
- LeBuff, C.R. 1969. The marine turtles of Sanibel and Captiva islands, Florida. Sanibel-Captiva Cons. Found. Spec. Publ. No. 1. 13 pp.

PREPARED BY: Frank Lund, P.O. Box 541, Jupiter, Florida 33458.



ATLANTIC LOGGERHEAD TURTLE (*CARETTA CARETTA*)
(Nesting range)

**Threatened
FLORIDA KEYS MOLE SKINK**

Eumeces egregius egregius (Baird)
Family Scincidae
Order Squamata
Suborder Sauria

OTHER NAMES: Striped Red-tailed Skink, Red-tailed Skink.

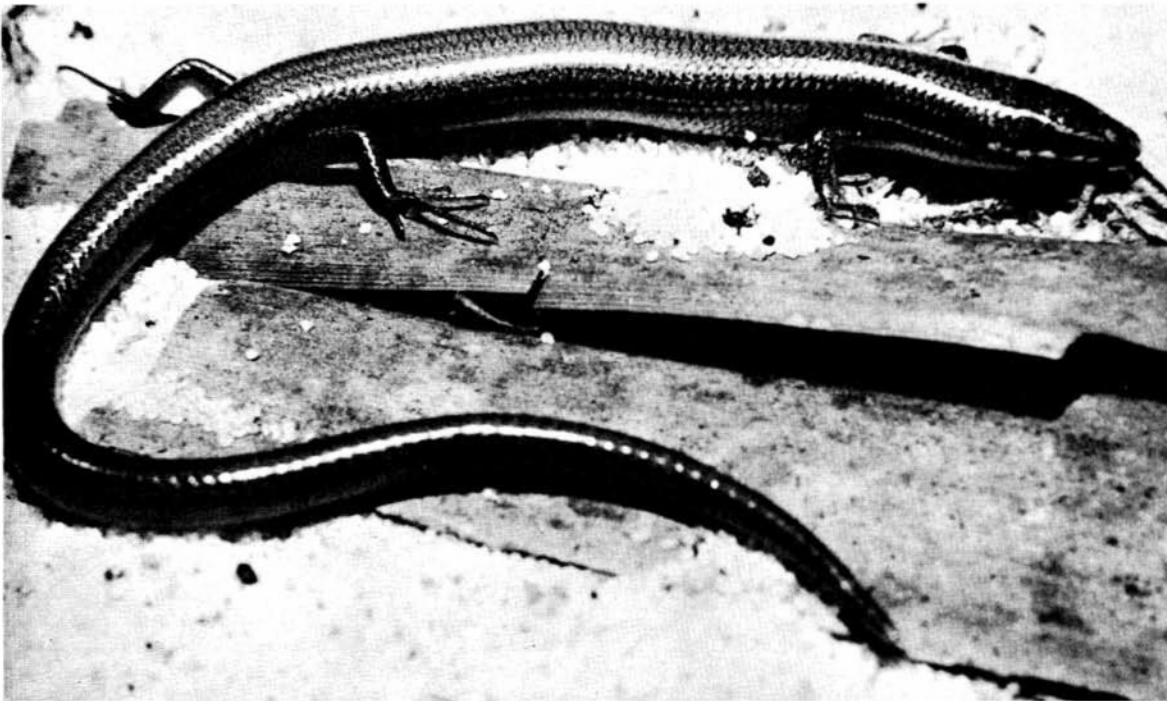


Fig. 21. *Eumeces egregius egregius* from Saddlebunch Keys, Monroe County, Florida (photograph by R.S. Simmons)

DESCRIPTION: This is a small, shiny, brownish skink with a pair of dorsolateral light lines on the body and a pinkish tail. The ground color may be some shade of gray-brown to a darker brown. The tail may be salmon, pink, or orange. The dorsolateral lines remain parallel throughout their length, and do not widen as in other subspecies of *Eumeces egregius*. The Florida Keys Mole Skink reaches a length of 12.7 cm (5 in), of which approximately two-thirds is tail.

RANGE: This lizard is found in the Dry Tortugas and the Lower Florida Keys. Individuals have been recorded from the Tortugas, Key West, Stock Island, Big Pine Key, Upper Matecumbe Key, Indian Key, and Key Largo. Those from the Upper Keys usually show characteristics intermediate between this race and the mainland form, *Eumeces egregius onocrepis*. It is not known whether this lizard still occurs at the type locality on Indian Key. Other subspecies of *Eumeces egregius* range throughout Florida and northward into southern Georgia and southeastern Alabama.

HABITAT: The Florida Keys Mole Skink is found in sandy areas, usually near the shoreline, but not always. It has been recorded from "under stones on sand in the shade" (Duellman and Schwartz, 1958). This lizard also occurs frequently under driftwood and tidal wrack along shorelines. It probably requires a fairly loose soil in which it burrows in the characteristic "sandswimming" manner.

LIFE HISTORY AND ECOLOGY: Little is known about the life history and ecology of this animal. Much

of what follows is based on a study by Mount (1963) of the related *Eumeces egregius onocrepis*, in north-central Florida. The species lays from three to seven eggs once a year under debris, usually in nest cavities constructed in the sand. Females remain with the eggs until hatching (31 to 51 days), presumably offering protection from small predators. Reproductive maturity occurs at the age of one year in the laboratory. Mating takes place in March. Mole skinks eat small invertebrates, especially spiders, roaches and crickets. Nowhere in the Keys does this lizard seem to be very abundant. Unlike other subspecies of *Eumeces egregius*, the Florida Keys race does not seem to be especially gregarious.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The species *Eumeces egregius* is almost endemic to Florida. *Eumeces egregius egregius* is another clement of the distinctive isolated fauna of the Lower Florida Keys. Its closest relative is apparently not the adjacent subspecies *onocrepis*, but rather the north Florida form, *Eumeces egregius similis*. Several other examples of this interesting "disjunction phenomenon" between the Lower Keys and North Florida are known, and currently under scientific investigation. The species *Eumeces egregius* is interesting also because of the intermediate evolutionary position it seems to occupy between the generalized cursorial skinks and the highly specialized fossorial "sand-swimmer," *Neoseps reynoldsi*.

BASIS OF STATUS CLASSIFICATION: The Lower Florida Keys are presently undergoing tremendous development and human population pressures. Continuation of these trends will result in the extirpation of much

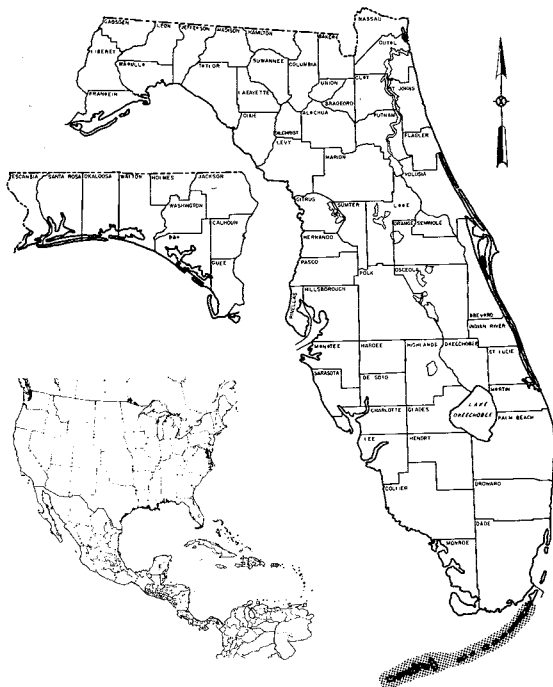
of the unique fauna of these islands, including the Keys Mole Skink.

RECOMMENDATIONS: The National Key Deer Wildlife Refuge remains a bright ray of hope on a dim horizon for the Keys. I recommend anything that can be done to add additional land to the refuge. Collecting on the refuge has not been restricted. Although I believe that in general habitat destruction, not collecting, is the main enemy of the lower vertebrates, I think amateur collecting on the Key Deer National Wildlife Refuge should be controlled.

SELECTED REFERENCES:

- Duellman, W.E. and A. Schwartz. 1958. Amphibians and reptiles of southern Florida. *Bull. Florida St. Mus.* 3(5):181-324.
- Mount, R.H. 1963. The natural history of the Red-tailed Skink, *Eumeces egregius* Baird. *Amer. Mid. Nat.* 70(20):356-385.
- Mount, R.H. 1965. Variation and systematics of the scincoid lizard, *Eumeces egregius* (Baird). *Bull. Florida St. Mus.* 9(5):183-213.
- Mount, R.H. 1968. *Eumeces egregius* (Baird). *Cat. Amer. Amphib. Rept.* 73.1-73.2.

PREPARED BY: Steven P. Christman, *National Fish and Wildlife Laboratory, 412 N.E. 16th Avenue, Gainesville, Florida 32601.*



FLORIDA KEYS MOLE SKINK (*EUMECES EGREGIUS EGREGIUS*)

**Threatened
BLUE-TAILED MOLE SKINK**

Eumeces egregius lividus Mount
Family Scincidae
Order Squamata
Suborder Sauria

OTHER NAMES: Brown Red-tailed Skink, Red-tailed Skink.

DESCRIPTION: The Blue-Tailed Mole Skink is a small, shiny brownish lizard, with a blueish tail. The unregenerated tail in juveniles and young adults is bright blue. Older adults and adults with regenerated tails sometimes display a light pinkish tail color. The legs of the mole skink are slightly reduced, and not used when the animal is progressing in sand. The ground color is some shade of light brown with a pair of dorsolateral lighter stripes which may widen or diverge posteriorly. The total length is about 12.7 cm (5 in), with the body making up as much as 5.7 cm (2.25 in).

RANGE: This lizard occurs on the Lake Wales Ridge in Polk and Highlands counties, Florida. It is known from less than a dozen localities, its total range encompassing probably less than 20,235 hectares. The Blue-Tailed Mole Skink is known to still occur at its type locality north of Avon Park in Polk County. Mole Skinks showing some characteristics of this subspecies sometimes occur in isolated populations in the Ocala National Forest, and probably represent remnants of past hybridization during the Pleistocene when *lividus* may have been more widespread. All of the localities from which *lividus* is known are above 30 m (100 ft) in elevation. Other subspecies of *Eumeces egregius* range throughout Florida and northward into southern Georgia and south-eastern Alabama.

HABITAT: This lizard is confined to the Sand Pine (*Pinus clausa*) scrub forest (rosemary scrub) where it burrows in the St. Lucie Fine Sand. It is most frequently found just under the sand at a depth of 2.5 to 5 cm under fallen logs or palmetto fronds. It is less commonly found in the "Turkey Oak community" which remains after sandhill communities have been lumbered.

LIFE HISTORY AND ECOLOGY: Nothing is known of the life history of this subspecies. However, it is probably much like that of *Eumeces egregius onocrepis*, which has been described by Mount (1963). *Onocrepis* in Levy County, Florida, lays from three to seven eggs once a year in nest cavities constructed in the sand at depths of probably less than a foot. Females remain with the eggs until hatching (31 to 51 days), presumably offering protection from small predators. Reproductive maturity occurs at the age of one year in the laboratory. Mating takes place in the winter. Mole Skinks eat small invertebrates, especially roaches, spiders and crickets. *Eumeces egregius* is apparently a gregarious species. Within seemingly suitable habitat, individuals are not dispersed throughout, but rather concentrated in localized pock-



Fig. 22. *Eumeces egregius lividus* (photograph by R.S. Simmons)

ets. Apparently they disperse very little. Population densities are sometimes as high as 25 adults per acre or even higher.

SPECIALIZED OR UNIQUE CHARACTERISTICS:

The species *Eumeces egregius* is almost endemic to Florida. The subspecies *lividus* is a distinctive element of the central Florida rosemary scrub fauna. Mount considered this lizard to be closest to the ancestral

populations that differentiated in Florida to give rise to the other four subspecies. *Eumeces egregius lividus* is today found only in the high elevation Lake Wales Ridge, where it is believed to have persisted throughout the higher sea level times of the Pleistocene up to the present. *Eumeces egregius* represents an intermediate step in the evolution of sand-adapted morphology and behavior between the generalized Five-Lined Skink (*Eumeces fasciatus*) and the highly specialized sand-swimmer, *Neoseps reynoldsi*, the Sand Skink.



BLUE-TAILED MOLE SKINK (*EUMECES EGREGIUS LIVIDUS*)

BASIS OF STATUS CLASSIFICATION: The habitat of this unusual lizard is being destroyed by real estate development and agricultural modification. Although good populations still remain, the Blue-tailed Mole Skink must be considered a threatened species until scrub sanctuaries can be set aside and protected from further development.

RECOMMENDATIONS: Some portion of the range of *E. egregius lividus* should be set aside and protected from development if we are to save this very distinctive element of the Florida scrub association. Some scrubs along U.S. Route 27 in Highland County support seemingly viable populations of this lizard, and should be considered as possible scrub sanctuaries.

SELECTED REFERENCES:

- Christman, S.P. 1970. The possible evolutionary history of two Florida skinks. *Quart. J. Florida Acad. Sci.* 33(4):291-293.
- Mount, R.H. 1963. The natural history of the Red-tailed Skink, *Eumeces egregius* (Baird). *Amer. Mid. Nat.* 70(2):365-385.
- Mount, R.H. 1965. Variation and systematics of the scincoid lizard, *Eumeces egregius* (Baird). *Bull. Florida St. Mus.* 9(5):183-213

Mount, R.H. 1968. *Eumeces egregius* (Baird). Cat. Amer. Amphib. Rept. 73.1-73.2

PREPARED BY: Steven P. Christman, *National Fish and Wildlife Laboratory, 412 N.E. 16th Avenue, Gainesville, Florida 32601.*

**Threatened
SAND SKINK**

Neoseps reynoldsi Stejneger
Family Scincidae
Order Squamata
Suborder Sauria

OTHER NAMES: Florida Sand Skink.

DESCRIPTION: The Sand Skink is a small, slender, shiny lizard with reduced legs and toes. Sand Skinks are usually some shade of gray or gray-white, or may be light tan colored. The front legs are tiny and have only one toe, while the hind legs are only slightly larger with two toes. During its characteristic "sand-swimming" locomotion, the Sand Skink's front legs are adpressed against the body into small grooves and thus hidden from sight. The total length may reach 12.7 cm (5 in), of which one-half is tail.

RANGE: The Sand Skink is distributed only in central Florida in Highlands, Polk, Lake, and Marion counties. It has been found at seventeen localities, all above 27 m (90 ft) in elevation. The type-locality is Fruitland Park in Lake County. No other species closely related to *Neoseps reynoldsi* are known.

HABITAT: The Sand Skink occurs in loosely packed sand on the high-elevation central Florida ridges. The primary habitat of *Neoseps* is rosemary scrub (Sand Pine scrub forests), where it lives just below the surface of the sand (St. Lucie Fine Sand) usually under fallen debris such as logs, Spanish Moss or palmetto fronds. In certain sandhill forests where the Longleaf Pines have been lumbered out and replaced by Turkey Oaks, *Neoseps* has invaded, and lives in the Lakeland Yellow Sand of this new artificial association, usually called the "Turkey Oak community."

LIFE HISTORY AND ECOLOGY: *Neoseps* lays two eggs in the sand, probably under fallen logs in the early summer. Hatchlings emerge in July at about 2.5 cm (1 in) in length. Sexual maturity is probably attained after one year at a snout-vent length of 5 cm (2 in). The normal life span is probably about three years. The diet consists of beetle larvae and termites. The Sand Skink seems to be fairly abundant at several of the localities in Polk and Highlands counties, but is rare at the Marion County localities, in the Ocala National Forest.



Fig. 23. *Neoseps reynoldsi* from Auburndale, Polk County, Florida (photograph by R.W. McDiarmid)

SPECIALIZED OR UNIQUE CHARACTERISTICS:

The legs of the Sand Skink are greatly reduced and practically non-functional. This lizard is highly specialized for a fossorial "sand-swimming" existence. The eyes are greatly reduced; there are no external ear openings; the snout is wedge-shaped, and the lower jaw is partially counter-sunk into the upper one. *Neoseps* is a characteristic element of the Florida Scrub Association. It has no known relatives anywhere else in the world, and is itself entirely confined to the state of Florida.

BASIS OF STATUS CLASSIFICATION:

Neoseps is restricted to the well-drained sandy soils of the Interior Florida Highlands. These areas are being converted to trailer courts and citrus groves. *Neoseps* requires loose sand. It cannot tolerate dense ground cover or heavily rooted vegetation. Agricultural practices destroy the habitat of *Neoseps*. Although the Sand Skink is still common at many localities, its status must be considered threatened.

RECOMMENDATIONS:

Neoseps is not at present protected by any legislation. Restrictions against collecting or possessing the sand skink are probably not necessary at this time. However, the scrub habitat of this Florida endemic must be preserved and protected from development. Certain scrubs along U.S. Route 27 in Highlands County currently support seemingly healthy populations of *Neoseps*. Preservation of these scrubs would probably ensure the survival of *Neoseps reynoldsi*.

SAND SKINK (*NEOSEPS REYNOLDSI*)**SELECTED REFERENCES:**

- Christman, S.P. 1970. The possible evolutionary history of two Florida skinks. *Quart. J. Florida Acad. Sci.* 33(4):291-293.
- Myers, C.W. and S.R. Telford. 1965. Food of *Neoseps*, the Florida Sand Skink. *Quart. J. Florida Acad. Sci.* 28(2):190-194.
- Telford, S.R. 1959. A study of the Sand Skink. *Neoseps reynoldsi*. *Copeia* 1959 (2):100-119.
- Telford, S.R. 1962. New locality records for the Sand Skink (*Neoseps reynoldsi*) in central Florida, with comments on the habitat. *Quart. J. Florida Acad. Sci.* 25 (1):76-77.
- Telford, S.R. 1969. *Neoseps reynoldsi* Stejneger. *Cat. Amer. Amphib. Rept.* 80.1-80.2.

