

A Proposal to
The Friends of Florida Foundation

for a project on

**CAPTIVE BREEDING AND HABITAT RESTORATION FOR THE
SCHAUS SWALLOWTAIL FOLLOWING HURRICANE ANDREW**

Submitted by

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CAPTIVE PROPAGATION AND HABITAT RESTORATION FOR THE SCHAUS SWALLOWTAIL FOLLOWING HURRICANE ANDREW

A. STATEMENT OF PROBLEM:

The Schaus Swallowtail butterfly, *Papilio (Heraclides) aristodemus ponceanus* Schaus, is a rare tropical element of the U.S. fauna which was described from the tropical hardwood hammocks of the Miami area in southern Dade County, Florida, in 1911. After 1924, it was extinct on the mainland and persisted only in the Florida Keys. Urbanization and habitat clearing eliminated populations in the Middle and Lower Keys by the 1960's. By 1984, the total known population was restricted to less than 70 individuals. The distribution at that time was already restricted to only Northern Key Largo and several much smaller keys in Biscayne Bay inside Biscayne National Park. Intensive surveys and field work sponsored by the Fish & Wildlife Service and the Florida Game & Fresh Water Fish Commission's Nongame Wildlife Program via contracts and grants to our research team at the University of Florida allowed the discovery by 1986 that mosquito pesticide spraying by Monroe County was severely impacting the species on Key Largo and was probably a key factor in preventing its re-establishment in other parts of the historic range (from the former hammocks of Dade County to Key West). The halting of most mosquito control spraying in the vicinity of Crocodile Lake National Wildlife Refuge on Northern Key Largo allowed the partial recovery of the species there.

Nonetheless, it was obvious (and so stated in our annual reports) that this species, living in such a small total habitat area, was dangerously exposed to the possibility of extinction via a massive storm or other natural or man-made disaster striking its small remaining geographic area of distribution. Thus with remarkable prescience in May-June 1992, the USFWS authorized us to remove about 100 eggs taken from wild females briefly caged on Elliott Key in Biscayne National Park (the then-most populous colony of the species), and the Schaus Swallowtail was brought into captive propagation under the direction of our University of Florida laboratory. This highly fortuitous timing allowed the production of larvae and subsequently over 30 diapausing pupae in captivity by the end of July 1992.

On August 24, 1992, Hurricane Andrew slammed into southern Dade County and the northern fringe of Monroe County, and totally destroyed the tropical hardwood hammocks on all the keys inside Biscayne National Park and destroyed or heavily damaged the tropical hardwood hammocks at the northern end of Key Largo. The USFWS office at Jacksonville requested an immediate field survey team to be taken by me to south Florida in order to examine and assess the damage wrought by this extremely severe storm. We started this survey just four days following the storm and discovered the extraordinary damage to the Schaus Swallowtail habitat cited above. The ecological results of this storm make it possible that these are the last 31 pupae from Biscayne National Park and hence among the last representatives of the Schaus Swallowtail left alive. Now, proper conditions for the captive propagation of the species must be planned for possibly the next two to three years in order to expand this small nucleus of a breeding population and release them again into the wild when the hammocks have recovered. Additionally, habitat restoration work is badly needed on the keys in Biscayne Bay and at the northern end of Key Largo in order to properly prepare former essential habitat areas for the species' return.

extinct in
the wild

properly
prepare"

B. OBJECTIVES:

The pupae reared in the pilot captive propagation effort of May-July 1992 (the single annual breeding season for the species) will be brought out of their overwintering diapause next April or early May 1993. By that time, we urgently need to have the right conditions for them to survive and carry on reproduction here at Gainesville. We also must be prepared to maintain their offspring through 1993, and possibly for two additional years, for subsequent field release of the butterflies into their original restored habitat areas, where we will then monitor their survival. **The purpose of this proposal is to request funds for providing the right conditions for maintenance, captive propagation, and eventual reintroduction of the endangered Schaus Swallowtail butterfly into their native Florida Keys habitats.**

C. PROCEDURE TO ACCOMPLISH OBJECTIVES:

There are two projects encompassed by this proposal: (1) *captive propagation of the Schaus Swallowtail butterfly*, and (2) *habitat restoration in the hurricane-devastated range of the species* for eventual reintroduction of the butterfly.

