

UNIVERSITY OF FLORIDA  
GAINESVILLE, 32611



DEPARTMENT OF ZOOLOGY  
223 BARTRAM HALL  
904-392-1107

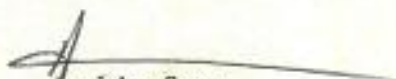
March 27, 1985

George Balazs  
NMFS  
Box 3830  
Honolulu, HI 96812

Dear George:

Many thanks for the copies of your figures for the turtle plastron ms. I think your study is well worth publishing as a descriptive account of ontogenetic pattern change in Hawaiian Chelonia. I think it is too early to generalize about relationships among Pacific turtles without comparable data from large series of specimens of each stage to show individual as well as specific variation. Comparable material for the developmental series of Chelonia in several strategically located Pacific and Indian Ocean sites will probably yield interesting results. Why don't you do this. Meantime your information on the changes in the Hawaiian turtles would make an interesting short article somewhere.

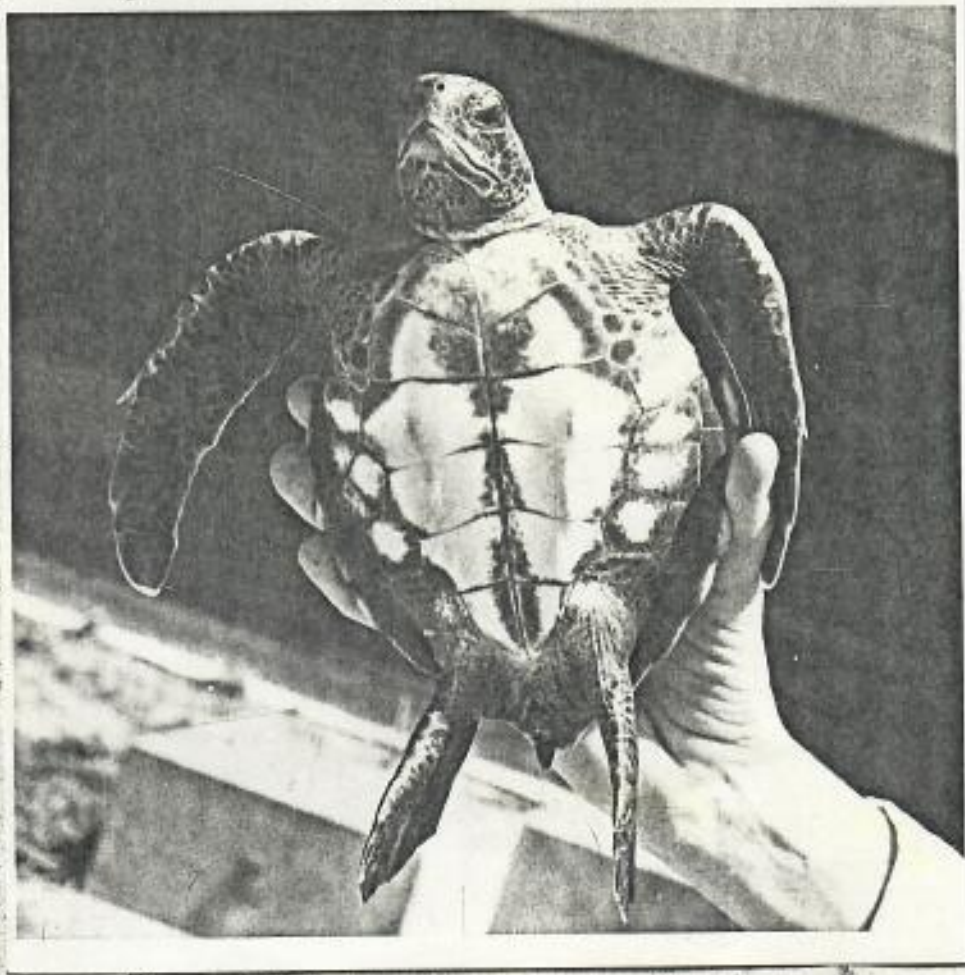
Sincerely yours,

  
Archie Carr  
Graduate Research Professor

AC/ms

George: Is this  
the same Little Man  
stage I met  
you before.