PREPARED BY: Steven P. Christman, *National Fish and Wildlife Laboratory, 412 N.E. 16th Avenue, Gainesville, Florida 32601.*

Threatened
BIG PINE KEY RINGNECK SNAKE

Diadophis punctatus acricus Paulson
Family Colubridae
Order Squamata
Suborder Serpentes

OTHER NAMES: Ringnecked Snake.

DESCRIPTION: A small, black snake usually less than 30 cm (12 in) long. Dorsally the anterior half is slate gray, giving way to black on the posterior half. The characteristic neck ring is poorly developed or absent in this race. The dorsal surface of the head is grayish brown and spotted. The ventral surface is pale anteriorly and yellow to orange posteriorly. Scales are smooth and anal plate divided. Dark pigment on the upper labials is diffuse and not confined to discrete spots as in mainland ringneck snakes.

RANGE: The species consists of five subspecies found in the eastern, southeastern, and central United States. The Lower Keys' race has been reported from Big Pine Key only. It has been speculated but not documented that populations also exist on the following keys: No Name, Little Torch, Middle Torch, Ramrod, Cudjoe, Summerland, Sugarloaf.

HABITAT: Rocky pine scrub areas.

LIFE HISTORY AND ECOLOGY: Little information is available on reproduction, feeding, or microhabitat. Specimens have been found crossing roads at night and under flat rocks and boards in the Big Pine Key pine-lands.

SPECIALIZED OR UNIQUE CHARACTERISTICS:

This unusual little snake was first described in 1966. It is

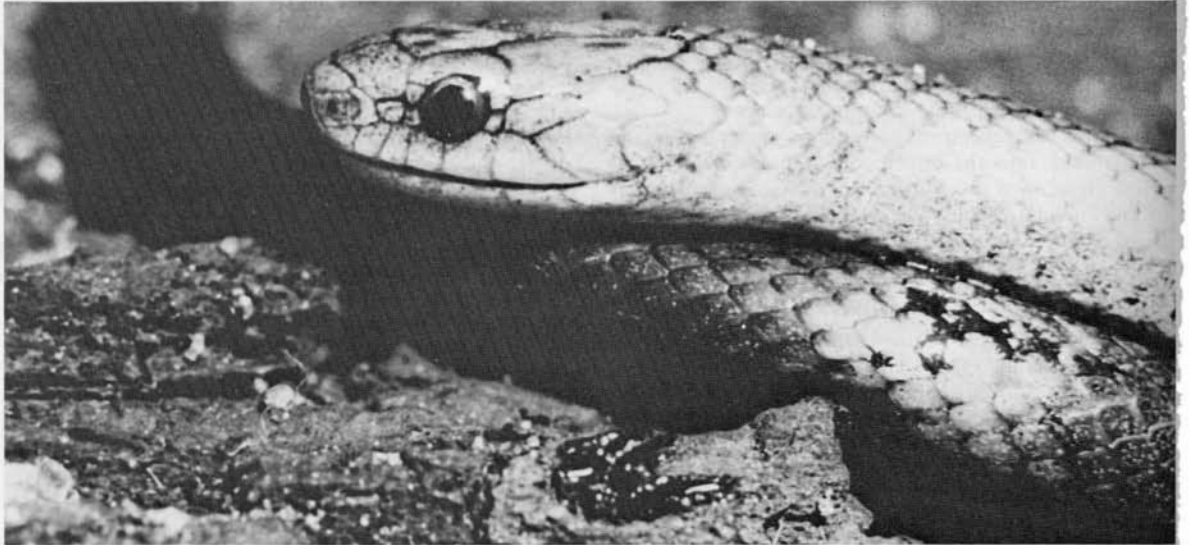


Fig. 24. *Diadophis punctatus acricus* from Big Pine Key, Monroe County, Florida (photograph by S.P. Christman)

unique among eastern *Diadophis* in lacking the neck ring, generally considered characteristic of the species.

BASIS OF STATUS CLASSIFICATION: The snake is apparently neither widespread nor common and could easily become endangered by widespread development of living, recreational and commercial areas.

RECOMMENDATIONS: Urgent need for field work to establish life history parameters.

SELECTED REFERENCES:

- Carr, A.F. 1940. A contribution to the herpetology of Florida. Univ. Florida Publ. Biol. Sci. Ser. 3(1): 78-79.
- Duellman, W.E. and A. Schwartz. 1958. Amphibians and reptiles of southern Florida. Bull. Florida State Mus. 3(5):292-293.
- Paulson, D.R. 1966. Variation in some snakes from the Florida Keys. Quart. J. Florida Acad. Sci. 29(4):295-308.

PREPARED BY: W.G. Weaver, Department of Biology, Miami-Dade Community College, Miami, Florida 33167, and Steven P. Christman, National Fish and Wildlife Laboratory, 412 N.E. 16th Avenue, Gainesville, Florida 32611.



BIG PINE KEY RINGNECK SNAKE (*DIADOPHIS PUNCTATUS ACRICUS*)

**Threatened
RED RAT SNAKE**

Elaphe guttata guttata (Linnaeus)
(Lower Keys Populations)
Family Colubridae
Order Squamata
Suborder Serpentes

OTHER NAMES: Corn Snake, Pink Rat Snake, Rosy Rat Snake.

DESCRIPTION: These medium-sized snakes can grow to nearly 1.2 m (4 ft) in length but are more commonly seen as juveniles or individuals about 0.9 m (3 ft) long. The back is marked by a series of poorly defined pink blotches bordered by slightly darker pigment. The pale red or pinkish ground color is similar in hue to the blotches. The belly is yellow to orange and is only faintly

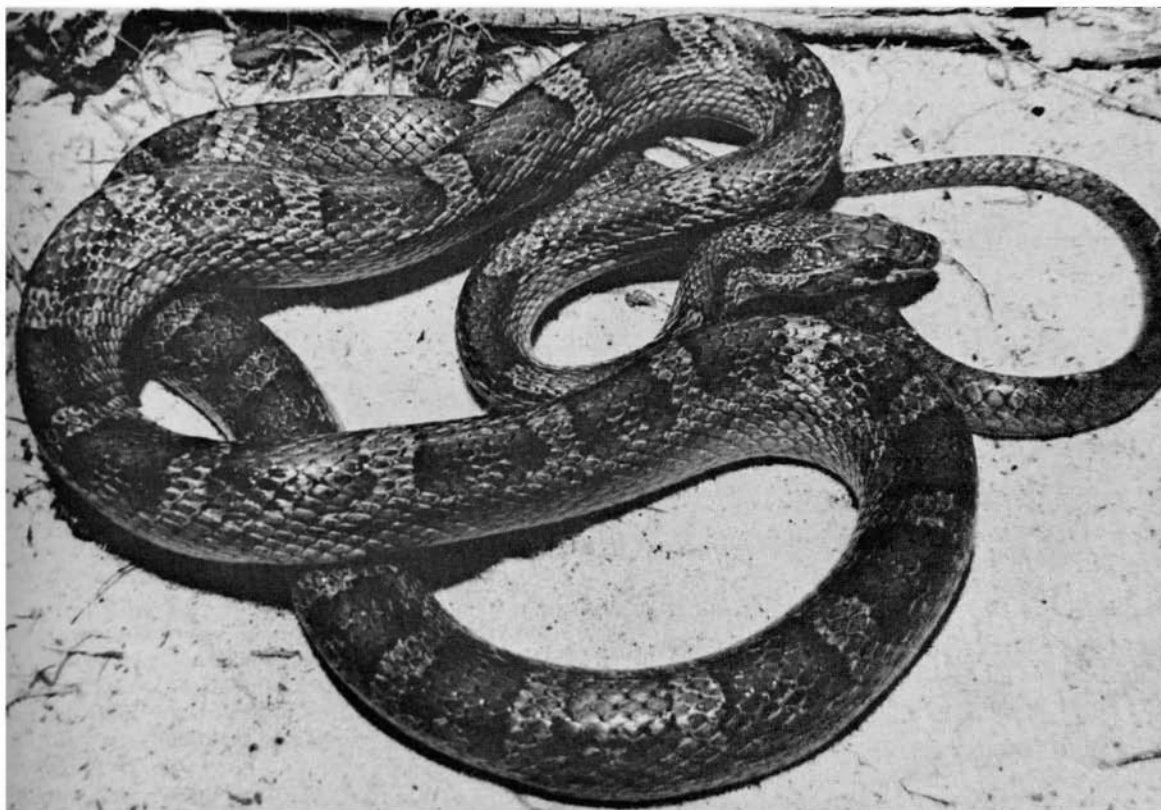


Fig. 25. *Elaphe guttata guttata* from Marathon Key, Monroe County, Florida (photograph by R.S. Simmons)

marked by the black, checkerboard pattern characteristic of peninsular populations.

The lateral edges of the first blotch extend forward to the head where they unite behind the eyes. Juveniles are strongly blotched and have a dark stripe from eye to neck on each side. Scales are keeled and anal plate divided.

RANGE: The species is fairly common in the southeastern and Atlantic coastal states. It occurs throughout Florida where it undergoes a decided color change in the Lower Keys. The pale insular populations were once given subspecific status, but subsequent work showed the color pattern of these populations to exist within color variations of *Elaphe guttata guttata*. Specimens have been collected from the following keys: Bahia Honda, Big Pine, Key Vaca, Key West, Indian, Little Pine, Stock Island, Sugarloaf. They also have been reported from the Marquesas Keys.

HABITAT: Lower Keys populations live in pine woods and in edificarian situations.

LIFE HISTORY AND ECOLOGY: These chiefly nocturnal snakes hide under rocks and logs and will burrow into loose sand. They are also found in conjunction with Australian Pine, wooden planking and under wooden bridges. The snake is often found under the bark of

Jamaica-dogwood trees. Carr (1940) reported declining populations long before the recent keys development. However, at present, populations appear to be stable and locally abundant (Schwartz, personal communication). The snake is an accomplished climber and subsists on rodents, birds and lizards.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The edificarian habit of this species suggests that it is highly adaptable to change.

BASIS OF STATUS CLASSIFICATION: The paucity of field work makes estimates of population size questionable. These snakes are threatened to the extent that most vertebrate populations of the Lower Keys are threatened by development.

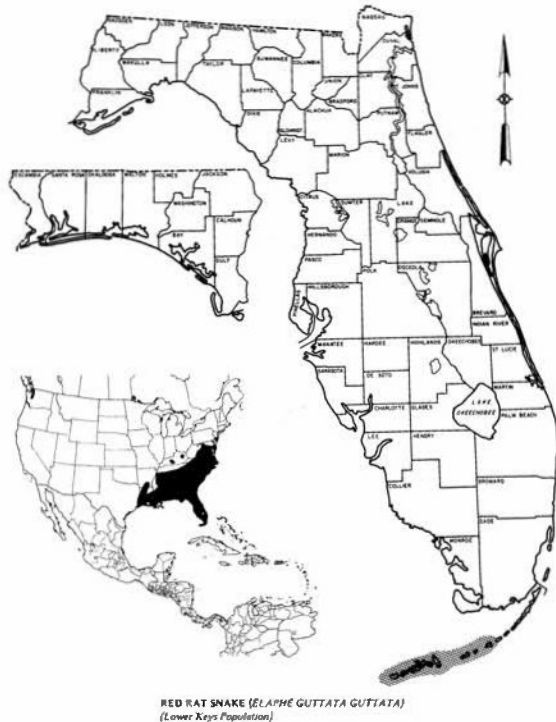
RECOMMENDATIONS: Increased field work to gain accurate data about the life history of Lower Keys populations.

SELECTED REFERENCES:

- Carr, A.F. 1940. A contribution to the herpetology of Florida. Univ. Florida Publ. Biol. Sci. Ser. 3(1):83.
 Duellman, W.E. and A. Schwartz. 1958. Amphibians and reptiles of southern Florida. Bull. Florida St. Mus. 3(5):298-300.

Mitchell, J.C. 1977. Geographic variation of *Elaphe guttata* (Reptilia: Serpentes) in the Atlantic Coastal Plain. *Copeia* 1977 (1):33-41.

PREPARED BY: W.G. Weaver, Department of Biology, Miami-Dade Community College, Miami, Florida 33167.



RED RAT SNAKE (*ELAPHE GUTTATA GUTTATA*)
(Lower Keys Population)

Threatened FLORIDA BROWN SNAKE

Storeria dekayi victa Hay
(Lower Keys Populations)
Family Colubridae
Order Squamata
Suborder Serpentes

OTHER NAMES: Dekay's Snake

DESCRIPTION: A spotted, brown snake usually less than 30 cm (12 in) long. The dorsal ground color may be various shades of brown. A faint nuchal band is present. The belly is pale, usually with a spot on the lateral edges of each ventral scale. The anal plate is divided and scales strongly keeled. The Brown Snakes from the Lower Keys are quite different from those from mainland Florida in several respects. Lower Keys Brown Snakes usually have two preocular scales instead of one. They have less ventral pigment than peninsular Brown Snakes and generally a reduced head pattern.

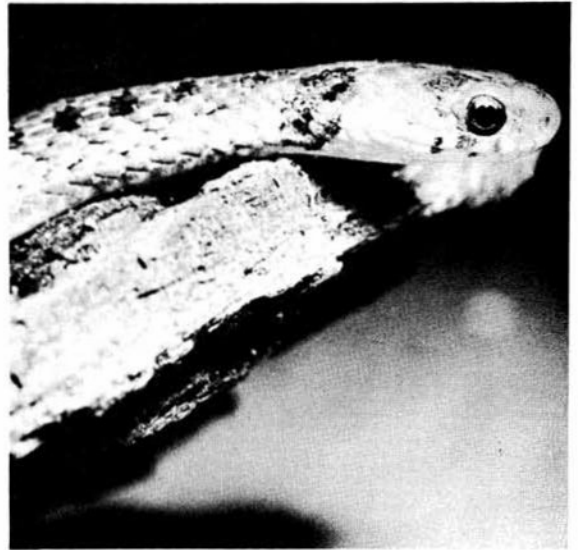


Fig. 26. *Storeria dekayi victa* from Big Pine Key, Monroe County, Florida (photograph by S.P. Christman)

RANGE: The species lives throughout the eastern United States. The Florida Brown Snake, *Storeria dekayi victa*, occurs from southeastern Georgia south into Florida. Specimens are known from the following Lower Keys: Big Pine, No Name, Sugarloaf.

HABITAT: On the Lower Keys, Brown Snakes occur in rocky pine forests and near aquatic situations, usually under rocks.

LIFE HISTORY AND ECOLOGY: Practically nothing is known about the Lower Keys populations. They are smaller than the mainland forms, and decidedly less aquatic than peninsular *S. dekayi victa*. Although Florida Brown Snakes are often associated with aquatic vegetation, those from the Lower Keys appear to be entirely terrestrial.

SPECIALIZED OR UNIQUE CHARACTERISTICS: In many respects, the Brown Snakes from the Lower Keys are more like those from north Florida than those from the nearby mainland and Everglades regions. This appears to be a relatively common phenomenon, and one which needs more investigation.

BASIS OF STATUS CLASSIFICATION: Massive commercial development in the Lower Keys may result in extinction of this race in that area.

RECOMMENDATION: Preservation of selected habitat areas, and more study.

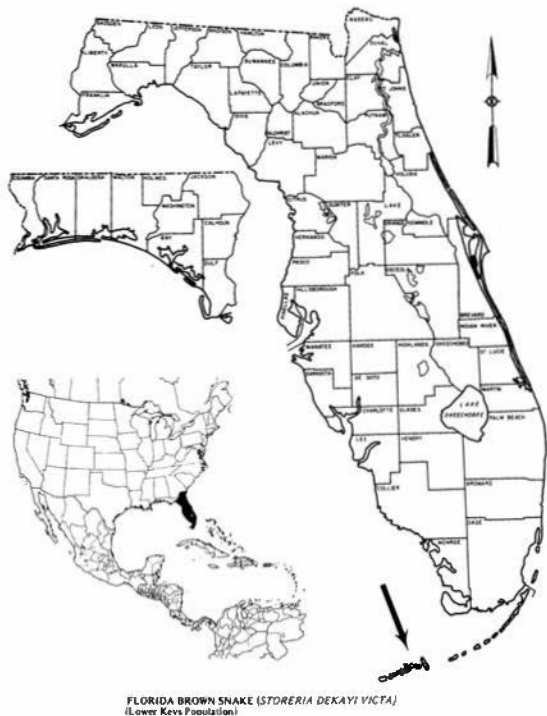
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PREPARED BY: W.G. Weaver, Department of Biology, Miami-Dade Community College, Miami, Florida 33167 and Steven P. Christman, National Fish and Wildlife Laboratory, 412 N.E. 16th Avenue, Gainesville, Florida 32601.



**Threatened
MIAMI BLACK-HEADED SNAKE**

Tantilla oolitica Telford
Family Colubridae
Order Squamata
Suborder Serpentes

OTHER NAMES: Miami Crowned Snake.

DESCRIPTION: The Miami Black-headed Snake is a light brown or tan snake with the head and nape of the neck black. Scales are smooth. Maximum length about 25 cm (10 in). This snake cannot be confused with any other in the Miami-Key Largo area. Detailed scale and anatomical differences separate it from the Peninsular



Fig. 27. *Tantilla oolitica* habitat in tropical hammocks on north Key Largo, Monroe County, Florida (photograph by H.W. Campbell)

Crowned Snake; it has more ventral scales and fewer subcaudals, on the average, and has two enlarged basal hooks on the hemipenes instead of one.

RANGE: Dade and Monroe counties, Florida only, on the Eastern Rock Rim of Miami oolite and on Key Largo. Type locality: vacant lot at S.W. 27th Ave., near S.W. 24th St., Miami, Dade Co., Florida.

