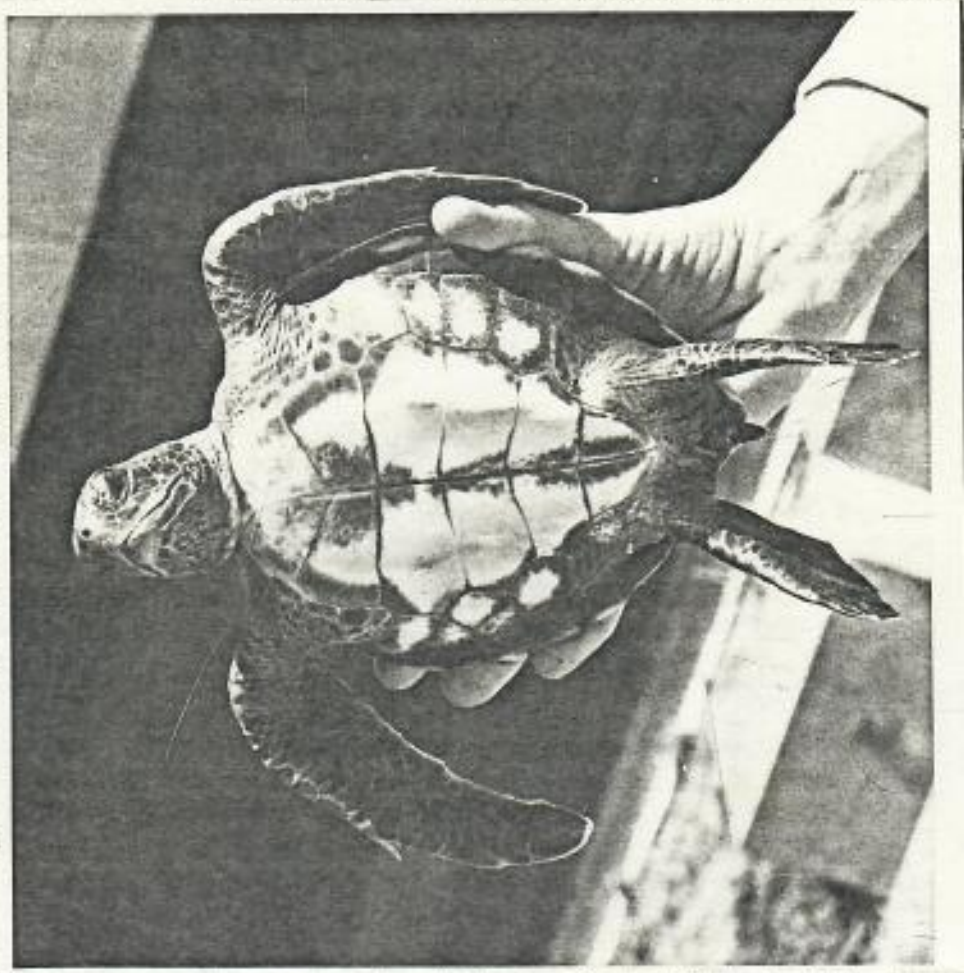


1980s G.H. BALAZS PIGMENTATION FILE



George: Is this
the name Little Man
stage I paint
you before.
If you need a
photo of it I
hope we can
find the neg.

UNIVERSITY OF FLORIDA

GAINESVILLE, 32611



DEPARTMENT OF ZOOLOGY
225 BARTRAM HALL
904-382-1107

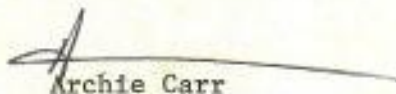
March 27, 1985

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

~ NOV 1980

2-4-85

Can (904) 392-1250

Turtle died shortly thereafter. pigment seemed to have been fading out at that point.

E. Pacific base
discoloration
shading

NEED
Send to
Mortimer
↓
KSC 131
Send?
Lockers?
part part part

Where is pigment?
in eastern Pacific?

Histologically?

Pig. in plastron?
↓
absolutely
not in
Tortyuan young
turtles.

"Little Man"
at 40 weeks



PURE WHITE AT HATCHING ??

Like Hawaiian

Note shape and heavy pigmentation of head and lower jaw;
heavy pigmentation of underside of marginals.
ventral hind flippers too?

Near Life Size - NOTE SIZE OF FINGERS - EST ~ 9 cm SL

17 July 85

George -

Just a quick note - I am practically preparing for trips to Georgia, Canada & Bahamas all to take place too soon & too close together.

J. Hepp. sent me your ms to review, of course I recommended publication, but wanted to write to you directly about Archie's "Little Man" info. Enclosed is slide of Little Man at 15 months, held in my hand - estimated carapace length ~ 18-20 cm. He lived for some time after this, but this is last photo I could find. His body resides in the Florida State Museum w/ date of death, but it was locked today, & I won't have time to check later on condition of his plastron, coloration or age at death. ^{After maybe, can give you the info.} I recall him being 10-12" carapace length & maybe two years old - but I could be way off. I wasn't taking care of him. Please return the slide to me. You are welcome to copy it - I just don't have time. I'll be back third week in August if I can help.

