RECOVERY PLAN

FOR THE

ST. CROIX GROUND LIZARD, *AMEIVA POLOPS*

Prepared by

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for

U.S. Fish and Wildlife Service
Southeast Region
Atlanta, Georgia

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Approved: Robert E. Gilmore
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DISCLAIMER

This is the completed St. Croix Ground Lizard Recovery Plan. It has been approved by the U.S. Fish and Wildlife Service. It does not necessarily represent official positions or approvals of cooperating agencies, and it does not necessarily represent the views of all individuals who played a key role in preparing this plan. This plan is subject to modification as dictated by new findings and changes in species status and completion of tasks described in the plan. Goals and objectives will be attained and funds expended contingent upon appropriations, priorities, and other budgetary constraints.

LITERATURE CITATIONS SHOULD READ AS FOLLOWS:

U.S. Fish and Wildlife Service. 1984. St. Croix Ground Lizard Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, Georgia. 26 pp.

Additional copies may be obtained from:

Fish and Wildlife Reference Service
1776 E. Jefferson Street
4th Floor
Rockville, Maryland 20852

TABLE OF CONTENTS

I. INTRODUCTION 1

II. RECOVERY 8

A. Recovery Objective 8

B. Stepdown Outline 8

C. Narrative 10

D. Literature Cited 19

III. IMPLEMENTATION SCHEDULE 21

IV. APPENDIX - List of Reviewers 23

RECOVERY PLAN
FOR THE
ST. CROIX GROUND LIZARD

Part I - INTRODUCTION

Description

The St. Croix ground lizard (*Ameiva polops*) is a small species of *Ameiva* (snout-vent length 35-77 mm). According to Dodd (1980), this species has a light brown middorsal stripe, bordered by wide dark brown or black stripes below which are narrow parallel stripes of brown, black and white. Continuing onto the tail are the middorsal stripe, bordering stripes and the narrow white stripes. The tail also has alternating rings of blue and black. The top of the head is a uniform brown. Chin, throat, chest, sides of the snout and undersides of the forelegs are deep pinkish-red. The belly is light gray with lateral bluish markings. Taxonomic characteristics which distinguish this species from other *Ameiva* include: 10 (12) longitudinal rows of ventral scales, 33-39 femoral pores, dorsal caudal scales in oblique rows, enlarged median gular scales, and 2 parallel rows of preanal scales.

Taxonomic Position

According to Cochran (1941), *A. polops* is most closely related to *A. taeniura* on Hispaniola, while geographically *A. exsul* of the Puerto Rico Bank (Puerto Rico east to Anegada) is its closest congener.

Former Range and Status

In pristine times, Ameiva polops was probably restricted to St. Croix, U.S. Virgin Islands and its offshore islands and Cays. This species was thought to have become extinct during the early 20th century (Barbour 1930; Seaman and Randall, 1962). Seaman (in Baskin and Williams, 1966) reported that the species existed on St. Croix at Christiansted as late as the 1920's. Grant (1937) reported on the rediscovery of A. polops with Beatty's reports of the species at East End, in some empty lots facing Christiansted Harbor, on Green Cay and on Protestant Cay. A small colony was found on the west coast of St. Croix by Seaman and reported by Philibosian and Ruibal (1971). The A. polops at Frederiksted were last seen in 1968 (Philibosian and Yntema, 1976). While A. polops was never seen on Buck Island, St. Croix, Philibosian and Ruibal (1971) presented information suggesting that A. polops should have been on Buck Island prior to the introduction of the mongoose in 1912 to that area.

Population estimates prior to 1967 were 35 A. polops on Protestant Cay (Grant, 1937) and 100 A. polops on Green Cay (Baskin and Williams, 1966). Beatty (Grant, 1937) reported that he had "observed many scurrying about the beach, a large number of these being young" at Green Cay in 1936, and that they seemed to have disappeared from mainland locations

where they were formerly abundant. In 1967, Philibosian and Ruibal (1971) reported that there was a small colony at Frederiksted, about 200 individuals at Protestant Cay and about 300 individuals at Green Cay. After 1968, no A. polops were seen at any location on St. Croix (Philibosian and Yntema, 1976).

Present Range and Status

Green Cay and Protestant Cay off the north shore of St. Croix are the only sites where A. polops remain as of August 1983.