If you need a  
photo of it I  
hope we can  
find the neg.  
A





23 February 1981

Dr. Archie Carr  
Department of Zoology  
University of Florida

Dear Archie:

I'm obviously tardy in responding to you about the draft "Speciation" proposal that you mailed to me on January 15th. I have two excuses to offer- 1) that I was in a mild state of confusion preparing for, and carrying out, my study visit to Western Samoa; and 2) after initially reading the draft, I wanted some time to carefully think over the ramifications of doing this work in Hawaii and eventually dispatching turtles for distribution to museums. I won't trouble you with all of the pros and cons that have gone through my mind, but will simply tell you that I recognize the great potential value of the work, and definitely want to do it with you.

Another problem that has caused me some delay since returning to Honolulu on February 19th is the Reagan budget cuts for NMFS. I had intended to carry on for one more year (June81-June82) under this University of Hawaii-NMFS contractual arrangement. It has been very advantageous to me, and quite frankly, I don't have many other options available to me right at this time. The extension of the contract may still proceed as planned, but some uncertainty does now indeed exist. I will keep you posted.

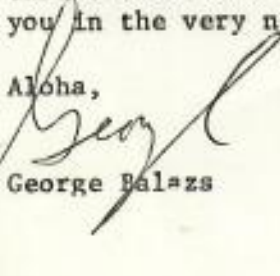
I'm still working on the proposal's budget, but assuming my salary is derived from elsewhere, the cost should be something under \$20,000. As you know, it is by no means cheap to raise turtles when you consider food, student helpers, facilities improvement, as well as shipping costs and photography supplies.

My other general and brief comments are:

- 1) You would have to be listed as the Principal Investigator- my name as co or secondary project leader. This is the only way it will get funded, in my opinion.
- 2) We should solicit funds from three sources- NSF, National Geographic, and WWF-USA. PWS and NMFS should only be approached as a last resort (they will be broke anyway, from Reaganomics).
- 3) I anticipate some tough federal permit problems due to our plan to dispatch turtles. However, I feel confident that this bureaucratic obstacle can be overcome.
- 4) If our hatchlings/eggs are received at different times from each of the areas (as seems highly likely), our rearing conditions will not be absolutely identical due to changing weather conditions here in Hawaii. Obviously there's little, if anything, we can do about this. I wouldn't expect it to be a substantial problem- would you?

That's about all I can say right now. I'll work on this some more and get back to you in the very near future.

Aloha,

  
George Balazs

UNIVERSITY OF FLORIDA  
GAINESVILLE, 32611

DEPARTMENT OF ZOOLOGY  
223 BARTRAM HALL  
904-392-1107

January 15, 1981

Mr. George Balazs  
P.O. Box 1346  
Kaneohe, HI 96744

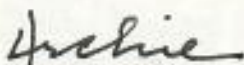
Dear George:

I enclose some notes for a possible turtle-farming proposal. I won't try to polish this up till I see what you think of the ideas at this stage. I've left the budget wholly up to you, because expenses in Hawaii will be the main part, and I can't estimate what they might amount to. Maybe space for 25 turtles from each of five localities for at least a year could be taken as one approximate production figure for part of your calculations. 125

May I saddle you with another chore? A very important one, and one that as Anne suggests, I will surely shirk. It is to start trying to generate interest in our next turtle group meeting, and to conceive and explore possible sources of travel funds - without which there will not be any meeting ever. I'll do some things along the way, but you do the rabble-rousing. O.K.?

Best regards.

Sincerely yours,



Archie Carr  
Chairman, Marine Turtle Specialist Group

AC/lw  
encl.