1. **Captive propagation:** Separate funding is making available a modular laboratory building which will contain the laboratory space required to house the pupae, and which will provide working space for handling the eggs and larvae of the next generation/s. We need to construct two greenhouses and a flight cage next to this building for culture of approximately 600 torchwood (*Amyris*) and wild lime (*Xanthoxylem*) trees (the larval foodplants), and additional plant species to serve as nectar sources for the adults. When the pupae emerge in spring 1993, the adults will be allowed to fly and go through courtship behavior in the large 20' x 30' x 12' anodized/aluminum screening flight enclosure in order to obtain matings. The enclosure is to be covered on the roof by strips of 50 and 70% shade cloth which will provide the proper pseudo-hammock conditions for the adults to mate and also to feed naturally at potted nectar sources placed within the enclosure. The purpose of the two greenhouses (21' x 31' x 12') is to provide sufficient space for the culture of the torchwood and wild lime trees brought up from native plant nurseries in south Florida.

We have worked out all the necessary culture techniques for the larval foodplants (the trees), the adult nectar sources, and the handling of the eggs, larvae, pupae, and adults, as a result of our previous pilot captive propagation project. In summary, the adults emerging from the present diapausing pupae will be mated, and a comprehensive Stud Book maintained on all breeding adults (numbered on the wings) to insure maximum possible outbreeding in the small captive group. Preceding (1986-92) captive breeding programs here at U.F. for the Giant Swallowtail and Bahama Swallowtail from the Florida Keys (species in the same genus as the Schaus) and Bjorndal's Swallowtail from Great Inagua Island in the Bahamas (*Papilio aristodemus bjorndalae*, thus a conspecific species with *P. a. ponceanus*) have helped to provide information on the most appropriate techniques for captive propagation of the Schaus Swallowtail, including mating, egg production, larval care, and correct pupation conditions. Of our June 1992 experimental group of Schaus Swallowtail immatures, the subgroup reared under lowered humidity inside a building and reared as individuals in special lab containers, eating leaves from trees brought in to the lab from trees cultured in our greenhouses, had the best (90%) survival rate to the pupal stage. This procedure is manpower-intensive, but the results are well worth the investment.

Thus our personnel needs consist of (1) two part-time student assistants to maintain the cultures of the larval foodplants and adult nectar sources 12 months a year, and (2) temporary personnel hired to handle the extraordinary time commitments necessary for proper culture maintenance activities during late April-July, when adults, eggs, larvae, and pupae are all being handled at the same during this single annual emergence and activity period for the species.

Assuming the species' habitats are not ready for reintroduction efforts in 1993, all Schaus individuals will be carried over from July 1993 to April 1994 as diapausing pupae, and the whole procedure repeated again for a second or third year of captive propagation, if necessary, for eventual release of butterflies into their native habitat again.

2. Habitat restoration: Hurricane Andrew's path exactly covered (with the highest winds and eye-wall of the storm) the former tropical hardwood hammock habitats of the Schaus Swallowtail in southern Dade County, the keys in Biscayne Bay, and the northern tip of Northern Key Largo. The extraordinary extent of the ecological destruction throughout this area was absolutely staggering on our initial survey of 28-30 August. The combination of high shear-force winds exceeding 160 mph cut off trees at a maximum of 10-12' above the ground in the hammock areas and removed all the leaves and virtually all branches from these trees, or toppled the trees. Additionally, a storm surge exceeding 10' above land level across these islands caused devastating impact on the habitat for the Schaus Swallowtail. The islands were biological deserts instead of thriving hammock forests at the end of August 1992.