Based upon unpublished mark and release surveys conducted by the Virgin Islands Division of Fish and Wildlife (1980-1981) and the U.S. Fish and Wildlife Service between July 1980 and May 1981, estimates of the population ranged between 360 and 4300 individuals on Green Cay. The population on Green Cay probably does not exceed 2,500 individuals and on Protestant Cay there may be about 50 individuals. Although the figures indicate an increase in the population, it is believed that the apparent increase is a result of improved censusing techniques rather than an actual increase in the population.

Both the populations at Green Cay and Protestant Cay have been relatively stable since 1936 and probably will remain stable in the future if no significant changes occur at either site.

Causes of Decline

The account of Seaman and Randall (1962) indicates that there is only strong circumstantial evidence that correlates the decline of A. polops with the proliferation of the small Indian mongoose (Herpestes auropunctatus) to the Virgin Islands in 1884. The work of the National Park Service and the Virgin Islands Division of Fish and Wildlife with the limited control of the mongoose and the introduction of A. polops on Buck Island Reef National Monument, indicates that the mongoose was probably the principal reason for the decline of A. polops on St. Croix (Philibosian and Riubal, 1971). Nellis (1979) indicates that the introduction of the mongoose in the U.S. Virgin Islands had a significant impact in reducing native terrestrial animals and eliminated Ameiva exsul. Later removal of the mongoose resulted in a recovery of the native species except for the extirpated A. exsul.

The extensive development of the coastal fringes, Christiansted, Frederiksted and Protestant Cay, including modification to the understory such as constant raking, removal of undergrowth and other "beautification" measures, also may have contributed to the decline of the ground lizard.

The use of the toxicants diphacinone and zinc phosphide for rat control at the hotel located on Protestant Cay are not known to have caused any impacts to Ameiva polops.

Pertinent Studies

No comprehensive life history data on *A. polops* is available. Cochran (1941), and Heatwole and Torres (1967) discussed the taxonomic relationship with other species of *Ameiva*. General comments on environment and foraging activity are in Heatwole and Torres (1967) and on food in Grant (1937), Heatwole and Torres (1967), and Philibosian and Ruibal (1971). Seaman and Randall (1962), Baskin and Williams (1966), Philibosian and Ruibal (1971), and Philibosian and Yntema (1976) presented information on the possible effect of mongoose predation on populations of this species. Philibosian and Yntema (1976) documented an unsuccessful attempt to introduce the species on Buck Island. The Virgin Islands Division of Fish and Wildlife (1980-1981) conducted mark and release census studies of the ground lizard on Green Cay for the U.S. Fish and Wildlife Service during 1980-1981. Dodd (1978) summarized what was known about the biology of the lizard. Wiley (in prep.) reports on habitat utilization, behavioral repertoire and thermoregulatory behavior of the species on Green Cay. Vivaldi and Woodbury (1982) conducted a vegetative survey and habitat classification of Green Cay in January 1982.

Habitat Description

On Green Cay, Wiley (in prep.) determined that the beach areas and upland forest of the *Hippomane* - *Tabebuia* woodland were the most heavily used habitat. The principal plant species in the *Hippomane* - *Tabebuia*

woodland are the trees Hippomane mancinella, Tabebuia heterophylla, Exostema caribaeum, and the shrubs Eupatorium sinuatum, Lantana involucrata, and Croton betulinus. Wiley (in prep.) judged optimal Ameiva sites on the island as having the following components: exposed and canopied areas (including trees), leaf or tidal litter, loose substrate, and crab burrows. A. polops displayed differential utilization of habitat among size classes, with smaller individuals being found in more exposed habitat and larger lizards in canopied sites (Wiley, in prep.).

Food Habits

Ameiva polops was noted by Wiley (in prep.) to actively prowl, root and dig for prey. In 1936, Beatty (Grant, 1937) dissected a number of Ameiva and found them to have eaten the amphipods which were abundant along the beach. Philibosian and Ruibal (1971) reported that the hermit crab (Coenobita clypeatus) was a prey item for the animals introduced to Buck Island. Wiley (in prep.) observed that the smaller ground lizards foraging among the tidal wrack took grammarian amphipods flushed from the seagrasses, that small white moths were taken from under the forest litter, and that A. polops was frequently observed foraging out of sight under the litter or in shallow holes dug by the lizard.