HABITAT: Poorly known, but apparently eurytopic. Specimens have been taken in sandy soils in Slash Pine flatwoods, tropical hammock, and vacant lots and pastures with shrubby growth and scattered Slash Pine.

LIFE HISTORY AND ECOLOGY: Little is known about the life history of this species. It is secretive and a burrower, usually found beneath trash, rocks, and in rotten logs.

SPECIALIZED OR UNIQUE CHARACTERISTICS: *Tantilla oolitica* is endemic to a small area in southeastern Florida but appears morphologically most similar to *Tantilla coronata* of extreme northern Florida and the southeastern United States. It is separated from this species by intervening populations of a related but less similar species, *T. relicta*. A similar pattern of distribution and relationships is found in only a few other species and is of considerable biosystematic and zoogeographic interest. Its ecological role in the communities it inhabits is unknown but not necessarily insignificant.

BASIS OF STATUS CLASSIFICATION: *Tantilla oolitica* is threatened by rapid loss of habitat throughout its circumscribed range. Its ability to maintain populations in edification situations is to its advantage, but the rapid habitat modifications underway throughout its

range can be expected to eliminate even marginally suitable habitat in the foreseeable future.

RECOMMENDATIONS: As nothing is known of the limiting factors for this species, it is difficult to make specific suggestions for its survival beyond the preservation of tracts of suitable habitat. It should be noted, however, that the species does appear to tolerate rather severely modified habitat conditions. Thus, the incorporation of environmental considerations into open space design, public parks and green belts along highways and throughout low-density residential developments, for example, might contribute significantly to its survival. Minimum design criteria should include retaining a maximum of the native plant and animal (especially invertebrate) species in these areas by reducing the area planted in lawn and ornamentals as far as is consistent with primary use of the area. Development and subsequent use of the areas should be done to minimize alteration of substrate characteristics by compaction and alteration of the water table. If a reasonably natural complex of plants and invertebrates could be retained over a significant portion of this species' range, it may be able to survive in the face of the urbanization of southeastern Florida.

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MIAMI BLACK-HEADED SNAKE (*TANTILLA OOLITICA*)

PREPARED BY: Howard W. Campbell, *Office of Endangered Species and International Affairs, Fish and Wildlife Service, U.S. Dept. of Interior, Washington, D.C. (Present address: National Fish and Wildlife Laboratory, 412 N.E. 16th Avenue, Gainesville, FL 32601.)*

**Threatened
FLORIDA RIBBON SNAKE**

Thamnophis sauritus sackeni (Kennicott)
(Lower Keys Populations)
Family Colubridae
Order Squamata
Suborder Serpentes

OTHER NAMES: Ribbon Snake, Southern Ribbon Snake.

DESCRIPTION: A small, slender snake with a pair of lateral, longitudinal stripes. Most individuals have well-developed yellow or orange vertebral stripes bordered by two narrow black stripes. The ventral surface is pale yellow. Scales are keeled and the anal plate single. The tail is proportionately longer than in mainland ribbon snakes. Although *Thamnophis sauritus sackeni* is usually characterized by having eight supralabials, most specimens from the Lower Keys have only seven.

RANGE: The Florida Ribbon Snake is common in most of Florida. The distinctive Lower Keys population is known only from Big Pine, Cudjoe Key and No Name Key.

HABITAT: Generally found at the edges of almost any freshwater body. In the Lower Keys, however, the Florida Ribbon Snake inhabits mangrove and spartina habitats as well as freshwater situations.

LIFE HISTORY AND ECOLOGY: The Ribbon Snake is amphibious and a good climber. The Florida Ribbon Snake is known to eat frogs and fish. On the Lower Keys, Ribbon Snakes also eat lizards. Young are born alive in the early summer.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The Lower Keys Ribbon Snake is very poorly known. Its biogeographic affinities, like several other Lower Key plants and animals, probably lie with more northern populations rather than with populations from southern Florida.

BASIS OF STATUS CLASSIFICATION: Until exploitation and development of the Lower Keys is under better control, most of the unique fauna must be considered threatened. Although the Key Deer National Wildlife Refuge still remains a sanctuary for Lower Key plants and animals, the remainder of the Islands is essentially an "extinction-trap" for much of their flora and fauna.

RECOMMENDATIONS: Preservation of permanent freshwater bodies on the keys may be necessary for the continued existence of these populations in that area. More study is needed to determine the requirements of these interesting Ribbon Snakes.

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PREPARED BY: W.G. Weaver, Department of Biology, Miami-Dade Community College, Miami, Florida 33167, and Steven P. Christman, National Fish and Wildlife Laboratory, 412 N.E. 16th Avenue, Gainesville, Florida 32611.



FLORIDA RIBBON SNAKE (*THAMNOPHIS SAURITUS SACKENI*)
(Lower Keys Population)

**Rare
SPOTTED TURTLE**

Clemmys guttata (Schneider)
 Family Emydidae
 Order Testudinata

OTHER NAMES: None.

DESCRIPTION: The Spotted Turtle is a small, dark brown to black turtle which apparently never exceeds 12.7 cm (5 in) in total shell length. The carapace is typically smooth, oval in outline, and more or less covered with a scattering of small, round, white or yellow spots which may be lost in old adults. The plastron is unhinged, and is yellow or orange in color with large black blotches on the outer portions. The skin is black with a scattering of yellow spots and a large yellow blotch in the tympanic region. The chin is white to orange in color. Males have brown eyes, and a long tail with the anal opening near the tip. Females have yellow or orange eyes, and a short tail with the anal opening under the rear margin of the shell. Spotted Turtles can be distinguished from other local turtles by their combination of an unhinged plastron and a spotted, unserrated carapace.

RANGE: The Spotted Turtle is restricted to eastern North America from southern Ontario and the north-eastern U.S., along the Atlantic Coastal Plain, to central Florida. In Florida the Spotted Turtle is known from as far south as Lake Weir in Marion County, and as far west as the St. Marks National Wildlife Refuge in Wakulla County, and from seven other localities in northern and central Florida.

HABITAT: This turtle is an inhabitant of shallow woodland ponds and meandering sloughs in fresh or brackish water where they prefer a soft bottom and abundant aquatic vegetation. They are relatively terrestrial and are often seen moving over land.

LIFE HISTORY AND ECOLOGY: Very little is known of the life history of the Spotted Turtle in Florida. Elsewhere in the range they are opportunistic feeders, eating both plant and animal food. Home ranges are about 0.5 ha (1.3 a). They bask readily.

Mating occurs in early spring and may involve many copulating pairs in a small area. Three or four elliptical eggs are laid in early summer in a flask-shaped nest dug by the female in well-drained loamy soil. Hatchlings emerge in late summer and are just over 2.5 cm in length.

Spotted Turtles are typically quite secretive and are not easily approached. Extensive overland migration often occurs in spring, and it is during this period that most Florida specimens are collected.

SPECIALIZED OR UNIQUE CHARACTERISTICS: Spotted Turtles were once highly prized by the pet trade, but reduction in their numbers due to over-collecting and habitat alteration in the northeastern U.S. has resulted in a decline in their popularity.

BASIS OF STATUS CLASSIFICATION: As a result of the virtual lack of systematic herpetological collections in northern and western Florida, it was not until quite recently that herpetologists became aware of the presence of established populations of Spotted Turtles in Florida. It is, therefore, impossible to know what decline in numbers has already been suffered as a result of the

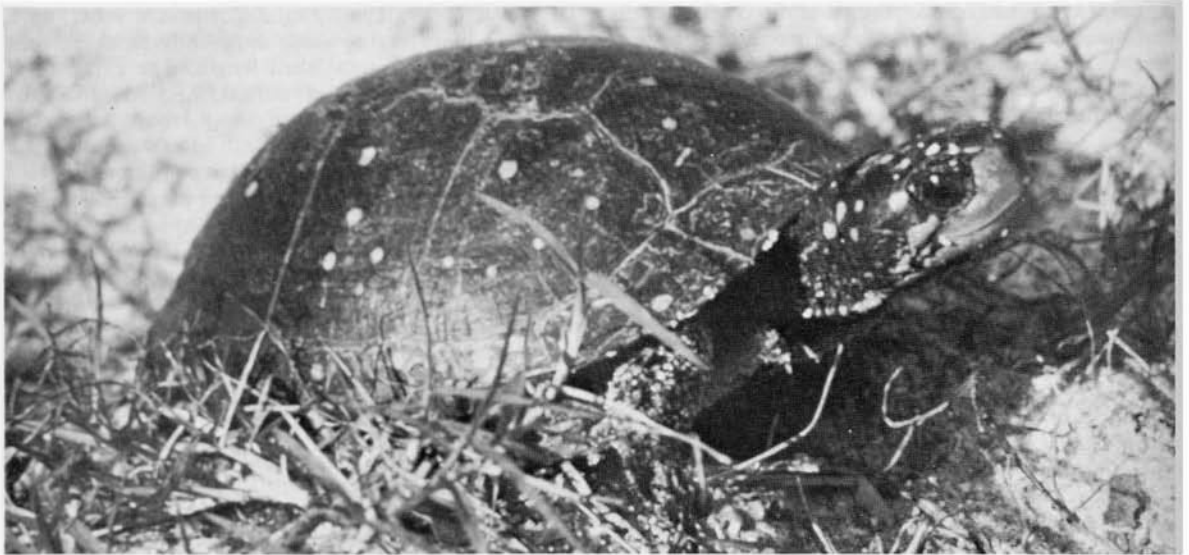


Fig. 28. *Clemmys guttata* (photograph by P.C.H. Pritchard)

destruction of wetland habitats. The most stable populations are apparently located in the Steinhatchee Wildlife Management Area and in the St. Marks National Wildlife Refuge where habitat destruction has been minimal.

Spotted Turtle colonies in Florida represent relict populations of an essentially northern species which are restricted to those wetland refugia where proper ecological conditions allow their existence.

RECOMMENDATIONS: Before specific actions can begin to protect the Spotted Turtle from extirpation in the state, it will be necessary to initiate scientific investigations to study the exact range and status of the turtle in Florida. In the meantime, collection of Spotted Turtles without proper permits should be made illegal.

Since alteration of wetland habitats is the most direct threat to the species, it is imperative that undeveloped areas of suitable habitat be purchased and maintained. It is particularly urgent that those areas of the Gulf Coast northwest of Cedar Key where the greatest concentration of suitable habitat exists be protected from development.

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SPOTTED TURTLE (*CLEMmys GUTTATA*)

of amphibians and reptiles in the southeastern United States. Publ. Res. Div. Ross Allen's Rept. Inst. 1(7):75-96.

Chattahoochee and the Flint Rivers in Georgia. Several small streams that enter these rivers also contain map turtles.

PREPARED BY: James F. Berry, Department of Biology, University of Utah, Salt Lake City, Utah 84112.

HABITAT: Rivers are the preferred habitat of this turtle. They occasionally will be found in river swamps and are known from the Dead Lakes, a man-made lake at the south end of the Chipola River. Areas of the river that contain considerable amounts of exposed limestone are preferred.

Rare
BARBOUR'S MAP TURTLE

Graptemys barbouri Carr & Marchand
Family Emydidae
Order Testudinata

OTHER NAMES: Barbour's Sawback Turtle.

DESCRIPTION: There is a considerable size difference between male and female Barbour's Map Turtles. The male is the smaller of the sexes rarely exceeding 12.7 cm (5 in). The female is commonly 20 to 28 cm (8 to 11 in) long and may occasionally exceed 30 cm (12 in) in length. The olive-green carapace has light yellow markings which form a U-shape on each of the lateral scutes. These markings fade with age and the older turtles may be considerably darker than the young. The head has an olive-green background with a large yellow blotch behind the eyes and an extensive pattern of yellow lines. The head of the female is massive containing large crushing jaws while the head of the male is much smaller. Young map turtles have a very prominent dorsal keel, thus giving rise to the name sawback.

RANGE: Described in 1941 from the Chipola River in Jackson County the range of the species is confined to the Apalachicola drainage system. This includes the Chipola and Apalachicola Rivers in Florida and the

LIFE HISTORY AND ECOLOGY: The feeding habits of Barbour's Map Turtles differ according to the sex and the size of the turtle. The diet of males and small females consists mainly of caddisfly larva. Other aquatic insects, small snails and occasionally plants are included in their diet. The large females feed almost exclusively on snails and the bivalve *Corbicula* which they crush with their massive jaws.

The usual clutch size varies from 4 to 11 white oval eggs with several clutches being laid in a season. The males become sexually mature in three to four years while the females take approximately twenty years to reach sexual maturity.

These turtles are often found clumped together in areas containing exposed limestone. The home range of adult turtles remains constant year after year. Dispersal over land, common in many aquatic turtles, is unknown. Hatchlings show limited dispersal during their first year. Dispersal is more pronounced during periods of extreme high water.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The degree of sexual dimorphism found in the Barbour's Map Turtle is more pronounced than found in other species of turtles. As a result of this dimorphism an array of differences in behavior and ecology exist between the sexes.

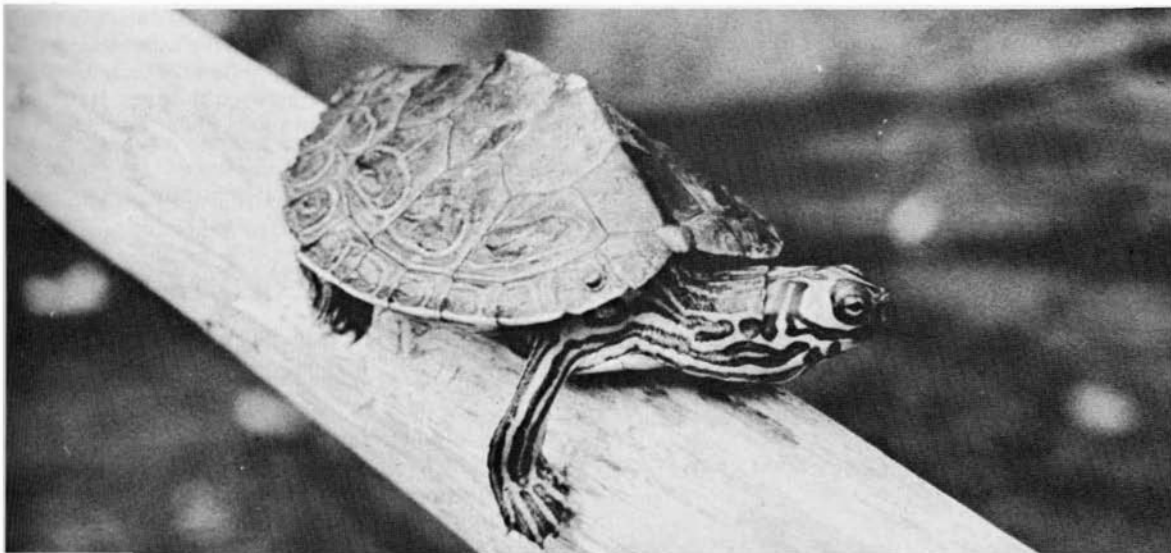


Fig. 29. *Graptemys barbouri* (photograph by R.A. Sanderson)

BASIS OF STATUS CLASSIFICATION: The restricted geographic range of this species to one drainage system makes this species vulnerable. There is considerable collecting of large females for food which, if it continues at the current rate, could be very detrimental to the population.

RECOMMENDATIONS: Under current state law the export of this species over the state line or its sale is prohibited. Further protection that would prohibit collecting except for valid scientific research is needed. Education of the people in the Chipola and Apalachicola River area is needed in order to prevent the use of this turtle for food. The use of bush hooks should be prohibited from the rivers that this species inhabits since several turtles have been found snagged on these hooks.

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PREPARED BY: Roger A. Sanderson, *Department of Biology, University of South Florida, Tampa, Florida 33620.*

Rare
ALABAMA MAP TURTLE

Graptemys pulchra Baur
Family Emydidae
Order Testudinata

OTHER NAMES: None.

DESCRIPTION: (The following description applies specifically to Florida populations.)

Shell triangular in cross section. Highest point of shell slightly more than one-third the upper shell length from the front edge. Rear edge of upper shell saw-toothed. Females to 28 cm (11 in), with large skulls and broad jaws. Males to 12.7 cm (5 in), with small heads, longer tails, and without long front toenails. Upper shell greenish with faint yellowish reticulations and bordered by short yellow vertical bands. Ridge of upper shell with longitudinal black stripe or blotches over projecting tips of scutes. Lower shell immaculate and yellowish-white in adults; rear edge of scutes bordered with black in young individuals. Neck, legs, and tail black with broad yellow or orange stripes. A broad yellow or orange blotch behind each eye and one between the eyes. Hatchlings more brightly colored than adults, about 4.4 cm (1.75 in) in length.

RANGE: The species is found from northern Mississippi and Alabama to southeastern Louisiana and northwestern Florida. In Florida it is confined to the Escambia River and Yellow River drainages.

HABITAT: The species is most abundant in the Escambia River, where nesting areas and food species are most available. Although frequently found in small streams, it is most abundant in large rivers. It is absent where fresh water snails and clams are not found, as in the Perdido River and Blackwater River. Apparently tolerant to organic pollution, the species maintains stable populations in areas contaminated by sewage. Salt water is avoided to the extent that individuals are rarely found within a mile upstream of a river mouth.



BARBOUR'S MAP TURTLE (*GRAPTEMYS BARBOURI*)



Fig. 30. *Graptemys pulchra* (photograph by R.M. Shealy)

LIFE HISTORY AND ECOLOGY: Young individuals and males feed primarily on insects. Adult females feed almost exclusively on small fresh water clams and snails.

Individuals normally remain within several hundred yards of a favorite basking site. They can return to the home range after being displaced 15 miles upstream or downstream.

Sexual maturity is reached in about 14 years in females and in about 3 years in males. Maximum size is reached in females in about 23 years, and natural longevity probably exceeds 50 years. Predators, particularly raccoons and crows, destroy over 90% of the natural nests. Once hatched, minor mortality occurs among young individuals. Most adult deaths are caused by man and possibly the Alligator Snapping Turtle.