Budget

## WAGES

Technician, 12 months, 30 hours/wk @ 5.50 hour -	\$7920.
Fringe benefits (9.8%) -	776

## EXPENDABLE SUPPLIES

Food for turtles -	2400
Renovation of rearing tanks -	1500
tags -	50
Medication -	150
Photographic supplies & processing -	250

## TRAVEL AND SHIPPING

Honolulu-Maruata Bay, Mexico (round trip)	900
Gainesville-Honolulu (round trip) -	1200
Air Express shipping -	450

## OTHER

Telephone calls -	150
Indirect costs (University of Hawaii 32% of 7920)	2535

TOTAL -	\$18,281
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26 March 1981  
Box 1346  
Kaneohe, HI 96744

Dear Archie:

I still don't have my signed employment contract in hand for 1980-81, but it seems likely that it will be forthcoming. I have therefore proceeded to make a few comments and additions to the "speciation" proposal, and to prepare a draft budget for your consideration. I regret that it's taken me so long to get this back to you, but I did want to make sure that my position would be continued before proceeding further with the joint proposal. As I stated in my letter to you of February 23rd (copy attached), you will need to be listed as the project leader- I will be your associate or "agent" on the scene here in Hawaii where we can undertake the turtle rearing with much less difficulty than in Gainesville.

On a completely separate matter, Limpus telephoned me from Australia a few weeks ago. He does this every so often after ignoring my letters for months on end. Anyway, I took the opportunity to mention the need for a turtle group meeting. He responded by saying that his agency still might be interested in hosting the affair. What do you think- would Australia (Heron Is.?) be a good place for us to meet? I suggested Sarawak to you in one of my earlier letters (note letter from Lucas Chin that I sent to you a few days ago).

I haven't talked to you by telephone for some time now because it's becoming increasingly harder at both Univ. Hawaii and NPS to get approval for such expenditures. There was a time when all of the telephone vouchers were simply rubber-stamped. Nevertheless, we do need to talk more frequently, and I'm going to work on the problem.

My God, when did Peter Scott resign as Chairman of SSC? I just got a notice from TALBOT about an election and the fact that G. Lucas is now Chairman. What happened to Wayne?

Best regards,



George Balazs

Speciation in Separately Breeding Populations of *Chelonia*  
As Shown by Characters of the First Year Young

Co-Principal Investigators: George Balazs, University of Hawaii;  
Archie Carr, University of Florida

The aim of this project is to investigate speciation in *Chelonia* by rearing young from different populations under identical conditions and thus providing material for comparative analyses of characters which undergo ontogenetic change or disappear with age.

Background and Justification

Although sea turtle research has accelerated markedly in recent years, aspects of the biology of the group are still very poorly known. A conspicuous example is our desultory taxonomic knowledge of sea turtles. This is obviously an obstacle to both biologic research and conservation practice. If it is not known how many species and subspecies one is working with, to understand their ecologic geography or provide adequate programs of protection or management for them is obviously not possible. One reason for the elementary state of sea turtle systematics is that most studies have mainly been based on big, mature specimens, and because of storage difficulties specimens have always been few in museum collections. Another cause of confusion is that characters useful in systematics are not for the most part as well expressed in old sea turtles as in young of the first few weeks or months. As in some emydid turtles, notably *Pseudemys*, most of the good characters occur, or are most clearly expressed, in the young stages; because in older turtles markings diffuse, change in size and shape, fade, or are hidden by melanism.



The East Pacific populations of *Chelonia* show this plainly. There is no trouble distinguishing *agassizi* on the coast of Mexico or Costa Rica from *mydas* on the Caribbean shore. However, two names have been proposed for populations of East Pacific *Chelonia*, with type localities respectively in Mexico and Guatemala. Nobody has been able to point out clear differences between the two, so they are usually grouped under *agassizi* because they share a markedly elevated carapace and black upper parts and bluish suffusion of the plastron. So, however, do the populations that breed in the Galapagos and Hawaiian Islands.