Behavioral Activities

Foraging and food manipulation was the major activity (64 percent of activity period) of the lizard and thermoregulation (cool and bask; 31 percent) was the next most important activity (Wiley, in prep.). Wiley

(in prep.) found that home ranges of individuals overlap; that Ameiva pass the night in ground holes; that there is little feeding overlap between Ameiva polops and Anolis acutus due to temporal and foraging strategy differences; and that beach animals spend as much time cooling as basking, while forest animals spend about 15 times as much time in basking as in cooling.

Protective Actions Taken to Date

The St. Croix ground lizard was listed as an endangered species and Critical Habitat was established on June 3, 1977 (Fed. Reg. 1977). The Green Cay National Wildlife Refuge was purchased on December 15, 1977. The purchase of Green Cay provides protection to 14 of the 18 acres of the designated critical habitat for Ameiva polops; the remaining four acres of critical habitat located on Protestant Cay is leased to private concerns by the Virgin Islands government.

The Fish and Wildlife Service and National Park Service signed a cooperative agreement in January 1982 for the National Park Service to provide protection to Green Cay National Wildlife Refuge. The National Park Service, in cooperation with the Virgin Islands Division of Fish and Wildlife and the U.S. Fish and Wildife Service, is proposing a mongoose eradication program at Buck Island Reef National Monument, beginning in January 1984, to protect endangered sea turtle nests and provide an experimental release site for A. polops.

Part II - RECOVERY

A. Recovery Objective

Protect the existing population at Green Cay, insure the continued existence of the population on Protestant Cay, establish a self-sustaining population (500 or more individuals) on Buck Island by 1990, and obtain an adequate population dispersion so the species can be considered for reclassification from endangered to threatened. The lack of suitable habitat, which can be maintained free of mongoose, limits recovery actions such that the species may never be recovered to a point where it could be considered for delisting.

B. Step-down Outline

1. Protect the existing population and habitat on Green Cay

11. Monitor habitat and population levels on Green Cay at least quarterly

12. Minimize human disturbance on Green Cay

121. Establish public use regulations

122. Regularly patrol Green Cay

13. Monitor development of the north shore of St. Croix near Green Cay to minimize adverse impacts

14. Provide information about the species and the need to protect it

2. Insure the continued existence of the population on Protestant Cay

21. Monitor habitat conditions and population levels on Protestant Cay

22. Encourage maintenance and improvement of habitat conditions on Protestant Cay

23. Provide public recognition of the Protestant Cay habitat preservation

3. Experimental release of Ameiva polops to Buck Island Reef National Monument

31. Establish a cooperative mongoose eradication program at Buck Island, including the National Park Service, Fish and Wildlife Service and Virgin Islands Division of Fish and Wildlife

311. Establish a cooperative public information program with the local media and governmental agencies

312. Trap mongooses on Buck Island and evaluate success

313. Maintain a regular mongoose surveillance program after eradication and establish an emergency mongoose eradication plan if the species is reintroduced to Buck Island

32. Evaluate and select optimal location(s) for release of lizards

33. Implement and evaluate experimental capture and transplant program

4. Obtain comprehensive life history data on Ameiva polops

C. Narrative

1. The first step in insuring the continued survival and recovery of the St. Croix ground lizard is the protection of the species and its habitat on Green Cay. The U.S. Fish and Wildlife Service (FWS) must insure that the Green Cay National Wildlife Refuge will remain in its present condition.

11. A herpetologist with experience in Ameiva ecology should be contracted to establish a habitat and population monitoring program for Green Cay which can be utilized by FWS, NPS and DFW biologists in conducting the quarterly survey.

12. The only significant impact on the resources of Green Cay is human visitation. Currently the visitation levels are low and of short duration.

121. Public use regulations need to be restrictive in order to insure that human visitation does not impact on the principal foraging sites of the lizard. Entry to Green Cay should be either completely restricted or limited to the small sandy beach on the southeast corner of the cay.

122. In order to control public use at Green Cay, regular patrols of the area need to be undertaken. Since the Fish and Wildlife Service has no personnel assigned to St. Croix a cooperative management program is needed. Due to the proximity of Green Cay to Buck Island Reef National Monument, the Park Service regularly passes Green Cay. The NPS has federally trained law enforcement personnel who can be given FWS law enforcement authority in order to patrol Green Cay. The FWS and NPS can enter into an agreement whereby Green Cay could be functionally administered by NPS while FWS would still retain title and the basic jurisdiction over the area. Cooperative action by NPS and FWS will insure the best control for the funding available.