Nesting occurs from May through July on sandy beaches adjoining home streams. Six to 13 elliptical, flexible-shelled eggs are deposited in flask-shaped nests above 12.7 cm (5 in) in depth. Most females produce several nests per season.

SPECIALIZED CHARACTERISTICS: Females, with their broad jaws, are well adapted for feeding on thick-shelled clams. The introduction of the imported Oriental Mussel to the Escambia River has probably resulted in local population expansion in this turtle.

BASIS OF STATUS CLASSIFICATION: Although relatively abundant in restricted areas, the species is confined in Florida to only two rivers. Any substantial modification of these drainages, such as stream channelization or heavy metal pollution, could reduce populations radically. The common practice of shooting basking turtles, if increased, may reduce numbers in some areas.

RECOMMENDATIONS: The quality of natural waters should be maintained and, in many areas, improved. A survey of population densities should be made to determine any future population changes in this species.

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PREPARED BY: Robert M. Shealy, *Biology Department, Pensacola Junior College, Pensacola, Florida 32504.*



ALABAMA MAP TURTLE (*GRAPTEMYS PULCHRA*)

Rare MANGROVE TERRAPIN

Malaclemys terrapin rhizophorarum Fowler
Family Emydidae
Order Testudinata

OTHER NAMES: Diamondback Terrapin, Keys Terrapin.

DESCRIPTION: The Mangrove Terrapin is a medium-sized (up to 20 cm [8 in] carapace length) salt water turtle

with webbed toes. The head may be drawn into the shell and when so retracted the neck is bent vertically. Concentric grooves and ridges of light and dark markings on each of the large scutes of the carapace are characteristic of the species. The Mangrove Terrapin may be distinguished from other subspecies of Diamondback Terrapins by its terminally expanded dorsal keels, the lack of yellow centers in the dorsal laminae, the presence of black borders along the submarginal and plastral seams and head spots fused to form blotches.

RANGE: The range of *Malaclemys terrapin rhizophororum* is the Florida Keys westward to at least the Marquesas Keys. It is believed to intergrade with *M. t. tequesta* in Biscayne Bay and with *M. t. macrospilota* in Florida Bay.

HABITAT: The Mangrove Terrapin is intimately associated with the mangrove swamps and mangrove-bordered waters of the Florida Keys. It is occasionally found inland in spring tide and hurricane pools isolated from permanent water.

LIFE HISTORY AND ECOLOGY: Nothing is known concerning the habits of the Mangrove Terrapin, but its ecology and life history are probably similar to other southern subspecies. Copulation takes place in the water in early spring. An individual female may lay from one to five times during a season, the first clutch being deposited in April or May. Eggs usually number five to twelve and are buried in nests excavated to a depth of 12.7 to 15.2 cm (5-6 in) by the hind feet of the female. Beaches and sand dunes are the preferred nesting sites and the incubation period lasts about ten to twelve weeks. Sexual maturity is reached in four or five years and the upper age limit is probably over forty years. Sexual dimorphism is marked, with females averaging one-third larger than males.

The natural food consists of crustaceans and molluscs, which are easily crushed with the heavy-muscled, broad jaws. Other subspecies are known to feed mainly at high tide, at which time they cruise the flooded regions picking up snails from grass stems, foraging along the bottom for small crabs and other invertebrates and probably engage in a certain amount of scavenging. They have been seen to feed on the tender shoots and rootlets of marsh plants, but the true importance of plant food in the diet is unknown.

The Mangrove Terrapin has many potential predators. Many nests are probably dug out by raccoons, which suck the eggs and leave the shells behind. Fish Crows are known to follow females and steal the eggs as they are being laid. In Everglades National Park, Bald Eagles prey upon adults and Red-shouldered Hawks feed the hatchling terrapins to their young. The Diamondback Terrapin was the gourmet's delight, and pound for pound the most expensive turtle in the world. The extent of predation by man in the Florida Keys is unknown.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The Mangrove Terrapin, *Malaclemys terrapin rhizophororum*,

is unique in that it is restricted to the Florida Keys. The adaptations of this race to the subtropical mangrove environment make it of special interest to ecologists and biogeographers alike.

BASIS OF STATUS CLASSIFICATION: The Mangrove Terrapin appears to be rare and possibly threatened in the Florida Keys. Despite intensive searching by several prominent herpetologists since the original description in 1906, less than a dozen specimens are recorded in the literature. Attempts by the author to secure specimens from the Aquarium, the pet shop and fishermen on Key West proved futile. All agreed the animal is rare on the Keys. The Mangrove Terrapin is more common in Florida Bay (William B. Robertson, pers. comm.) and is perhaps better suited to the estuarine environment this area provides.

RECOMMENDATIONS: The protection of the mangrove ecosystem offers the best hope for the Mangrove Terrapin's continued survival. It is recommended that measures be taken to limit human exploitation of the terrapin on the Florida Keys. Further research into the status and ecological requirements of this turtle are badly needed.

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MANGROVE TERRAPIN (*MALACLEMYS TERRAPIN RHIZOPHORURUM*)

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PREPARED BY: J. Steve Godley, Department of Biology, University of South Florida, Tampa, Florida 33620.

Rare
GULF COAST SMOOTH SOFTSHELL

Trionyx muticus calvatus Webb
Family Trionychidae
Order Testudinata

OTHER NAMES: Chicken.

DESCRIPTION: A rather small turtle, usually less than 23 cm (9 in) in carapace length (record for the subspecies is 28.7 cm [11.3 in] female from Dallas County, Alabama), with the typical characteristics of the soft-shelled family (broad, very flat, soft, scuteless carapace, only three claws on each foot, and clongate tubular snout). The species *muticus* is distinguished from the sympatric *Trionyx spinifer* by the absence of ridges on the nasal septum and by the absence of spines or tubercles on the anterior part of the carapace. The subspecies *calvatus* is distinguished by the juvenal pattern of large, often ocellate, circular spots; the absence of stripes on the dorsal surface of the snout; the pattern of fine, poorly contrasting markings on the dorsal surfaces of the limbs; and the presence of thick black borders around the pale postocular stripes.

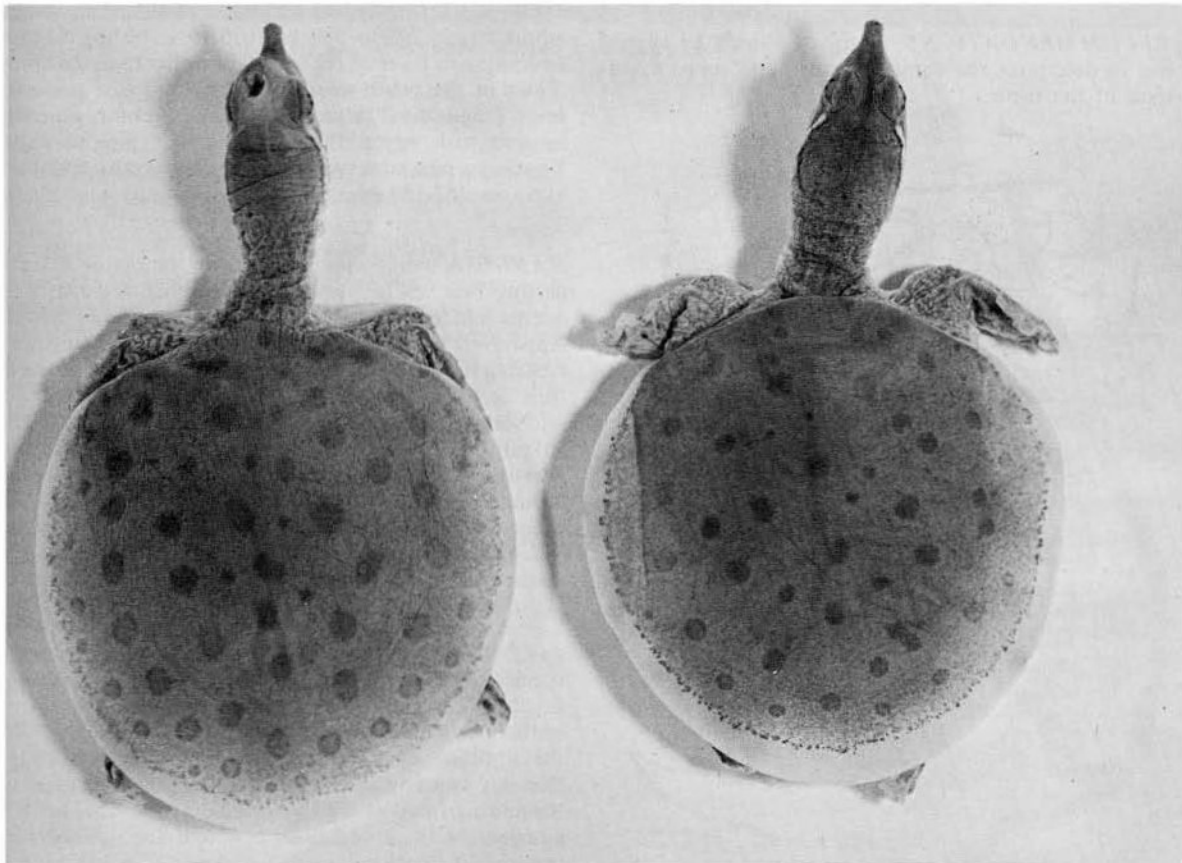


Fig. 31. *Trionyx muticus calvatus* (photograph by Isabelle Hunt Conant)

RANGE: *Trionyx muticus* is widely distributed in the Mississippi Valley. The subspecies *calvatus*, however, is only known from the Pearl River and Tombigee River in Mississippi; Washington and East Baton Rouge parishes in Louisiana; from the Alabama River in Dallas, Elmore and Macon counties and the Conecuh River in Escambia County in Alabama; and from the vicinity of Century on the Escambia River in Escambia County, Florida. It is possible that *calvatus* has a more extensive range in the Florida Panhandle than this.

HABITAT: It is highly aquatic and typically found in rivers and streams but may also be expected in lakes and impoundments.

LIFE HISTORY AND ECOLOGY: No detailed studies on this subspecies have been reported. Fresh nests have been found in sandboxes on the Escambia River on June 1st.

BASIS OF STATUS CLASSIFICATION: The classification is not based upon a thorough study of the status of this subspecies in Florida, but rather upon the peripheral nature of the range of the form in the State. More data are needed to evaluate the status of the subspecies properly.

RECOMMENDATIONS: A survey should be carried out to determine the complete range and survival outlook of the turtle.



GULF COAST SMOOTH SOFTSHELL (*TRIONYX MUTICUS CALVATUS*)

SELECTED REFERENCES:

- Mount, R.H. 1975. The reptiles and amphibians of Alabama. Auburn Univ. Agric. Experiment Station, 347 pp.
- Webb, R.G. 1962. North American recent soft-shelled turtles (Family Trionychidae). Univ. Kansas Publ. Mus. Nat. Hist. 13(10):429-611.

PREPARED BY: Peter C.H. Pritchard, Florida Audubon Society, P.O. Drawer 7, Maitland, Florida 32751.

Rare ATLANTIC LEATHERBACK

Dermochelys coriacea Linnaeus
Family Dermochelyidae
Order Testudinata

OTHER NAMES: Trunkback Turtle, Leathery Turtle.

DESCRIPTION: This is the largest of all marine turtles; adults weigh 295 to 590 kg (650 to 1,300 lb). Shell is covered with layer of rubbery skin rather than the horny scutes of the other marine turtles. Carapace possesses seven longitudinal ridges and is black in color, generally spotted with white. Plastron is mainly pinkish-white. Upper jaw possesses two toothlike projections. Carapace averages 152-157 cm (60-62 in) in length.

RANGE: A world-wide species with the major Atlantic nesting beaches in Surinam and French Guiana. Frequents colder waters as far north as Nova Scotia. Apparently a wide-ranging species with one tag recovery crossing the Atlantic, and others from French Guiana to New Jersey and the Gulf of Mexico.

Nesting in Florida is rare and typically occurs on the Atlantic coast. Most records are from Palm Beach and Martin counties, although nesting has been recorded as far north as Flagler Beach and as far south as Miami. On the west coast, single nesting records exist for Walton and Okaloosa counties. Adults are infrequently harpooned off the lower east coast.

LIFE HISTORY AND ECOLOGY: A wide-ranging species capable of moving far out to sea. Principal food is jellyfish. Nesting season in Florida extends from April until July. Nests contain an average of 80-85 eggs, with the addition of a number of undersized yolckless eggs. Possibly as many as six clutches may be laid in a season. Re-nesting interval is probably 2-3 years. This turtle is equipped with powerful flippers and streamlined shell for long distance travel.

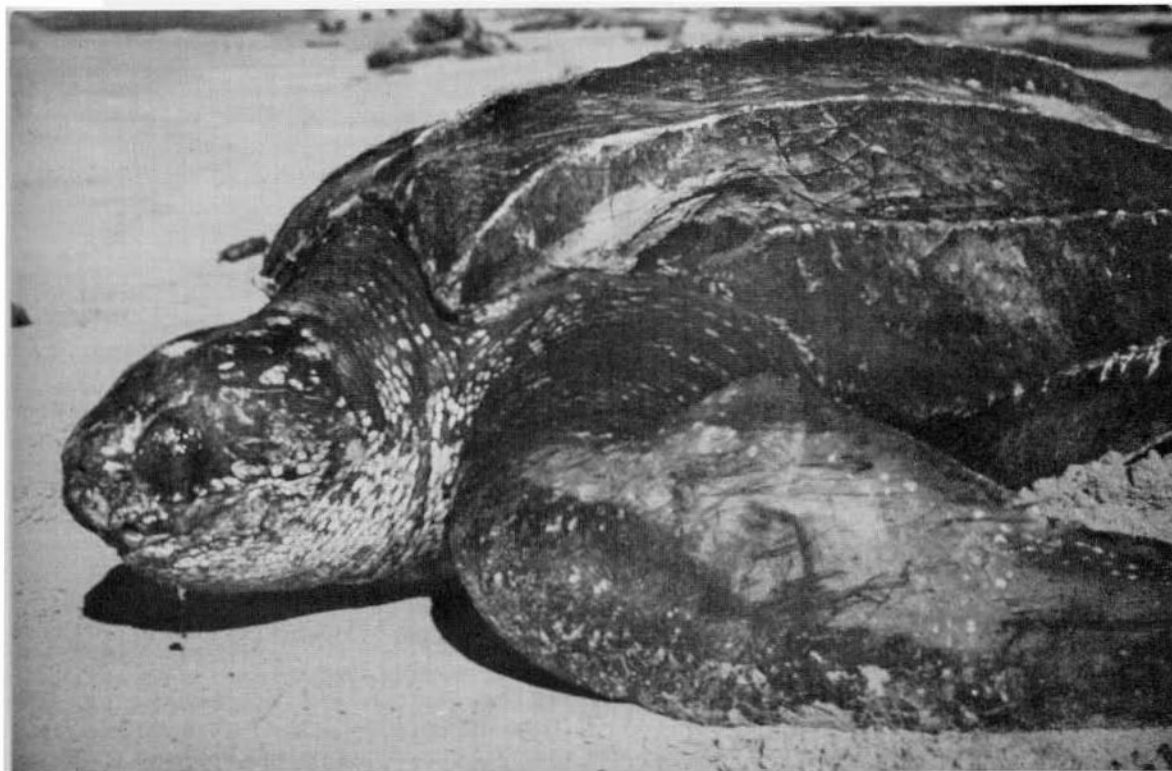


Fig. 32. *Dermochelys coriacea* (photograph by P.C.H. Pritchard)

SPECIALIZED OR UNIQUE CHARACTERISTICS:

The Leatherback is the largest turtle, the most thoroughly pelagic and wide-ranging of all marine turtles.

BASIS OF STATUS CLASSIFICATION: There are no records of this turtle ever having been common in Florida. Observations in recent years indicate 10-12 turtles nest annually with no detectable decline in numbers. Since protected on nesting beaches and almost never seen except when nesting, few are killed in the State.

RECOMMENDATIONS: The Leatherback's non-commercial status and rarity in the State both protect the turtle. The extremely poor survival of the species in captivity justifies severe restrictions on collecting the species for captive research. Illumination of beaches during the nesting season should be restricted. The turtle should be given total protection in state waters.

SELECTED REFERENCES:

Pritchard, P.C.H. 1971. The Leatherback or Leathery Turtle *Dermochelys coriacea*. IUCN Monograph No. 1, Morges, Switzerland. 39 pp.

PREPARED BY: Frank Lund, P.O. Box 541, Jupiter, Florida 33458.



Rare
FLORIDA SCRUB LIZARD

Sceloporus woodi Stejneger
Family Iguanidae
Order Squamata
Suborder Sauria

OTHER NAMES: Scrub Pine Lizard, Scrub Lizard.

DESCRIPTION: The Florida Scrub Lizard is a rough, spiny-scaled reptile generally pale brown or gray-brown in color. It closely resembles the Southern Fence Lizard (*Sceloporus undulatus*) but possesses a conspicuous and definitely delimited dark lateral band from its neck to the base of its tail. Males of the species have a long blue area on each side of the belly, bordered by black on the proximal side and a pair of blue spots at the base of the throat. The rest of the throat is black except for a median white stripe. The female has dark spots on the chest and undersurface of the head with traces of blue on the throat and sides of the white venter. This lizard, which varies from 8.9 to 13.5 cm (3.5-5.3 in) in length, usually dashes away over the ground like a Racerunner (*Cnemidophorus sexlineatus*) instead of dodging around tree trunks and logs like a fence lizard. It climbs readily, however, when closely pursued.

RANGE: This species is endemic to Florida, discontinuously distributed in scattered Sand Pine-Scrub Oak communities from Marion and Putnam counties southward to Highland County. Populations of the Florida Scrub Lizard also occur on both coasts: in Lee and Collier counties on the west and continuously from Brevard County to Dade County on the east.