Best,
Karen

LIBRARY PHOTODUPLICATION ORDER FORM

Caldwell

C

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pp. 113-4

Title (with author and pages for periodical articles) (Incl. edition, place and date)
Caldwell, D. K.
Hatching green sea turtles, Chelonia mydas at sea in the
Northeastern Pacific Ocean Any edition

Verified in (or Source of reference)
Zool. Record. Repkilia, p. 9

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HATCHLING GREEN SEA TURTLES, *CHELONIA MYDAS*,
AT SEA IN THE NORTHEASTERN PACIFIC OCEAN

LIBRARY OF
GEORGE H. BALAZS

Carr (1967: 101) stated that he knew of no place that small sea turtles of any kind could be caught with any degree of regularity. His reference was to very small turtles at sea, and not to emerging hatchlings on the nesting beach.

Small sea turtles are highly prized by salt water aquarists and command a premium price. In early June, 1963, several tuna and sardine fishermen brought with them hatchling- and just post-hatchling-sized green turtles, *Chelonia mydas*, when they returned home to San Diego and San Pedro, California, from the Revillagigedo Islands. The fishermen reported that the turtles were frequently encountered at the surface around Clarion and Socorro Islands during the summer, and at night often came up to the lights of their anchored vessels where they were easily dipnetted. The response by the aquarium hobbyists to this discovery was instantaneous and \$25.00 or more apiece was offered for the turtles. With this incentive, the fishermen brought back large numbers of these baby green turtles on succeeding trips that year, and repeated this the following year. Enough turtles were brought in to flood even this large and lucrative market to the point where some dealers were having trouble selling the turtles for even \$5.00 or less.

Similar data on the capture of baby green turtles at sea was provided by Mr. Gilbert Furuya, a commercial fisherman, although his findings were not confirmed by subsequent captures. He wrote me (*pers. comm.*, 21 December 1963) that in November of that year he had scooped up a number of hatchling-sized green turtles about 50 miles SE of Manzanillo, Mexico, and about 10 miles offshore. He noted that his boat was drifting at night with floodlights hanging over the side and that from their behavior the turtles apparently had been attracted to his lights. He felt that the turtles were there that time of year, and earlier, regularly enough and in large enough numbers to make him confident of collecting them again.

Green turtles nest in the Revillagigedo Islands (Caldwell, 1963), and Mr. Furuya's locality data would be approximately off the Mexican state of Michoacan where green turtles also nest (Peters, 1957; Caldwell, 1963). Consequently, these hatchlings almost certainly came from those rookeries. How long they remain in the waters in either vicinity is not known, but enough were there in season to make it worthwhile for the fishermen to capture them. Certainly they were there more dependably than the occasional baby sea turtle of any

species that is infrequently captured as a straggler at sea throughout most of the tropical and temperate waters of the world.

I examined some of the turtles from each locality and confirmed the identifications and the fact that they were hatchling or just post-hatchling in size. Not enough data are available to determine if these hatchlings were *Chelonia mydas agassizi* or *C. m. carrinegra*. All were very dark dorsally and almost white ventrally. Specimens were deposited in the herpetology collections of the Los Angeles County Museum of Natural History.

LITERATURE CITED

- CALDWELL, DAVID K. 1963. The sea turtle fishery of Baja California, Mexico. *Calif. Fish and Game*, 49: 140-151.
- CARR, ARCHIE. 1967. *So excellent a fisher*. Garden City, New York: The Natural History Press. x + 248 p.
- PETERS, JAMES A. 1957. The eggs (turtle) and I. *The Biologist*, 39: 21-24.

David K. Caldwell, Marineland Research Laboratory, St. Augustine, Florida 32084.

Accepted for publication February 4, 1969.