13. It is important to maintain a constant awareness of the development of the north shore of eastern end of St. Croix. The island of St. Croix is only one quarter mile south of Green Cay. Any major development near Green Cay could result in a major increase in human activity and increased chances of the Green Cay beaches (where lizards feed among the tidal wrack) becoming polluted.

Regular communications should be maintained with all local zoning agencies by FWS. Information about Green Cay and the lizard should be provided to all local zoning agencies.

14. It is important that visitors, local residents and governmental agencies be aware of the lizard and the need to protect the species. An informational leaflet about Green Cay should be prepared and made available to the public. The leaflet could provide information on the history of the ground lizard and Green Cay, and the need for protection. The implementation of an appropriate sign plan could provide a significant opportunity to provide the public with information about Green Cay and the lizard.

2. In order to maintain a second population of the species in case of catastrophe at Green Cay, it is essential to insure the continued existence of the lizard population at Protestant Cay.

21. Monitoring habitat conditions and population levels is the only way to evaluate the status of the species at Protestant Cay. A herpetologist with experience in Ameiva ecology should be contracted to establish a habitat and population monitoring program for Protestant Cay which can be utilized by FWS, NPS and DFW biologists in conducting the quarterly survey. The DFW should have the responsibility for implementing a monitoring program on Protestant Cay because the cay belongs to the Virgin Islands government. Quarterly surveys should be undertaken to evaluate the status of the species on Protestant Cay.

22. It is necessary to encourage the maintenance and improvement of habitat conditions at Protestant Cay in order to provide the lizard with sufficient areas for food and cover.

A cooperative lizard management program should be undertaken between the DFW and the hotel owner. This would insure that the Virgin Islands government would be adequately protecting the resources on their property.

Biologists from the DFW should provide the hotel management with information about the habitat requirements of the lizard. This will help them understand the types of activities that would be of benefit to the lizard.

The hotel operator and local pest control agencies should be briefed by DFW in order to insure that appropriate toxicants are used and that no secondary poisoning results.

23. A public information campaign about the lizard and the habitat on Protestant Cay would provide recognition of the efforts of the hotel in maintaining this species. A good publicity campaign involving the Tourism Office and hotel would provide potential benefits to the hotel and the lizard.

3. In order to help disperse the population and reduce the chance of a catastrophic event eliminating the species, an experimental release program at Buck Island Reef National Monument should be implemented. Buck Island appears to have suitable ground lizard habitat and is managed and protected by NPS.

311. In order to make sure the public understands the need for trapping mongooses on Buck Island, a public information program will be established by NPS. The program will provide information to the local news media, governmental agencies and interested public groups.

312. Before Buck Island can be a release site for A. polops, it will be necessary to remove the mongooses from the area. A DFW live trapping program funded by NPS and FWS must be undertaken to remove the mongooses. This type of program has been experimentally tested on other off-shore islands in the Virgin Islands by the DFW. Buck Island will be covered with a trapping grid of 200 National live traps baited with raw pork. Trapping will take place over a period of time long enough to be reasonably certain that all mongoose have been trapped.

A follow-up trapping period of two weeks will take place eight months after the mongoose removal project. This follow-up trapping by DFW will provide verification of the success of the mongoose control program on Buck Island.

313. After the trapping program has been completed, NPS will implement a mongoose surveillance program and develop an emergency plan, with DFW, for immediate eradication of any mongoose detected on Buck Island.

32. To provide a viable release site(s) for Ameiva polops on Buck Island, NPS, DFW and FWS biologists must evaluate the available vegetative and soil associations with a consulting herpetologist with experience in Ameiva ecology and select that (those) protected site(s) that is (are) similar to the habitat associations

on Green Cay. Using the vegetative survey of Woodbury and Vivaldi (1982) as basis for comparison, NPS, DFW and FWS personnel will seek similar plant community associations on Buck Island as potential release sites. Based upon trap efficiency results during the mongoose control program and NPS experience on Buck Island, potential release sites will be rated as to the degree of protection afforded each site.