HABITAT: Florida "scrub" is defined as a fire sub-climax forest characterized by an overstory of Sand Pine

(*Pinus clausa*) and an understory of sclerophyllous shrubs dominated by small oaks (*Quercus chapmanii*, *Q. myrtifolia*, and *Q. virginiana* var. *geminata*) and Rosemary (*Ceratiola ericoides*). Ground cover plants (*Aristida* sp. and *Sporobolus* sp.) are scattered through expanses of bare sand, lichens and leaf litter. Although the Florida Scrub Lizard is generally restricted to this interesting plant association, it has also been observed in the scrub ecotone, in the *Pinus palustris*—*Quercus laevis* (Longleaf Pine—Turkey Oak) sandhill association and in citrus groves.

LIFE HISTORY AND ECOLOGY: Recent studies show that both sexes of this species reach sexual maturity when their snout to vent lengths are from 3.8 to 4.3 cm (1.5 to 1.7 in). Mating occurs from the end of March until late June. Within three to four weeks, the female deposits a clutch of from two to four eggs. The hatchlings range from 2.1 to 2.4 cm (0.82 to 0.96 in) in length and reach sexual maturity in one year.

Ants, adult beetles, and orthopterans comprised nearly 85 per cent of a small sample of these lizards examined from the Ocala National Forest.

SPECIALIZED OR UNIQUE CHARACTERISTICS: Most members of the *Sceloporus* group are arboreal and tend of watch for prey from elevated stations on tree trunks. However, the dense scrub oak understory in this species typical habitat prevents *Sceloporus woodi* from an unobstructed view of the ground. Consequently the lizard forages for prey much of the time on or near the ground. The lighter color and longer legs of the Scrub Lizard (as opposed to its close relative, the Southern Fence Lizard, *Sceloporus undulatus*) apparently are evolutionary adaptations to this habitat.

BASIS OF STATUS CLASSIFICATION: The Florida Scrub Lizard is considered rare. Although large

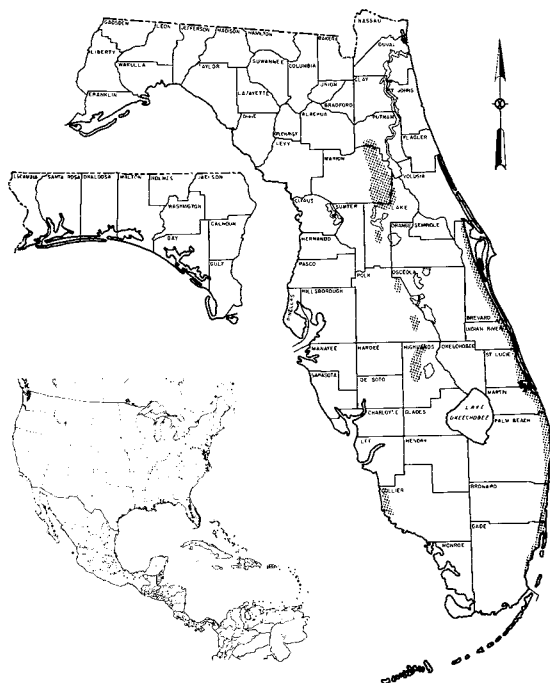


Fig. 33. *Sceloporus woodi* (photograph by R.S. Simmons)

tracts of Florida scrub exist, many are devoid of *S. woodi* populations. Even in large, continuous stands of scrub communities, lizard populations are very scattered and large hiatuses appear for no obvious reasons. Coastal populations may be particularly at risk because of the desirability of this land to developers.

RECOMMENDATIONS: Vigorous populations of the Florida Scrub Lizard are found in the Ocala National Forest, the Lake Wales Ridge, along the Atlantic Dune Scrubs, and in the Collier County Scrub. Intensive studies of these four areas may provide clues as to what exactly constitutes prime Scrub Lizard habitat. This knowledge perhaps could then explain the disjoint nature of the lizard's numbers in homogeneous stands of typical habitat.

Every effort should be made to protect tracts of Florida's scrub where this lizard occurs.



FLORIDA SCRUB LIZARD (*SCELOPORUS WOODI*)

SELECTED REFERENCES:

- Barbour, T. 1919. Distribution of *Sceloporus* in southern Florida. *Copeia* 70:48-51.
- Carr, A.F. 1940. A contribution to the herpetology of Florida. Univ. Florida Publ. Biol. Sci. Ser. 3:1-118.
- Carr, A.F. and C.I. Goin. 1955. A guide to the reptiles, amphibians and fresh-water fishes of Florida. Univ. Florida Press, Gainesville. 341 pp.
- Conant, R. 1975. A field guide to reptiles and amphibians of eastern and central North America. Houghton Mifflin Co., Boston. 429 pp.
- Funderburg, J.B. and D.S. Lee. 1970. Reproduction and growth in the endemic Florida scrub lizard, *Sceloporus woodi* Stejneger. *ASB Bull.* 17(2):43.

Jackson, J.F. 1972. The population phenetics and behavioral ecology of the Florida Scrub Lizard (*Sceloporus woodi*). Ph.D. Dissertation. Univ. of Florida, Gainesville. 119 pp.

Jackson, J.F. 1973. Distribution and population phenetics of the Florida Scrub Lizard, *Sceloporus woodi*. *Copeia* 1973(4):746-761.

Jones, J.P. 1927. An extension of the range of *Sceloporus woodi* Stejneger. *Copeia*. 160:181-182.

Lee, D.S. and J.B. Funderburg. 1970. The geographic and ecological distribution of the Florida Scrub Lizard, *Sceloporus woodi* Stejneger. *ASB Bull.* 17(2):52.

Stejneger, L. 1918. Description of a new snapping turtle and a new lizard from Florida. *Proc. Biol. Soc. Washington* 31:89-92.

PREPARED BY: Michael J. Fogarty, Florida Game and Fresh Water Fish Commission, Wildlife Research Projects Office, Gainesville, Florida 32605.

Rare CEDAR KEY MOLE SKINK

Eumeces egregius insularis Mount
Family Scincidae
Order Squamata
Suborder Sauria

OTHER NAMES: Brown Red-Tailed Skink. Red-Tailed Skink.

DESCRIPTION: This is a small, shiny, brown lizard with a pair of dorsolateral light stripes running the length of the body. The ground color is some shade of brown or gray-brown, and the tail is light pink or salmon. This is the largest of the subspecies of *Eumeces egregius*, approaching a total length of 15 cm (6 in), with the tail accounting for two-thirds of this. The legs are small, but well developed.

RANGE: This lizard is confined to the islands in the vicinity of Cedar Key, Levy County, Florida. It has been found on Sea Horse Key, Cedar Key, Airstrip Island, and probably also occurs on the other larger islands near Cedar Key. Other subspecies of *Eumeces egregius* occur throughout Florida, and northward into southern Georgia and southeastern Alabama. The type locality on Airstrip Island still supports a population of this lizard, although it has been very much reduced in recent years.

HABITAT: *Eumeces egregius insularis* is usually found under driftwood and tidal wrack ("sea weed"), along the shore. On Sea Horse Key it also occurs farther inland in loose sand at the bases of trees. It probably requires a loose sand in which it burrows in its characteristic "sand-swimming" manner.

LIFE HISTORY AND ECOLOGY: Nothing is known concerning the life history of the race, but it is probably similar to that described by Mount (1963) for the mainland race, *Eumeces egregius onocrepis*. *Eumeces egregius* lays from three to seven eggs once a year under debris, usually in a nest cavity constructed in the sand. Females remain with the eggs until hatching (31 to 51 days), presumably offering protection from small predators. Reproductive maturity occurs at the age of one year in the laboratory, and mating takes place in the winter. The Cedar Key Mole Skinks eat mainly marine amphipods which are exceedingly abundant under tidal wrack and driftwood. In some areas, the Cedar Key Mole Skink appears to be very abundant.

SPECIALIZED OR UNIQUE CHARACTERISTICS: *Eumeces egregius insularis* is a distinctive race of an almost endemic Florida lizard. The affinities of this subspecies are not well understood. Like many island endemics, the Cedar Key Mole Skink is larger than its mainland relatives. *Eumeces egregius* is interesting because of the intermediate evolutionary position it seems to occupy between the generalized cursorial skinks such as the Five-Lined Skink (*Eumeces fasciatus*) and the highly specialized "sand-swimming" skinks such as *Neoseps reynoldsi*, the Sand Skink.

BASIS OF STATUS CLASSIFICATION: This lizard was once extremely abundant on Airstrip Island near Cedar Key. Intense collecting by amateur reptile fanciers has drastically reduced its numbers there over the past 15 years. The National Wildlife Refuge which includes Sea Horse Key should be a haven for this lizard, if collecting there could be reduced.



CEDAR KEY MOLE SKINK (*EUMECES EGREGIUS INSULARIS*)

RECOMMENDATIONS: Limit collecting in the Cedar Keys National Wildlife Refuge.

SELECTED REFERENCES:

- Mount, R.H. 1963. The natural history of the Red-tailed Skink, *Eumeces egregius* Baird. Amer. Mid. Nat. 70(2):356-385.
 Mount, R.H. 1965. Variation and systematics of the scincoid lizard, *Eumeces egregius* (Baird). Bull. Florida St. Mus. 9(5):183-213.
 Mount, R.H. 1968. *Eumeces egregius* (Baird). Cat. Amer. Amphib. Rept.:73.1-73.2.

PREPARED BY: Steven P. Christman, National Fish and Wildlife Laboratory, 412 N.E. 16th Avenue, Gainesville, Florida, 32601.

**Rare
MOLE SNAKE**

*Lampropeltis calligaster
rhombomaculata* (Holbrook)
 Family Colubridae
 Order Squamata
 Suborder Serpentes

OTHER NAMES: Brown King Snake.

DESCRIPTION: This medium-sized kingsnake (adults about 76 to 101 cm [30 to 40 in.] long) is light brown to brown dorsally with about 45 to 55 rounded, reddish-brown blotches down the back; a similar number of reddish-brown, small vertical bars occurs along both sides, usually spaced alternately between the lateral edges of the dorsal blotches. Both the blotches and the bars are thinly edged with black. The belly is white to beige or yellowish and is checkered with alternating squares of dark brown color. The undersurface of the tail may be similar to the belly, but in one Florida juvenile it is yellowish-brown with two parallel darker stripes. Old adults may be uniformly brown dorsally. The head is proportionately small, and not clearly set off from the neck. All scales are smooth and the anal plate is undivided. The Mole Snake is easily confused with the Corn Snake, especially when young. But the latter two characteristics separate these species.

RANGE: The range of the Mole Snake is primarily the southeastern United States from Maryland to central Florida, then west to southwestern Mississippi. Continuing westward, this species is called the Prairie Kingsnake (*L. c. calligaster*). The few Florida specimens are known from the panhandle in Liberty (Means, pers. obs.), Calhoun, Bay, and Walton (David Gwaltney, pers. comm.) counties. An old literature record from Lake County suggests that the Mole Snake may occur in the upper peninsula.

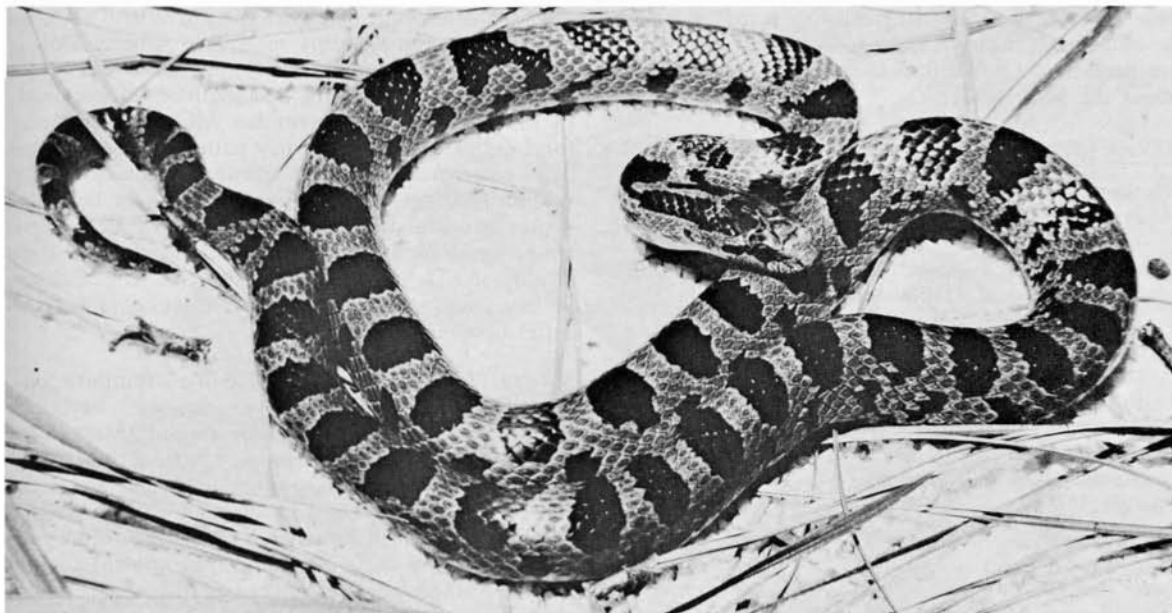


Fig. 34. *Lampropeltis calligaster rhombomaculata* (photograph by R.S. Simmons)

HABITAT: Almost all accounts of the Mole Snake refer to it as a burrower. It is commonly turned up from fallow fields by plowing. In Florida, specimens have been collected crossing roads at dusk during late spring and early summer (and in November). The habitats along such road collections are pine woodlands, usually in higher, drier sandy situations in pine flatwoods. Often these habitats are regenerating pine stands in early growth stages following logging operations. It appears that old-field habitats figure prominently in this species' preferences.

LIFE HISTORY AND ECOLOGY: Almost nothing is known about the life cycle, food habits, or population biology of this species in Florida. A clutch of white, leathery eggs is laid sometime in late spring or early summer; these hatch in late summer and are probably sexually immature by the next spring breeding season. It is probable that individuals reach maturity by their second summer after hatching. Apart from small mammals and an occasional bird, lizards and small snakes may also be eaten.

SPECIALIZED OR UNIQUE CHARACTERISTICS:

It is possible that this secretive snake is not so much an active burrower, but an inhabitant of burrows made by other animals, especially those forming its diet such as rodents, shrews, and moles. As a predator on small mammals in fallow and cultivated fields, this kingsnake might have locally high economic value as a partial biological control on agricultural pests, despite its seeming rarity. Florida peninsular populations are at the southern end of a wide-ranging subspecies that is relatively rare throughout its distribution.

BASIS OF STATUS CLASSIFICATION: The Mole Snake is considered to be rare in Florida because specimens are seldom seen and are known from less than 10

localities over the entire state. In addition, this subspecies is considered rather rare over most of its range outside Florida.

RECOMMENDATIONS: In light of the paucity of basic ecological and life history information available on this species, it is essential to instigate studies of this nature. In order to assess whether this species is a



MOLE SNAKE (*LAMPROPELTIS CALLIGASTER RHOMBOMACULATA*)

beneficial crop-pest predator, whether it may at present be endangered rather than rare, or even if its numbers are increasing, it is necessary to learn as much as possible about the Mole Snake.

SELECTED REFERENCES:

- Blanchard, F.N. 1921. A revision of the kingsnakes: genus *Lampropeltis*. Bull. U.S. Nat. Mus. (114): 1-260.
- Carr, A.F. and C.J. Goin. 1958. A guide to the reptiles, amphibians and fresh-water fishes of Florida. Univ. Florida Press, Gainesville. 341 pp.
- Wright, A.H. and A.A. Wright. 1957. Handbook of snakes of the United States and Canada. Comstock Publ. Assoc., Ithaca, N.Y. Vol. 1. 564 pp.

PREPARED BY: D. Bruce Means, Tall Timbers Research Station, Route 1, Box 160, Tallahassee, Florida 32303.

Rare
APALACHICOLA POPULATIONS
of the Eastern Common Kingsnake
including *L. g. goini*

Lampropeltis getulus (Linnaeus)
Family Colubridae
Order Squamata
Suborder Serpentes

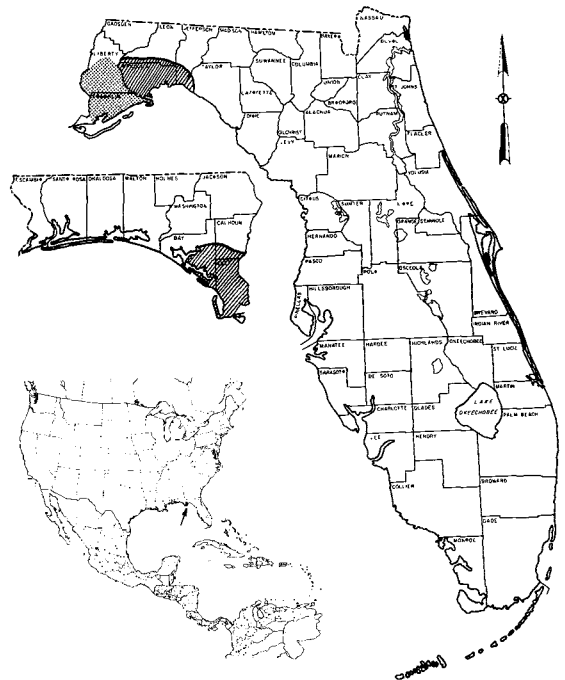
OTHER NAMES: Chipola Kingsnake, Blotched Kingsnake.