An intensive study of the habitat damage and status of any surviving Schaus Swallowtail stages in the area is urgently needed. In addition, extensive damage removal of the extraordinary storm debris and habitat restoration work are needed. These two efforts need to be done simultaneously with the planned captive propagation projects which will maintain breeding stocks of the species until the Schaus Swallowtail can be reintroduced into its former native habitat upon recovery. Thus, funds are requested for experienced personnel, under the field direction of a post-doctoral-level Biologist IV (Dr. Marc C. Minno) who has intimate knowledge of the habitat areas from eight years of field work there with me, to make biological surveys of all the former hammock habitat areas, make a complete inventory of the damage, and outline what needs to be done to mitigate the damage. The second phase of this part of the project will involve sending in teams of biologists and workers to help remove the worst damage from the affected areas and restore the habitat. In particular, the original trail areas in such Schaus Swallowtail colony sites as Elliott Key and Northern Key Largo need to be cleared before the late spring months of 1993, when larval foodplants and adult nectar source plants for the endangered Schaus Swallowtail re-sprout from root crowns. Currently, debris is piled as high as 10 feet on these trails, and this extraordinary amount of debris would prevent the butterflies from reaching these foodplants. Likewise, the debris cannot be removed by natural decay processes before the onset of the next growth season, and the lack of removal may greatly retard or prohibit the recovery of those larval and adult foodplant species before weedy exotics or other undesirable plant species crowd out those hostplants essential for the next (1993) emergence and breeding season from any pupae of the Schaus Swallowtails still surviving in the wild.

Such trail-clearing can be accomplished with the aid of chain saws, shovels, etc., a small four-wheel all-terrain vehicle to help in hauling the trail debris away, and the careful supervision of biologists who know where the host torchwood and wild lime trees were previously mapped (1984-92) by our team (and which still exist as stumps that will regenerate if sufficient light and space are available). The effort exerted to clear the trails for the butterflies will also enable more rapid recovery of the vertebrate populations in the

encroachment
of exotic
vegetation

area. These animals currently lack any open areas to forage in or find food. Because the National Park Service will undoubtedly be heavily involved in restoring the buildings and other service functions on their Biscayne National Park island, and will not have the time, funding, or personnel to carry out this habitat restoration work in Biscayne National Park during this critical first year of recovery from this major hurricane, additional plans need to be made. We feel that we have the best, most experienced team available, here at the University of Florida, to serve as a nucleus to supervise this work and to organize it most efficiently and effectively.

Finally, we would monitor the recovery of the habitat and the recovery of *endangered and threatened species* at selected points in Biscayne National Park's keys, and on Northern Key Largo. (This can also be done on the mainland in selected hammock areas where the Schaus Swallowtail occurred through the 1920's.) The purpose of this status monitoring would be to study the natural recovery of the tropical hardwood hammock in areas that we have previously monitored for the last eight years and for which we fortuitously have species count and quadrant-survey data. This part of the effort would include monitoring any endangered species still in these areas or subsequently returning to these areas from other affected habitats, as well as monitoring possible releases from captive propagation efforts.

The status monitoring should continue into future years, but needs to be organized *immediately* so that the rare natural event of this major hurricane can be studied from its inception (just as the eruption of Mt. St. Helens volcano in Washington offered an extraordinary opportunity for ecologists to study the biological succession that occurred after total destruction).

D. VALUE OF THE PROJECT:

The value of this project lies in helping to save an endangered species, a unique part of the Florida fauna and especially of the lower Florida Keys. Any loss of biodiversity hurts but this butterfly is one of the few species of tropical butterflies in south Florida that is endemic and it provides a unique part of our natural heritage for future generations to enjoy. The hurricane caused tremendous damage to the sole remaining population of the species, but due to prompt action by Fish & Wildlife Service authorization, the surviving Schaus Swallowtails were able to be rescued in time for successful captive propagation. The funds provided by this grant will allow their continued successful propagation and eventual return to the wild.

E. PROCEDURE FOR MAKING THE GRANT:

Should the Board of Directors of the Friends of Florida Foundation decide to favor us with a grant, a check may be made out to the University of Florida, Division of Sponsored Research and a notice of award sent to President John D. Lombardi, University of Florida, 226 Tigert Hall, Gainesville, Florida 32611.