NPS, DFW and FWS personnel will select at least one experimental release site and at least two alternate release sites. The sites selected will be those which exhibit a large degree of similarity to the vegetative and soil associations on Green Cay and which can be easily protected by NPS. The Fish and Wildlife Service, Caribbean Islands National Wildlife Refuges, will initiate the activities necessary to obtain approval to trap _Ameiva polops_ at Green Cay NWR and release them at Buck Island Reef NM.

33. After eradication of the mongoose, selection of release site and obtaining the necessary permits, lizards will be trapped at Green Cay and released at Buck Island. Prior to the initiation of the lizard trapping and release on Buck Island, mongoose traps will be placed at the release sites to provide security against any previously undetected mongooses.

Fifty lizards will be captured on Green Cay for an initial release at Buck Island. The lizards will be trapped using buckets and drift fences or by noosing. Hand trapping will not be permitted due to possible injuries to the lizards. The lizards will be identified with a permanent mark. The animals will be transported to Buck Island in individual cloth sacks and released upon arrival at the designated release site(s).

A herpetologist with experience in Ameiva ecology should be contracted to establish a habitat and population monitoring program for Buck Island which can be utilized by FWS, NPS and DFW biologists in conducting the surveys. Monitoring should be at least daily for the first week, at least twice a week for the next three weeks, at least twice a month for the next five months and quarterly thereafter.

NPS, DFW and FWS will prepare an evaluation report on the progress of the experimental release program. Summary reports will be prepared at the end of the first week, first month, first six months, first year and second year. NPS, DFW and FWS personnel will provide summaries of estimated survival rates and known mortalities for the evaluation reports. NPS, DFW and FWS personnel will report any known reproduction of the lizards in the evaluation reports. This information will

be used to indicate the viability of the release. Any trapping of mongooses or other potential lizard predators will be reported to NPS, DFW and FWS, and an assessment of the impact of the predators will be prepared.

A preliminary report on the overall project will be prepared at the end of the first year and a second report will be prepared at the end of the second year. The report will be as comprehensive as possible covering current status and future recommendations. If the initial release program is unsuccessful NPS, DFW and FWS will recommend a scope of future actions, including the selection of other potential release sites and the need for captive propagation.

4. In order to obtain a better understanding of Ameiva polops, comprehensive studies on the life history of the species should be undertaken. The studies will be particularly valuable in managing the population at Protestant Cay and in efforts to establish and manage populations at Buck Island.

The NPS, DFW and FWS will encourage research on the species at Protestant Cay, Green Cay and Buck Island and will provide research scientists with whatever assistance is possible.

D. Literature Cited

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Part III

IMPLEMENTATION SCHEDULE

St. Croix Ground Lizard

General Category	Plan Task	Task Number	Priority	Task Duration	Responsible Agency: FWS Region	Responsible Agency: FWS Program	Responsible Agency: Other	Estimated Fiscal Year Costs: FY 1	Estimated Fiscal Year Costs: FY 2	Estimated Fiscal Year Costs: FY 3	Comments/ Notes
I-1	Population and habitat monitoring	11	2	Ongoing	4	Refuges	NPS,DFW		6,000	4,000	
O-2	Minimize human disturbance on Green Cay	12	2	Ongoing	4	Refuges	NPS	2,000	2,000	2,000	
O-4	Reduce adverse impacts	13	2	Ongoing	4	Refuges	DFW		1,000	1,000	
O-1	I & E	14	2	Ongoing	4	Refuges	NPS		500	500	
M-3	Protestant Cay habitat preservation	2	1	Ongoing	-	-	DFW		1,000	500	
M-4	Buck Island mongoose control	31	1	1 year	4	Endanger Species	NPS,DFW	10,000 (FWS*)	10,000 (NPS)	-	
M-2	Release site selection	32	1	1 month	4	Endanger Species	NPS,DFW		3,500		
M-2	Experimental release program	33	1	Ongoing	4	Endanger Species	NPS,DFW		5,000	2,000	
R-3	Life history studies	4	3	2 years	4	Research	NPS,DFW		4,000	4,000	

NPS = National Park Service
DFW = Virgin Islands Division of Fish and Wildlife

*Cooperative program funded by the National Park Service and the Fish and Wildlife Service.

Priorities in column 4 have been assigned according to to following general rules:

Priority 1 - Those actions absolutely necessary to prevent extinction of the species.