DESCRIPTION: The Apalachicola populations of the Eastern Common Kingsnake, *Lampropeltis getulus*, are here considered to be all populations and individuals found in the Big Bend region of northern Florida that as adults either 1) have all dorsal scales bicolored (light yellow, and chocolate to light brown) with no pattern of light crossbands separated by darker interspaces, or 2) have light crossbands at least 3 or more scales wide middorsally that are separated by darker interband scales, each centered with a lighter spot. Crossband scales are usually dark posteriorly and light basally with a sharp line of demarcation between colors midway down each scale. Interband scales are always light in the center and usually completely fringed by darker pigment. Occasional specimens have patterns arranged in longitudinal hatching or stripes. All these are medium-sized snakes (adults from 0.9 to 1.7 m [3 to 5.5 ft] long) usually possessing an undivided anal scale, about 47 divided subcaudals, 215 ventrals, 21 middorsal scale rows, and about 18 (14-20) light crossbands (when present). The color pattern alone distinguishes these kingsnakes. Ventral color is chocolate-brown with variable degrees of lighter pigment. The adult color and pattern is partly acquired during juvenile growth; interband areas of most juveniles are dark but become light-colored by maturity.

RANGE: Uniformly patterned specimens with all dorsal scales light-colored occur mostly in Liberty County between the Apalachicola and Ochlockonee rivers to the west and east, respectively, and south of Telogia Creek. In Franklin County (except for Alligator Peninsula), some individuals are uniformly patterned as above, but light crossbands are often distinguishable on many specimens. Intermediates (interband spaces becoming darker, crossband width decreasing to 3 scales or less) are common both west of the Apalachicola River (type locality of *L. g. goini* near Wewahitchka, Gulf County) to Bay County, and east of the Ochlockonee River to Jefferson County.

HABITAT: These kingsnakes live in coastal flatwoods, primarily along low, wet depressions, bayheads, swamps, roadside ditches and streamsides. Most of the wet sites support a dense vegetation zone of titis (*Cyrilla racemiflora* and *Cliftonia monophylla*) and associated hydrophilic plants. Also, these snakes are common along the upper regions of estuaries. The environs of all such wet habitats are occupied inland from the coastline to the first surface appearance of coarse Miocene sediments along Cody Scarp.

LIFE HISTORY AND ECOLOGY: Little is known concerning the life history and ecology of these particular populations, except that their food consists mainly of snakes, amphibians, and possibly small rodents. Courtship probably occurs in early spring; eggs probably are laid in early summer (June-July) and hatch sometime in July or August. Maturity is probably reached in the second spring after hatching at a size of about 0.9 m (3 ft) long. Activity is greatest in mid-morning hours, with



EASTERN COMMON KING SNAKE - APALACHICOLA POPULATION
(*LAMPROPELTIS G. GETULUS* + *L. G. GOINI*)

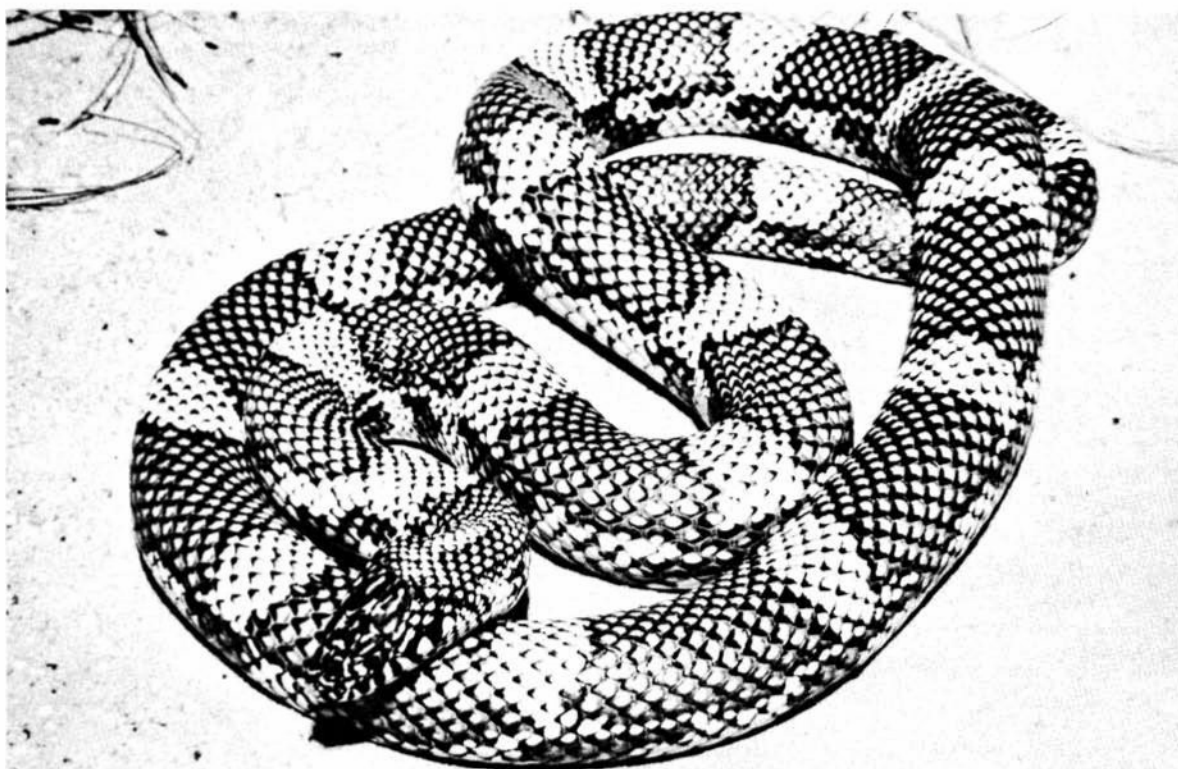


Fig. 35. *Lampropeltis getulus goini* (photograph by R.S. Simmons)

a second peak in late afternoon, although occasional individuals are found in midday and after dark.

SPECIALIZED OR UNIQUE CHARACTERISTICS:

The unique light pattern of these kingsnakes suggests an adaptation to some local environmental feature that may be similar to conditions in south peninsular Florida and in the Osceola National Forest where other overall lightly patterned kingsnakes are known (but which differ in the details of their patterns and in other characters, e.g., scale rows, number of light crossbands when apparent). Apalachicola populations are true Floridian forms, exclusively found in this state and probably evolved here.

BASIS OF STATUS CLASSIFICATION: The small geographic range of these populations and intergrades (*L. g. goini*) coupled with collecting pressure resulting from demand for the intergrades by private and commercial collectors, warrant consideration of these pattern variants as rare.

RECOMMENDATIONS: The main body of the range of these pattern variants lies in Liberty County, within the western one-half of the Apalachicola National Forest. So long as timber management practices don't alter the preferred habitat, Apalachicola kingsnakes have a good chance for survival. Research on all aspects of the taxonomy, natural history, and ecology is needed. The extent of commercial exploitation of Apalachicola kingsnakes and the *L. g. goini* phenotype should be

assessed with recommendations for regulation of the possession and sale of specimens.

SELECTED REFERENCES:

- Blaney, R.M. 1971. Systematics of the Common Kingsnake, *Lampropeltis getulus* (Linnaeus). Unpublished Ph.D. thesis, Louisiana State Univ., Baton Rouge, La.
- Loftin, H. 1962. A new record of the Florida Panhandle Kingsnake, *Lampropeltis getulus goini*. *Herpetologica* 18:138-139.
- Means, D.B. 1976. Variation in kingsnakes (*Lampropeltis getulus*) of the Apalachicola region of Florida (in prep.).
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- Neill, W.T. and R. Allen. 1949. A new kingsnake (genus *Lampropeltis*) from Florida. *Herpetologica* 5:101-106.
- Neill, W.T. 1963. Polychromatism in snakes. *Quart. J. Florida Acad. Sci.* 26(1):194-216.

PREPARED BY: D. Bruce Means, *Tall Timbers Research Station, Route 1, Box 160, Tallahassee, Florida 32303.*

Rare
GULF SALT MARSH SNAKE

Nerodia fasciata clarki (Baird & Girard)
Family Colubridae
Order Squamata
Suborder Serpentes

OTHER NAMES: Salt Marsh Water Snake, Striped Water Snake.

DESCRIPTION: The Gulf Salt Marsh Snake is a longitudinally striped water snake with strongly keeled scales. The dorsal ground color varies from yellowish to pale olive, patterned with two dark brown stripes running along each side of the body. The belly ranges from reddish brown to black with a distinct central row of yellowish spots. The average adult size is approximately 0.6 m (2 ft), but females up to 0.9 m (3 ft) in length have been recorded.

RANGE: *Nerodia fasciata clarki* occurs in brackish coastal habitats from the vicinity of Corpus Christi, Texas, eastward to the vicinity of Cedar Key, Florida. Beyond this point, two other races of salt marsh snake

range around the Florida peninsula and northward to Volusia County, Florida, including the Florida Keys and northern Cuba. The type locality of the Gulf Salt Marsh Snake is in Texas.

HABITAT: Salt marshes supporting cordgrass (*Spartina*), Blackrush (*Juncus roemerianus*), and glasswort (*Salicornia*) constitute the typical habitat of the Gulf Salt Marsh Snake, but mangrove swamps are also occupied toward the southern end of the range. This snake has also been reported from offshore islands, where it seeks shelter under tidal wrack.

LIFE HISTORY AND ECOLOGY: The Gulf Salt Marsh Snake is active primarily at night, especially during low tides. It can sometimes be observed in shallow tidal creeks and ponds searching for small fishes, which make up the bulk of its diet. From two to fourteen young are born during midsummer; mating probably occurs in the early spring. Gulf Salt Marsh Snakes are apparently not distributed evenly throughout what appears to be suitable habitat. Instead, they seem to be "clumped" in relatively small areas, sometimes reaching quite high population densities.

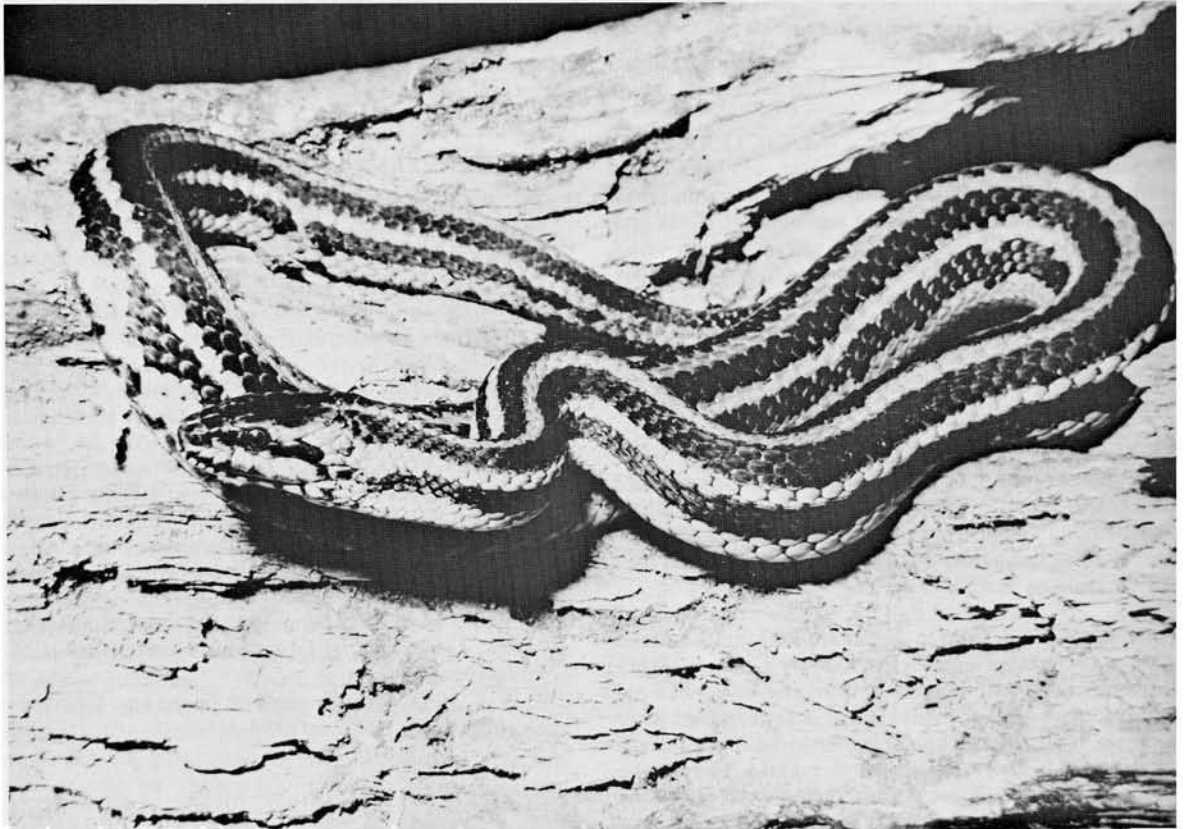


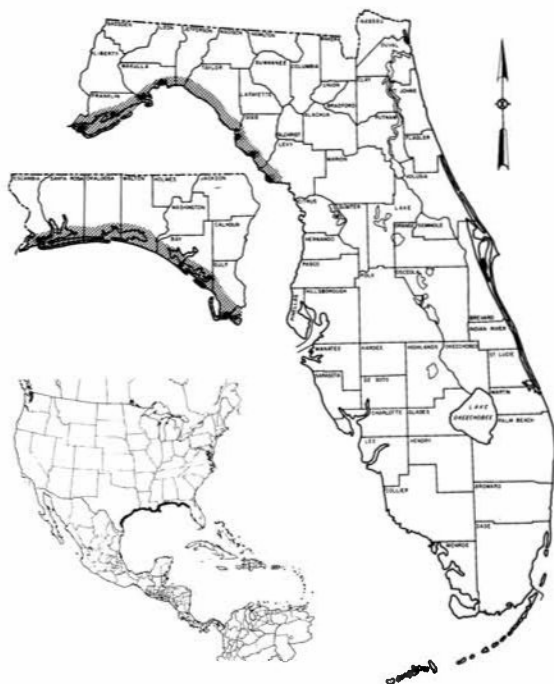
Fig. 36. *Nerodia fasciata clarki* from Cedar Key, Levy County, Florida (photograph by R.S. Simmons)

SPECIALIZED OR UNIQUE CHARACTERISTICS:

The salt marsh snakes are unique among North American snakes in being restricted to saline habitats. It appears that these snakes have evolved a major behavioral adaptation to such environments, whereby they refrain from drinking seawater. Instead, they seem to utilize the dilute body fluids of prey animals and their own metabolically produced water, as well as any rainwater which may occasionally be available.

BASIS OF STATUS CLASSIFICATION: The distribution of the Gulf Salt Marsh Snake in Florida is discontinuous due to numerous areas of unsuitable habitat along Florida's Gulf Coast. Thus, the range of *Nerodia fasciata clarki* in Florida is made up of many scattered, isolated populations, each of which must be considered vulnerable to extirpation in the event of habitat disturbance. Furthermore, there is evidence to suggest that chemical insecticides may have a lethal effect on salt marsh snakes.

RECOMMENDATIONS: The Gulf Salt Marsh Snake is presently under federal refuge protection in several areas within its range. Nevertheless, in view of the limited extent of suitable habitat and the low reproductive rate of this snake, additional measures should be taken to prevent the disturbance of currently unprotected populations. We would recommend the expansion of federal refuge programs in coastal northwest Florida.



GULF SALT MARSH SNAKE (*NATRIX FASCIATA CLARKI*)

SELECTED REFERENCES:

- Neill, W.T. 1958. The occurrence of amphibians and reptiles in saltwater areas, and a bibliography. *Bull. Mar. Sci. Gulf & Carrib.* 8(1):1-97.
 Pettus, D. 1956. Ecological barriers to gene exchange in the Common Water Snake (*Natrix sipedon*). Unpublished Ph.D. Thesis, Univ. of Texas. 87 pp.

PREPARED BY: Howard I. Kochman, *Department of Zoology, University of Florida, Gainesville, Florida 32601* and Steven P. Christman, *National Fish and Wildlife Laboratory, 412 N.E. 16th Avenue, Gainesville, Florida 32601.*

Rare
SOUTHERN COPPERHEAD

Agkistrodon c. contortrix Linnaeus
 Family Crotalidae
 Order Squamata
 Suborder Serpentes

OTHER NAMES: Highland Moccasin, Pilot Snake, Chunkhead, Dumb Adder.

DESCRIPTION: A rather handsome snake is the copperhead with a coppery-red head and a series of from 10 to 20 bands across the back. Each band forms a very pinched "hourglass" pattern. Sometimes this marking is so constricted that the two halves of the hourglass fail to meet. The snake is rather heavy-bodied with a broad head, facial pits, pupils which are vertically elliptical, and weakly keeled scales.

Adults of this venomous species average about 66.0 to 81.3 cm (26 to 32 in) in length. The young are paler in color than the adults and have a dark narrow line through the eye and a conspicuous yellow-tipped tail.

RANGE: The Copperhead is restricted to the panhandle of Florida where it is found in small numbers in the Apalachicola River drainage system.

HABITAT: This species shows a definite preference for ground that is shaded by a leaf canopy and blanketed with leaf litter from deciduous trees. Preferably this substrate should be wet or at least damp during the time that the snakes are active. However, Copperheads may wander into brush, grasslands or weedy fields, and may prowl on a dry substrate. It is also found in hammocks, flood plain forests of the Apalachicola River and in bordering agricultural fields.

LIFE HISTORY AND ECOLOGY: The Copperhead is largely a nocturnal, passive species, spending much of its time in one spot waiting for prey. One exhaustive study showed that summer ranges of males were about 10 ha (24.5 a) and only 3.4 ha (8.5 a) for females. Copperheads are gregarious, especially in autumn, when they assemble at hibernating dens or denning areas, often in the company of other species of snakes. In the northerly



Fig. 37. *Agkistrodon contortrix contortrix* (photograph by R.S. Simmons)

portions of their range, the species hibernates from mid-November until mid-April or when temperatures average below 10 degrees C. There is reason to believe that the snake is active almost year around in Florida because of our relatively warm winters.