NO

Preliminary examination of post-hatchling and yearling specimens of *Chelonia* from the Pacific coast of Mexico, French Frigate Shoal and the Galapagos suggests that the three can be distinguished by color pattern-- not merely color, but patterns and figures. In all three these features appear to change markedly as the little turtles grow, however; and what now is needed is a rearing program in which the ontogenetic progression of pattern changes, and of related morphometric features, can be systematically recorded. The reason that such analyses have not been made previously is that the useful characters are best expressed during the year or so following the first month of life. Because sea turtles of all kinds disappear during that stage, specimens of that age are very scarce in museum collections. Some collections have series of newly hatched turtles taken at the nest, but the good characters have not yet appeared in these, and a rearing program is clearly needed. The results of such a study will of course leave adult characters unrevealed, but this is irrelevant. The proposal is not for a definitive taxonomic analysis of *Chelonia*. It is rather to use juvenile characters to <sup>significantly</sup> advance knowledge of speciation in the genus.



Phenotypic variation in color and coloration is in some populations bewildering. It is well illustrated by Jack Frazier's series of color prints of Aldabran turtles. Peter Pritchard has seen extreme variation in Papua-New Guinea. Such diversity within populations not only confuses studies of geographically correlated variation--and thus of speciation within the complex--but also makes it impossible to confirm or disprove the occurrence of sympatry in some colonies. Since Carmen Angermeyer (*in litt.*) first began telling of two forms of *Chelonia*--a yellow turtle and a black turtle--in the Galapagos Islands, bits of evidence that the same thing occurs in numerous other Pacific localities have accumulated. Besides a main stock, the dark, high-shelled *agassizi* type, there occur also isolated individuals very like *mydas* in appearance. One such place is the Pacific coast of Mexico. Here some of the local people consider the *mydas*-like form to be a separate species, while others say it is merely an age-related stage. Comparison of series of young from different populations as proposed in this project will thus bear on two problems of sea turtle taxonomy: ① the degree to which separate breeding populations are genetically different; and ② the possibility of the sympatric occurrence of *agassizi*-like and *mydas*-like forms through parts of the Indo-Pacific. Without going into further documentation, it can be said that the problem might be relieved by such a rearing program as is here proposed.

#### Procedure

After the appropriate permits have been obtained, and as the nesting season of each colony begins, samples of eggs or very young hatchlings will be taken at the following localities: ① Maruata Bay, Mexico; ② San Jose, Guatemala; ③ Naranjo, Costa Rica; ④ The Galapagos Islands; ⑤ The Hawaiian

Archipelago (French Frigate Shoal). The sample from each locality will include young from several nests--say, ten turtles from each of five egg complements. Where hatchery programs are under way, young turtles will be taken; otherwise eggs will be taken. With minimal delay, all hatchlings will be sent to Honolulu and installed in tanks. Constant, homogeneous conditions will be provided for the turtles and they will have the same diet and feeding schedule. On arrival all will be photographed in dorsal, ventral, lateral and frontal view; and thereafter standard photographic and morphometric sampling will be repeated at the following ages: one month; three months; six months; nine months; one year. If accelerated changes appear to be occurring in any intervening period, additional measurements and photographs will be made. If, after nine months, change has slowed down markedly, the samples being reared will be cut down to more manageable size. As turtles are no longer needed for continued study they will be: (1) sent to localities within the range of the population from which they were taken, and released there; (2) given to marine aquariums; or (3) placed in the taxonomic collections of selected museums. The project seems sure to reveal taxonomic differences that justify revival of available taxonomic names for some of the stocks; if so, museums everywhere will be interested in acquiring series of the different forms for their research collections. If possible under the operative permit regulations, this would be a useful disposition and one consonant with the basic aim of the project.



Personnel

The project will be directed and supervised by the Co-Principal Investigators, George Balazs and Archie Carr. The routine care and feeding of the turtles will be provided by a Technical Assistant from the University of Hawaii.

Budget

George, please figure this out. Include one trip to Michoacan from here (or there), a small sum for local fees for collection, packing and shipping of eggs and hatchlings, and a reasonable amount for air express (Costa Rica - Gainesville; Gainesville - Honolulu; Galapagos - Honolulu; etc.).

If you want a partial salary from the grant, and know of a source that might provide it, stick that in, too. Also, exercise imagination and come up with a fund for turtle feed. And whatever else you think of. Telephone calls, for instance.