Priority 2 - Those actions necessary to maintain the species' current population status.

Priority 3 - All other actions necessary to provide

GENERAL CATEGORIES FOR IMPLEMENTATION SCHEDULES *

Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant
13. Reintroduction
14. Other information

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

*(Column 1) - Primarily for use by the U.S. Fish and Wildlife Service

Part IV - APPENDIX

List of Reviewers

Federal Agencies

Mr. Agustin Valido, U.S. Fish and Wildlife Service, Ecological Services, P.O. Box 3005 - Marina Station, Mayaguez, Puerto Rico 00709.

Dr. Robert Brander, Virgin Islands National Parks, P.O. Box 7789, St. Thomas, Virgin Islands 00801.

Mr. Ricardo Cotte, U.S. Fish and Wildlife Service, P.O. Box 3188 - Marina Station, Mayaguez, Puerto Rico 00709.

Director, National Park Service, Department of the Interior, Richard B. Russell Building, 75 Spring Street, S.W., Atlanta, Georgia 30303.

Dr. Kenneth Dodd, U.S. Fish and Wildlife Service, Department of the Interior, 18th and C Streets, N.W., Washington, D.C. 20240.

Mr. Sean Furniss, Caribbean Islands National Wildlife Refuge, P.O. Box 510, Boqueron, Puerto Rico 00622.

Dr. Jay Gouge, National Park Service, Department of the Interior, Richard B. Russell Building, 75 Spring Street, S.W., Atlanta, Georgia 30303.

Mr. Noel Pachta, Virgin Islands National Parks, P.O. Box 7789, St. Thomas, Virgin Islands 00801.

Division of Reptiles, Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560.

Unit Manager, Fort Christiansted National Historic Site, Christiansted, St. Croix, Virgin Islands 00840.

Dr. Frank Wadsworth, Institute of Tropical Forestry, P.O. Box AQ, Rio Piedras, Puerto Rico 00928.

Dr. Jim Wiley, U.S. Fish and Wildlife Service, P.O. Box 21, Palmer, Puerto Rico 00721.

Dr. H. Franklin Percival, Florida Cooperative Fish and Wildlife Research Unit, U.S. Fish and Wildlife Service, 117 Newins-Ziegler Hall, University of Florida, Gainesville, Florida 32611.

Chief, Biological Resources Division, National Park Service, Department of the Interior, Washington, D.C. 20240.

Dr. Thomas H. Fritts, U.S. Fish and Wildlife Service, Musuem of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico 87131.

Territorial Agencies

Commissioner, Department of Conservation and Cultural Affairs, P.O. Box 4340, St. Thomas, Virgin Islands 00801.

Director, Division of Fish and Wildlife, 101 Estate Nazareth, St. Thomas, Virgin Islands 00801.

Ms. Liz Wilson, Cooperative Extension Service, P.O. Box "L", Kingshill, St. Croix, Virgin Islands 00850.

Dr. David Nellis, Division of Fish and Wildlife, 101 Estate Nazareth, St. Thomas, Virgin Islands 00801.

Dr. John Yntema, Division of Fish and Wildlife, P.O. Box 1878, Frederiksted, St. Croix, Virgin Islands 00840.

Private Organizations

Dr. Clark Hubbs, Editor - Copeia, Department of Zoology, University of Texas, Austin, Texas 78712.

National Audubon Society, 950 Third Avenue, New York, New York 10022.

Dr. Edward Towle, Island Resources Foundation, P.O. Box 4187, St. Thomas, Virgin Islands 00801.

Virgin Islands Conservation Society, P.O. Box 4187, St. Thomas, Virgin Islands 00801.

Private Individuals

Dr. Jonathan Baskin, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138.

Dr. Carter Gilbert, Florida State Museum, University of Florida, Gainesville, Florida 32611.

Dr. William MacLean, Division of Science, College of the Virgin Islands, St. Thomas, Virgin Islands 00801.

Dr. Richard Philibosian, Department of Biology, University of California, Riverside, California 92502.

Dr. Juan Rivero, Biology Department, University of Puerto Rico, Mayaguez, Puerto Rico 00708.

Dr. Richard Thomas, Biology Department, University of Puerto Rico, Rio Piedras, Puerto Rico 00931.