Mating can take place at almost anytime during the warm periods of the year but generally occurs after the warm weather stabilizes. The 20 to 24 cm (8-9.5 in) long young, usually six to the litter, are born alive in late summer. The adult females have the capacity to store sperm so that copulation is not required before each generation.

Foods consist of small mammals, other snakes, and the Narrow-mouthed Toad (*Gastrophryne carolinensis*). Cicadas and larval lepidopterans are also taken.

SPECIALIZED OR UNIQUE CHARACTERISTICS:

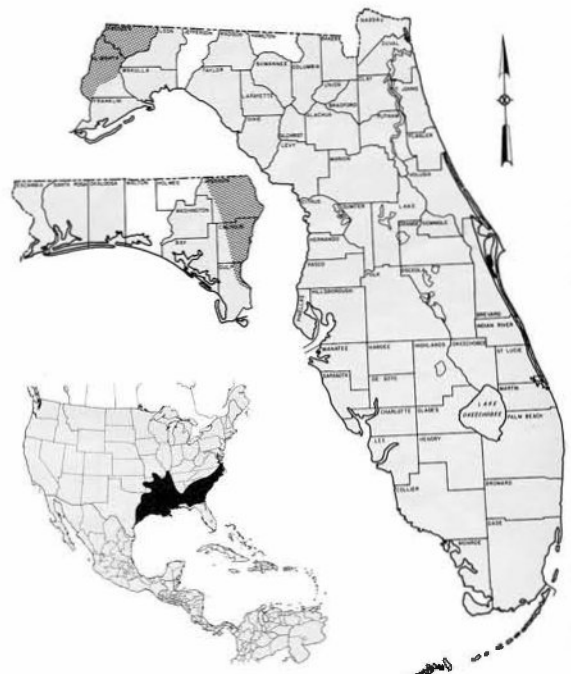
There are numerous species of Florida's herpetological fauna which are considered primarily "southern." Conversely, the Copperhead is thought of by scientists as a more "northern" species. The presence of this "northern disjunct" population within our state is alone a unique characteristic of the species.

BASIS OF STATUS CLASSIFICATION: This species is considered rare in Florida simply because of the extremely restricted range.

RECOMMENDATIONS: Current populations of the Copperhead should be assessed. Efforts should be made to establish sanctuaries where and when needed.

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SOUTHERN COPPERHEAD (*AGKISTRODON CONTORTRIX CONTORTRIX*)

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Species of Special Concern
AMERICAN ALLIGATOR

Alligator mississippiensis (Daudin)
Family Crocodylidae
Order Crocodylia

OTHER NAMES: Gator.

DESCRIPTION: The Alligator is a large, rough-backed, lizard-shaped reptile with a broad, rounded snout. Adults commonly attain lengths of 3 m (10 ft) and more. Individuals over 1.2 m (4 ft) long are black while smaller Alligators appear crossbanded with yellowish-white, particularly along the sides and lateral surfaces of the tail. The tail is strongly compressed and crested with high,



Fig. 38. *Alligator mississippiensis* (photograph by P.C.H. Pritchard)

pointed scales. The strongly keeled scales continue along the back to the base of the head in several lateral rows.

The only species which could be confused with the Alligator in Florida is the American Crocodile. Alligators may be distinguished from Crocodiles by their black or black and yellow coloration in contrast to the olive-grey with black markings of Crocodiles and by their broad, rounded snout which does not taper noticeably forward of the eyes as does the Crocodile's. In addition, the fourth tooth of the lower jaw is exposed in the Crocodile while it is concealed in the Alligator when the mouth is closed.

RANGE: The Alligator occurs in suitable habitat throughout Florida. However, its numbers are greater in the peninsula than in the panhandle. Outside of Florida the Alligator occurs below the fall lines from North Carolina to southern Texas and extends north in the Mississippi River drainage into southern Arkansas and extreme southeastern Oklahoma.

HABITAT: The Alligator is generally distributed in the various wetland types throughout the state, including the edges of large lakes and ponds, rivers, and the interiors of swamps and freshwater marshes. The reptile apparently is very adaptive and may be equally at home in ponds and lakes in urban areas or in the middle of the Everglades. Although not generally associated with salt water, it may occasionally enter brackish or even salt water habitats.

LIFE HISTORY AND ECOLOGY: Alligators may be inactive during the winter, particularly in northern Florida. In the summer and sometimes on warm days during the winter, they are often seen basking on the shoreline. When disturbed, they will enter the water, submerge, and usually reappear silently so that only the tip of their nose and the eyes are visible. As the spring approaches, Alligators become active and, until mid-December, remain a visible part of the outdoor scene.

Bellowing usually begins in mid-March. The male emits a very loud, deep, sonorous roar which may serve the dual purpose of identifying his territory and advertising his presence and availability to sexually receptive females. Receptive females answer the male with their own bellow which is not as loud or as deep in pitch as the males'. Alligators have two pairs of musk glands, a pair just inside the vent and a pair near the base of the lower jaw. The latter pair is visibly everted during bellowing. How adults locate one another for breeding is unknown, but a combination of the musk gland scent and the mutual bellowing may function to this end.

The female heaps vegetation into a mound nest. The completed nest is about 1.8 m wide and 0.6 to 0.9 m high. A clutch of from 20 to 50 eggs is deposited into a central cavity.

Some females are protective of the nest and remain near for the entire incubation period. After a period of about 9 weeks, the eggs hatch and the 22 cm (9 in) long young are freed from the nest by the female. Hatching

young are very vocal before hatching and their high-pitched "umph, umph" calls may stimulate the female to open the nest. The young often remain together in a group called a "pod" for an indefinite period. Tagged young have been recaptured near the nest site as long as three years after hatching.

Growth is quite variable but can exceed 0.3 m a year when weather conditions and food supplies are normal.

Young Alligators (less than 1.2 m [4 ft] long) are likely to subsist on a diet of insects, mollusks, and crustaceans while older animals will take prey consisting of fish, turtles, snakes, birds, mammals and crustaceans.

Adult gators (over 1.8 m [6 ft]) construct dens or "gator holes." These may be tunnelled underground away from a river or from the edge of a lake. In marsh habitats, gator holes resemble small ponds. The adults create and maintain these holes by vigorous activity of both the tail and mouth; tearing vegetation and mud from the center and sweeping them toward the edge of the hole. An underground passageway leads off from the edge of the hole to an enlarged cave a short distance away.

The female will spend most of her time near her den. She will usually wander no more than 450 m from the site. Home range sizes of 4 adult females studied in a Louisiana marsh varied from 2.6 to 16.6 ha (6.4 to 41.0 a) and averaged 8.5 ha (21.0 a). In a later study in Louisiana, it was determined that 14 males moved quite a bit more. The home ranges of these adults varied from 182.9 to 5,083.0 ha (452 to 12,560 a).

Young Alligators are taken by a variety of predators including wading birds, snakes, bullfrogs, otters, raccoons, and black bass. Larger Alligators fear only man.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The Alligator is unique in that it has become an aesthetic symbol typifying the outdoor scene of Florida. Most of our resident outdoorsmen would surely feel a sense of loss if "old mossy-back" were not a common sight basking along the shoreline or if its floating-log silhouette were missing from the water's surface.

Biologically the Alligator is unique in that its habits promote the welfare of many other wildlife species. The natural levee surrounding the edge of an alligator hole in the Everglades is usually the site of a thicket of willow (*Salix caroliniana*) and Groundsel-bush (*Baccharis halimifolia*) which serve as nesting areas for many avian species. During droughts the only surface water available is located in gator holes. These holes and their water supply may serve as refuges for numerous vertebrate and invertebrate species until the dry period terminates.

BASIS OF STATUS CLASSIFICATION: Hunting of this species for its hide continued until the late 1960's and effectively eliminated the animal from many haunts in its historic range (the southeastern states including Texas, Arkansas and North Carolina). It has been estimated that approximately 10 million Alligators were killed from the time when hunting began in earnest, around 1870, until just a few years ago.

Alligator populations, however, are apparently very resilient and through both judicious protection and

research the species has been restored in some areas in the southeast. Populations in southwestern Louisiana increased dramatically because of the efforts of the Louisiana Wildlife and Fisheries Commission to the point that the State has conducted two controlled experimental harvests of portions of that population. The populations in Calcasieu, Cameron, and Vermillion parishes have now been removed from the Federal Endangered Species List.

Some type of control may be warranted in Florida for Alligator populations that have recovered to the point where "people-gator" confrontations regularly occur. The alligator now has been reduced to "threatened" status in coastal southeastern South Carolina, Georgia, throughout Florida, in the southern third of Louisiana (excluding areas already removed from the Endangered Species List) and in the eastern half of coastal Texas by the federal government. It is fully protected by Florida statute.

RECOMMENDATIONS: Vigorous efforts should be taken to preserve suitable wetland habitats. Various methods of Alligator control should be given diligent consideration, particularly for those areas where possible dangerous confrontations occur between humans and alligators in urban situations.

The idea of "do not feed the alligators" should be given a new, fresh approach and a lot of publicity. Alligators will bite the hand that feeds them.

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Species of Special Concern
EASTERN INDIGO SNAKE

Drymarchon corais couperi (Holbrook)
Family Colubridae
Order Squamata
Suborder Serpentes

OTHER NAMES: Florida Indigo Snake, Gopher Snake, Blue Bull Snake.

DESCRIPTION: The Eastern Indigo Snake is a large, heavy-bodied serpent with smooth, shiny scales. Adults are uniformly black or bluish-black above and below, with the chin, throat and lips usually tinged with reddish or orange pigmentation. Hatchlings are often marked with light speckling on a darker ground color. Although the average adult length of the Eastern Indigo Snake is approximately 1.5 to 1.8 m (5-6 ft), individuals over 2.4 m (8 ft) have been recorded.

RANGE: The Indigo Snake is widely distributed throughout the American tropics, with seven races ranging from southern Texas to northern Argentina. *Drymarchon corais couperi*, however, is restricted to the southeastern United States, its range being completely isolated from that of the Texas race. It occurs primarily in southeastern Georgia and throughout peninsular

Florida, including the Florida Keys, but disjunct colonies have been reported from South Carolina, southern Alabama and the west Florida Panhandle. The type locality is in Georgia.

HABITAT: Although the Eastern Indigo Snake often inhabits dry, sandy areas, especially Florida's high pine communities, it is actually characteristic of moister habitats. It frequently has been encountered in pine flatwoods as well as in the moist tropical hammocks of south Florida. In the drier environments, Indigo Snakes invariably seek shelter in the burrows of the Gopher Tortoise (*Gopherus polyphemus*), which are also frequently utilized by the Eastern Diamondback Rattlesnake (*Crotalus adamanteus*).

LIFE HISTORY AND ECOLOGY: Despite the frequent occurrence of the Eastern Indigo Snake in xeric habitats, laboratory experiments indicate that it is susceptible to desiccation. The shelter provided by Gopher Tortoise burrows therefore appears to constitute a critical factor necessary for the survival of this snake throughout areas of limited moisture.

D. c. couperi is active primarily during the day. It is quite an omnivorous reptile, preying upon small mammals and birds as well as upon frogs, lizards and other snakes, including venomous species. Observations on captive specimens indicate that the Eastern Indigo Snake

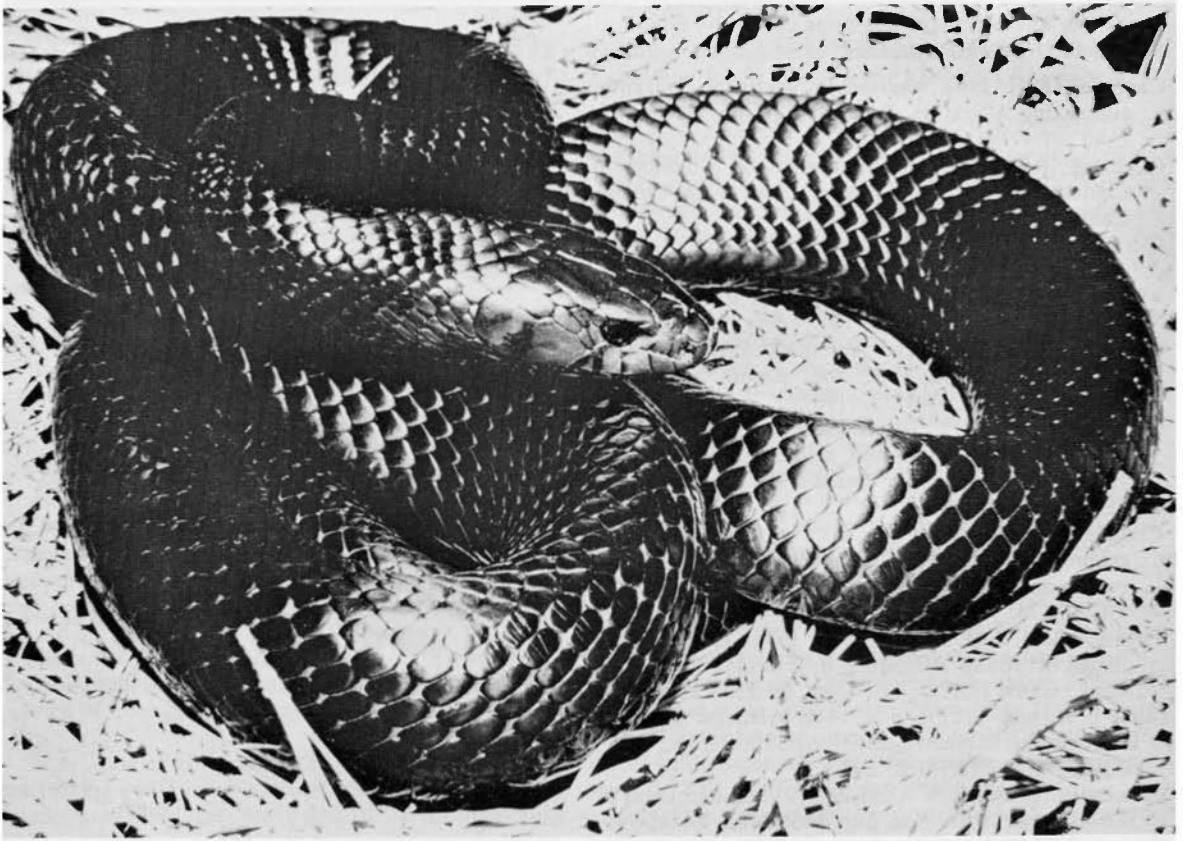


Fig. 39. *Drymarchon corais couperi* (photograph by R.S. Simmons)

lays from five to twelve eggs early in the season, usually in May. Hatching occurs during August and September; the young average 45.7 to 60.9 cm (18-24 in) in length. Mating behavior has been observed in captivity during October and January.

SPECIALIZED OR UNIQUE CHARACTERISTICS: With a maximum recorded length of 2.63 m (103.5 in), *D. c. couperi* rates among the largest colubrid snakes in the New World. This large snake is also renowned for its mild disposition.

BASIS OF STATUS CLASSIFICATION: Due to its impressive size and docile nature, the Eastern Indigo Snake has for years been a prime target of snake fanciers and animal dealers. Currently the indigo snake is considered threatened and legally protected in Florida. This legislation has partially curtailed overcollecting by forbidding the capture, sale or possession of this species, except under special permit. Nevertheless, reptile collectors continue to exploit the Indigo Snake. The technique of forcing reptiles out of Gopher Tortoise burrows through the use of gasoline, a practice commonly employed by rattlesnake hunters, is now known to have a lethal effect upon indigo snakes. Mount (1975) suggested that the Indigo Snake already may have been eliminated from Alabama.

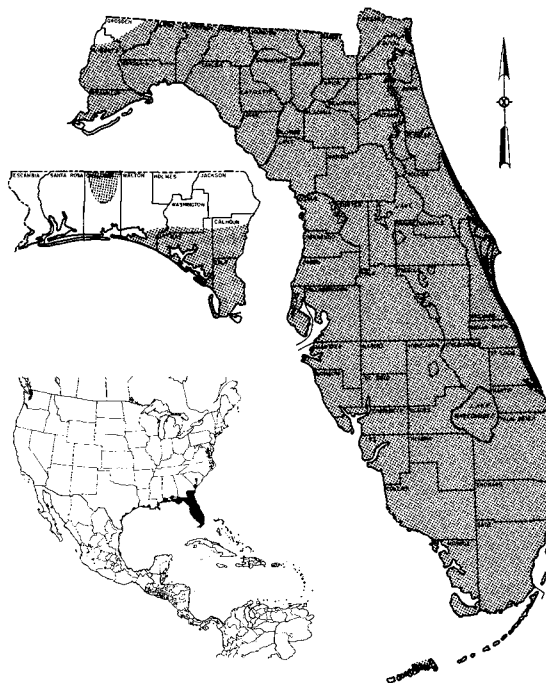
Unfortunately, no provisions have been made to safeguard the xeric habitats of the Indigo Snake in Florida. Any environmental disturbance that threatens the survival of the Florida Gopher Tortoise will likewise make the Indigo Snake vulnerable to extirpation throughout the drier portions of its range.

RECOMMENDATIONS: Current legislation governing the collection of indigo snakes must be rigidly enforced, with strict limitations on the issuance of permits. It is recommended that federally sponsored park or refuge programs be expanded to include at least a portion of Florida's sandhill habitats. Present restrictions on the exploitation of Gopher Tortoises should be maintained, if not increased.

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EASTERN INDIIGO SNAKE (*DRYMARCHON CORAIS COUPERI*)

**Status Undetermined
ALLIGATOR SNAPPING TURTLE**

Macrolemys temmincki (Troost)
Family Chelydridae
Order Testudinata

OTHER SCIENTIFIC NAMES: *Gypochelys temmincki*, *Macrochelys temmincki*.

OTHER COMMON NAMES: Alligator Turtle, Loggerhead.