1993 BUDGET

(1) Captive Propagation Subproject

A. Personnel

Salaries

One half-time graduate research assistant	\$13,000
OPS student assistants for greenhouses, rearing, and field work	18,000
Clerical Assistance for record-keeping, correspondence, paperwork on orders, etc. (including 8.3% fringe)	4,000

B. Permanent Capital Equipment

Two greenhouses, 21' x 31', with climate control	38,000
Outdoor flight enclosure, 20' x 30' x 12', anodized aluminum and screening	8,250

C. Operating Expenses

Purchase of additional torchwood and wild lime larval foodplant trees from south Florida native plant nurseries (up to 600 trees at \$8.00 each)	4,800
Plastic boxes, other rearing supplies, office supplies, field supplies, telephone, postage	9,600
Field work in south Florida for assessment of prospective release sites following captive propagation	4,500

Subtotal	\$100,150.00
U.F. Overhead (15%)	15,025.00
Total	\$115,175.00

1993 BUDGET

(2) Habitat Restoration Work Subproject

A. Personnel

A scientific project manager at the Senior Biologist IV level or post-doctoral associate level at the University of Florida	35,000
Fringe benefits (UF rate of 26% plus insurance)	9,100
Two half-time graduate research assistants at \$13,000 each	26,000
Part-time assistants for trail-clearing and habitat restoration	28,000
Principal Investigator's salary (part-time, summer)	5,800
Clerical assistance for record-keeping, paperwork on orders, etc.	7,500
Fringe benefits on last two positions	3,500

B. Equipment

Small powerboat (on trailer) (to provide transportation among the islands in Biscayne National Park and back and forth to the mainland)	8,200
John Deere 4-wheel ATV vehicle for trail use	3,150
6 chain saws at \$450 each	2,700
Laptop computer (Macintosh) for recording status surveys, quadrant data, etc., and logging data and mapping it along the trails and elsewhere in the field	3,500
Macintosh IISE for wordprocessing, data analysis, manuscript preparation, report preparation, etc. at main laboratory	7,500
Shovels, rakes, machetes, other miscellaneous equipment for habitat clearing, trail work, etc.	2,300
Permanent markers (to assist in monitoring recovery of specific areas of the hammocks over ensuing years)	650
House trailer for research and recovery team housing, to be transported to Elliott Key and placed in the former visitors' center area as a field research lab office and to provide housing for field crews	19,500

C. Operating and Field Expenses

Mileage	2,400
Per diem for at least four weeks of habitat clearing and restoration in the Biscayne Bay keys and Northern Key Largo (8 people x \$50/day x 30 days)	12,000
Vehicle and boat rental as necessary for split field parties (working in several points at once)	4,000
Subtotal	<u>\$180,800.00</u>
U.F. Overhead (15%)	27,120
Total	<u>\$207,920.00</u>

UNIVERSITY OF FLORIDA

GAINESVILLE, 32611-2019



DIVISION OF LEPIDOPTERA RESEARCH
OFFICE OF THE DIRECTOR

DEPARTMENT OF ZOOLOGY
421 CARR HALL
904 392-1137

October 23, 1992

Mrs. William R. Ford
1227 Washington St.
Key West, Florida 33040

Dear Mrs. Ford:

Thank you very much for your phone call and your interest in the Stock Island Tree Snail and the other endangered species threatened by the Hurricane Andrew destruction.

As you suggested, I am sending you a proposal for submission to the Board of Directors of the Friends of Florida foundation. I know that you and Jimmy Buffett share a strong interest in Florida's endangered species. Hurricane Andrew did terrible damage to the habitat of the Schaus Swallowtail butterfly in the northern Keys, and also the last remaining colony area for the Stock Island Tree Snail, following the local extinction of the snail in June 1992 there on Stock Island.

Thus I have split the proposal into two parts, which may be considered independently or together. We badly need support in both areas, but I realize that your foundation may have financial limitations or other considerations that would prevent it from doing as much as it would like to help in this urgent situation.

In addition to the materials that I have enclosed, I would be happy to meet with you and the rest of the board to discuss any questions or provide any additional information that might be required. I look forward to hearing from you.

With best regards,

Thomas C. Emmel
Professor and Director

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Enclosures (2)