DESCRIPTION: A very large freshwater turtle reaching a carapace length of over 50 cm (exceptionally over 75 cm) and a weight of over 50 kg (exceptionally over 100 kg). The head is very large (maximum width up to 23.7 cm), not fully retractile, and acutely triangular in shape when viewed from above. The tail is very long. Males reach maturity at a carapace length of about 35 cm, only marginally longer than that of the smallest mature females. However, males ultimately get much bigger than females.

The Alligator Snapping Turtle is unlikely to be confused with any other turtle except the Common Snapper, *Chelydra serpentina*. *Macrolemys* is distinguished from *Chelydra* by the more triangular head,



Fig. 40. *Macroclemys temminckii* (photograph by P.C.H. Pritchard)

laterally rather than dorso-laterally placed eyes, larger size, the presence of about four small extra scales on each side of the carapace between the marginals and the large lateral or costal scales, the much rougher shell which is tricarinate throughout life, and the presence of a bifurcated worm-like "fishing lure" on the upper surface of the tongue.

RANGE: In Florida the Alligator Snapping Turtle is found only in Gulf river drainages from the Santa Fe and Suwannee River northwest throughout the panhandle. It occurs in the Okcfenokee Swamp but not in the St. Mary's or St. John's rivers. In the Mississippi drainage the species has been recorded as far north as northwestern Illinois and southern Indiana. The western boundary of the range is represented by southeastern Kansas, most of Oklahoma except the extreme west, and eastern Texas.

HABITAT: Typically deep rivers and canals, but it is also found in lakes and swamps, especially those located near deep running water. Occasionally it is found in brackish water. This turtle is highly aquatic, rarely emerging from the water except for nesting purposes, and tends to be a bottom-walker rather than a swimmer. Only one case of aerial basking is on record (Ewert, 1976). Although rather sedentary it may progressively migrate many miles upstream over periods of many years.

LIFE HISTORY AND ECOLOGY: Mating occurs in February, March and April in Florida but presumably later in more northern parts of the Mississippi drainage, if indeed breeding takes place at all in that area. Nesting in Florida has been reported from April to June; in the Apalachicola, most nesting apparently takes place during the first two weeks of May. The eggs are buried in a flask-shaped cavity in the soil, and may number from 15 to 50, depending in part upon the size of the female. Six Apalachicola nests contained from 31 to 40 eggs each (mean: 34.2).

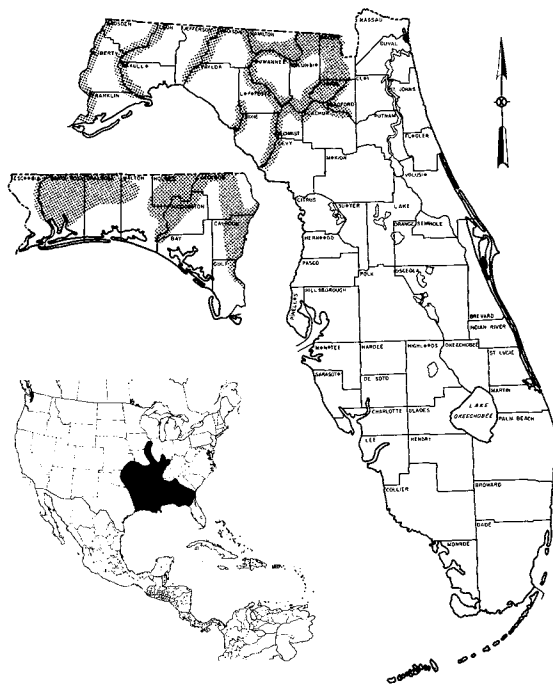
This species "angles" for fish, holding the mouth wide open to expose the "lure" on the tongue. It is also known to feed upon snails and mussels, and probably upon any animal it can catch and subdue, or any carrion that comes its way.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The Alligator Snapping Turtle is certainly the largest and most impressive freshwater turtle in the United States, and possibly the largest in the world. The Amazonian *Podocnemis expansa* may achieve a slightly longer shell, but is unlikely to reach the weight of a really large alligator snapper. The largest *Macroclemys* seen by the writer (from White Springs, Hamilton County, Florida) had a maximum straight-line carapace length of 80.0 cm, and a head width of 23.7 cm. The maximum confirmed weight appears to be 107 kg.

BASIS OF STATUS CLASSIFICATION: It is hard to make any population estimate for this species in view

of its almost totally concealed life style. Possibly it is more abundant in Florida than commonly thought. In the past the main pressure on the alligator snapper has been in Louisiana, where it is regularly caught for food in the southeastern part of the State. According to Ted Joanen (pers. comm.) the species is now so depleted in Louisiana that most of those sold for food in New Orleans are imported from Arkansas. Although there are substantial areas of wetland wildlife refuge in southwestern Louisiana, they do not include preferred habitat for *Macrolemys*, though *Chelydra* is abundant there. The future of *Macrolemys* in Florida would appear to be safe were it not for the fact that contract trapping for a large commercial soup company had apparently reduced it to below worthwhile levels in the Escambia River, and that permission was being sought to extend the trapping to other rivers to the east. Evidence from captive individuals and from Dobie's studies in Louisiana suggest that this species takes 11 to 13 years to mature, lays fewer eggs than the Common Snapping Turtle, and nests at most only once a year (sometimes only once in two years).

RECOMMENDATIONS: Because of its low reproductive potential and relatively easy extirpation by trapping, it is urged that commercial exploitation of alligator snappers be prohibited throughout the range of the species. Current fish and game regulations in Florida prohibit the purchase, sale, or export of the species, and allow residents of Florida possession of not more than one specimen without a permit. These state regulations would appear to be adequate.



ALLIGATOR SNAPPING TURTLE (*MACROCLEMYS TEMMINCKII*)

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Status Undetermined ALABAMA RED-BELLIED TURTLE

Chrysemys alabamensis (Baur)
Family Emydidae
Order Testudinata

OTHER NAMES: *Pseudemys alabamensis*.

DESCRIPTION: A medium-sized turtle, adult female shell length typically about 30.5 cm (12 in) (record female 33.5 cm [13.2 in]; record male 29.5 cm [11.6 in]) with a moderately domed, rugose, thick shell. The general proportions of the species are comparable to those of the more widespread Florida Red-bellied Turtle, *Pseudemys nelsoni*, from which it differs in having a more complex pattern of head stripes. Young specimens have a typical 'cooter' carapace pattern of light bars on a dark background, but mature specimens show a tendency to become strongly mottled on both carapace and plastron. The species shows the characteristics of the "rubri-ventris" group of the genus *Chrysemys* in having a reddish tinge to the plastron, a strongly cusped upper jaw with a median notch, and a so-called 'prefrontal arrow' on top of the head in front of the eyes (an arrow-shaped marking made up of the sagittal stripe joining the two supratemporal stripes). Juveniles may have a complex plastral pattern.

RANGE: Confirmed records exist only for the lower Tensaw River and Mobile Bay, Alabama (Monroe, Baldwin, and Mobile counties (Mount 1975). Carr and Crenshaw (1975) recorded specimens from Wakulla Springs, Wakulla County, Florida, and near Apalachicola, Franklin County. However, Mount (1975) ques-

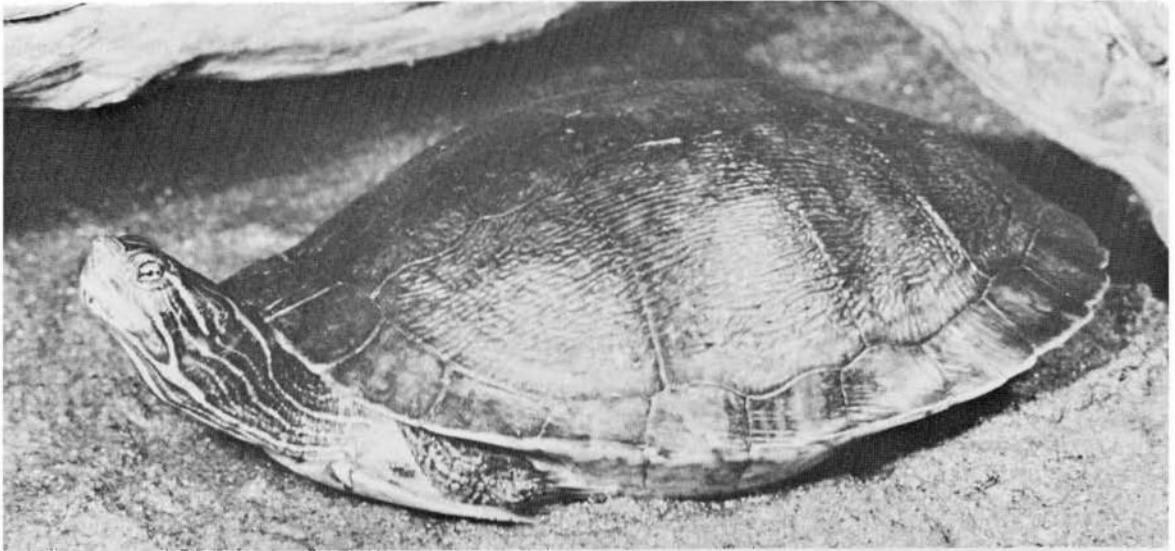


Fig. 41. *Chrysemys alabamensis* (photograph by Roger Barbour)

tioned the identification of these turtles, mentioning that James Dobie had examined one of them and considered it to be a *Chrysemys nelsoni*. It is possible that there are no valid records for *alabamensis* outside Alabama.

Jackson and Ross (1972) found a barnacle incrustated specimen on Dauphin Island.

HABITAT: This species is sometimes found in salt marshes and coastal swamps, a relatively unusual habitat for a member of the genus *Chrysemys*. However, it also occurs in rivers and streams. Mount (1975) records a population that formerly, and perhaps still, lives in Little River State Park Lake, the headwater of Little River which forms the boundary between Monroe and Baldwin counties. The writer has seen *alabamensis* in a small lake at Bellingrath Gardens, in Mobile County, near the Mobile Bay coast. Mount (op. cit.) considers optimum habitat to be the stretch of the Tensaw River between Hurricane and Spanish Port in Baldwin County.

LIFE HISTORY AND ECOLOGY: It is reported to be mainly herbivorous. The breeding habits have not been described. A fresh DOR specimen found by the writer at Mobile Bay on June 23, 1973, contained shelled eggs.

BASIS OF STATUS CLASSIFICATION: From the time of its original description this species has been considered questionably distinct by many herpetologists, and this doubt has hampered efforts to learn more of its life history or status. It is possible that the form is more widespread than is commonly recognized.

At the present time it is probable that substantial numbers of eggbearing females of this species are killed on Highway 90 east of the city of Mobile. They are also trapped for food in some places (Mount 1975).

RECOMMENDATIONS: Many more data are needed for a proper evaluation of the status and distribution of this species. A thorough study should be instituted.

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Status Undetermined SOUTHERN COAL SKINK

Eumeces anthracinus pluvialis Cope
Family Scincidae
Order Squamata
Suborder Sauria

OTHER NAMES: None.

DESCRIPTION: The Southern Coal Skink is a medium-sized (about 12.7 cm [5 in] in total length), ground-dwelling lizard having a brown or sometimes light green dorsal stripe (often with faint dark lines or rows of spots in it); laterally, a pair of thick, white or greenish-white lines run the length of the body and onto the tail. These two light lines enclose a rich brown or black lateral band; the uppermost light line passes over the eye through the supraocular scales, while the lowermost includes all the supralabial scales along the upper lip

(usually 7, with dark pigment in spaces between scales) and passes through the ear opening. Around mid-body are 24-30 scale rows. There are no postnasal scales, a single postmental scale, and the legs usually overlap when appressed. The juveniles are noteworthy for being lustrous black with no light lines on the body. The chin and area about the eyes in juveniles are white.

RANGE: The geographic distribution of this species (containing 2 subspecies) is somewhat unusual because of the absence of a central continuous "core." The three largest areal units of the Coal Skink's range lie isolated and peripheral to three smaller, isolated units. Basically the species is confined to the eastern United States but populations are found from the Appalachians to the Gulf Coastal Plain and west to the eastern edge of the Great Plains. Florida records are from Gulf, Franklin, and Holmes counties. The type locality of the Southern Coal Skink is "near Mobile, Alabama."

HABITAT: Throughout its distribution, this skink is said to prefer *humid* habitats, near water. This is probably best illustrated in Florida populations because drier, sandy hillside and upland habitats are relatively sharply set off from wetter stream bottoms or from wet depressions in flatwoods. The vegetation in these particular low-lying areas usually is dominated by one or both titis (*Cliftonia monophylla* and *Cyrilla racemiflora*), and usually contains Sweet Bay Magnolia, and sphagnum mosses. Two Franklin County juveniles reported by Stevenson (1969) came from near the edge of shallow water along the shoulder of a highway, where it cut through a swampy titi stream.

LIFE HISTORY AND ECOLOGY: Very little is known concerning the life history and ecology of the species throughout its entire range, although there are numerous published notes on geographic distribution. From an occasional comment on the species' biology in these papers, it is possible to speculate that Florida popula-

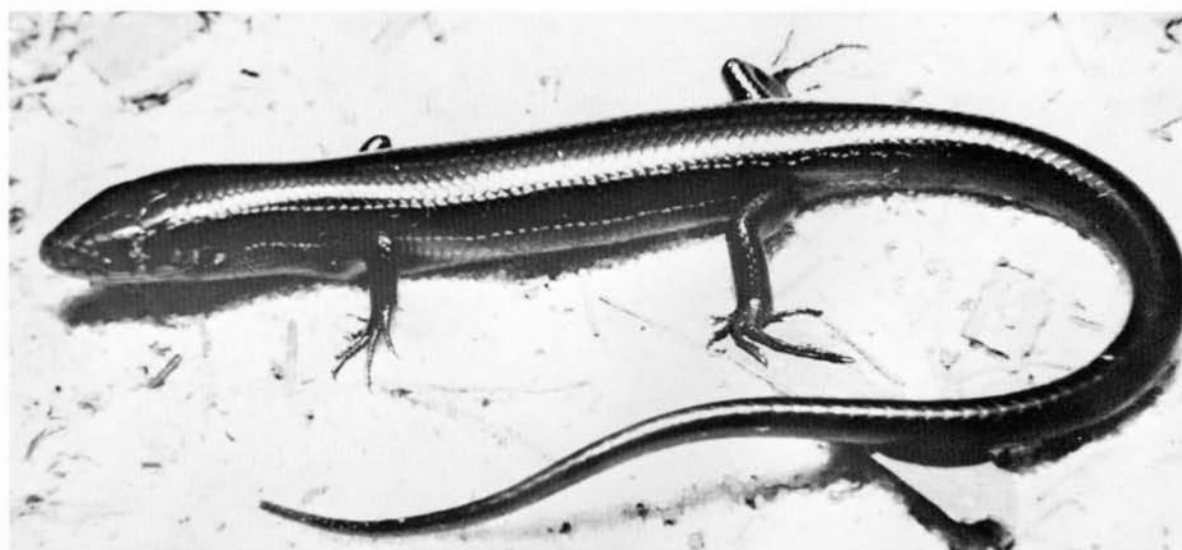


Fig. 42. *Eumeces anthracinus pluvialis* (photograph by R.S. Simmons)

tions mate in early spring and females lay about 8 small, oval eggs that they brood. Young probably hatch 4-5 weeks later, sometimes in late June or early July. The diet most likely consists mainly of terrestrial insects and other arthropods. This species is noted for its peculiar habit (for a lizard) of retreating from danger into shallow water where it hides under rubble on the bottom.

SPECIALIZED OR UNIQUE CHARACTERISTICS: Because of its discontinuous geographic distribution, the Coal Skink may be important to biogeography. Its extensive latitudinal range makes it potentially valuable to the study of race formation and comparative demography.

BASIS FOR STATUS CLASSIFICATION: Although the Florida habitat of this species is common, only 4 localities are presently known for the Southern Coal Skink in the state. This may be partly due to the secretive nature of the lizard and to the lack of zoological field work carried out in such habitats. Considering the present paucity of knowledge of this species in Florida, its secretive behavior, and the potential for its actual widespread occurrence, the status is here considered as undetermined.

RECOMMENDATIONS: A basic knowledge of any species is necessary in order to first judge whether its existence is threatened, and second to understand what can be done to preserve it. There is a critical need to know more about the occurrence, life history, and ecology of the Southern Coal Skink in Florida. Study of local populations of this lizard should be encouraged and financially supported wherever possible.

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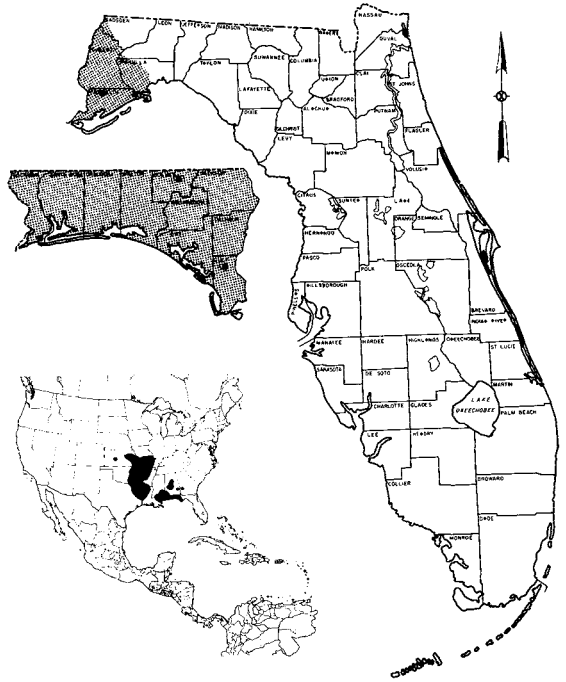
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SOUTHERN COAL SKINK (*EUMECES ANTHRACINUS PLUVIALIS*)