LIBRARY OF
GEORGE H. BALAZS

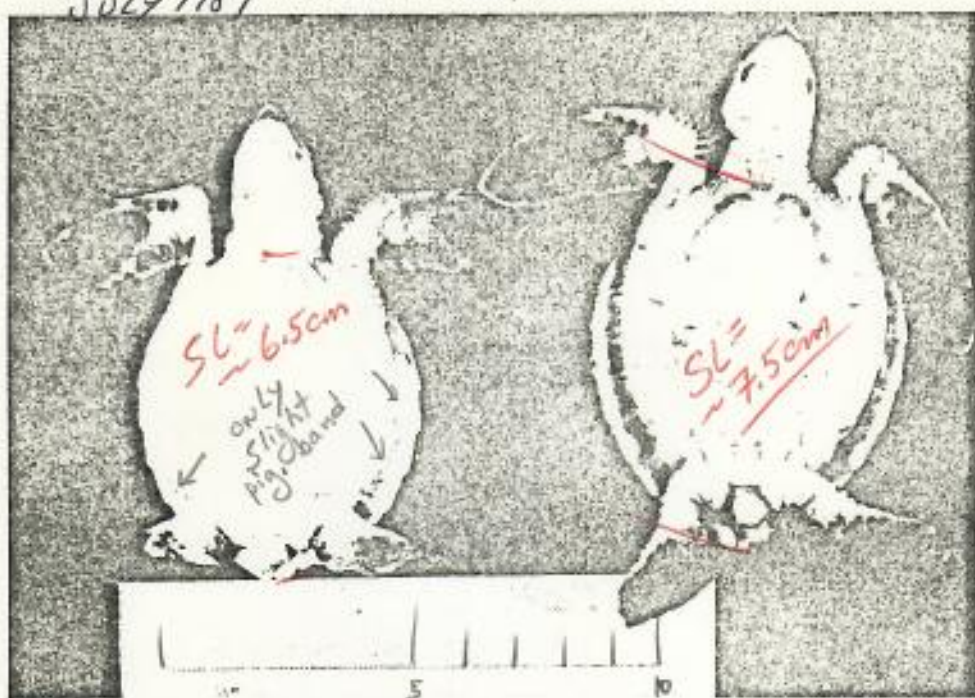


Fig. 1. The effect of housing on rearing green turtles in captivity. On the left, a six-week-old hatchling (group reared) with chewed flippers and tail. On the right, a clutchmate (individually reared), free of lesions.

However, this would soon become impractical. Alternatively, the stocking rate should be reduced from 20/basin to 5-10/basin.

ULCERATIVE STOMATITIS—PNEUMONIA COMPLEX

Ulcerative stomatitis ("canker") has been recorded in many species of captive reptiles throughout the world including the African rock python in Kenya (Cooper 1973), Gaboon viper in North America (Kuehn 1974), South American boa constrictor in the United States (Stull and Anderson 1976), Reticulated python in the United States, and the Greek tortoise in England (Hess and Rudy 1974; Holt and Cooper 1976).

In snakes the first sign was the appearance of a bubbly exudate around the lips. The animal refused to eat and would not attack its prey. In the acute lesion the gingiva adjacent to the upper and lower dental arcades were inflamed and swollen. As the infection progressed copious amounts of yellow to grey exudate accumulated between the lips and palate. The exudate was invariably aspirated into the lungs or swallowed, and pneumonia or gastroenteritis followed. *Pseudomonas fluorescens*, *Ps. aeruginosa*, *A. hydrophila* and *Proteus* spp were frequently

isolated from caseous material (Wallach 1969). The Greek tortoise of Holt and Cooper (1976) had developed acute haemorrhagic stomatitis after emergence from hibernation. Both forelegs were covered with fresh blood which appeared to have originated from a deep diphtheritic ulcer located on the dorsum of the tongue.

Pneumonia has been reported in captive sea turtles by Keymer (1978) in England, and Jacobson *et al.* (1979) in the United States. As veterinarian at the London Zoo, Keymer (1978) noticed a Loggerhead (*Caretta caretta*) and a green turtle swimming with difficulty near the surface of the water, the former with its head tilted downwards. *Penicillium lilacinum* was subsequently isolated from granulomatous nodules in the lungs of the loggerhead (Austwick 1974) and identified by histological examination in the green turtle. Jacobson *et al.* (1979) cultured *Paecilomyces* spp., *Sporotrichium* spp. and *Cladosporium* spp. from multifocal granulomas in the lungs of maniculture-reared green turtles. These turtles showed a buoyancy abnormality by swimming at an angle to the horizon.

Field observations

During the summers of 1977-78 and 1978-79

ular pattern of distribution was from front and rear legs appeared in and by day

turned when days old, on peak, ally failed to a six week group reared were the same s (Fig. 1) V. ophila were maternal heart

min A sup- prevent the

a peak in nd was most let feeding

roptila were things when

e gross and ose of farm lesion-free ers

ted that skin vbiting with s to produce

t from those 75) in many appeared in 1 with 8-12 sions were ers in areas o the more sions Most teror tooth esponsible. acteristic in semble the ebell *et al.* a inclusion um

(1 basin) in eliminated.

judinal flexibility at the bridges and along the midline of the pias-
tron; the chest can thus move in and out slightly as the turtle
breathes.

The jaw surfaces of sea turtles show adaptations to the differ-
ent dietary specializations of the various species; the vegetarian
green turtle has finely serrated jaw surfaces, which in some popu-
lations form quite long pseudo-teeth. The loggerhead and the rid-
leys have jaws adapted for the functions of crushing and grinding.
The hawkbill has a narrow head with the jaws meeting at a highly
acute angle, which facilitates extraction of food organisms from
crevices in coral reefs. The leatherback has delicate scissor-like
jaws which would suffer severe damage if subjected to anything
much harder than the usual food of jellyfish.

In recent years, the concentration of female sea turtles in cer-
tain favored areas for nesting and the dispersal of the turtles at the
end of the nesting season have prompted wide-scale tagging pro-
grams in an effort to elucidate the migrations of the various spe-
cies. Although other kinds of tag have been used occasionally, the
universally favored type is a Monel metal cattle ear tag which is
clipped through the trailing edge of the front flipper by means of a
specially designed pair of pliers. In areas where turtles are not
completely protected by law, these tags offer a reward to the cap-
tor of the turtle, and in this way a picture of the migration patterns
of the turtles is gradually built up. Such results are discussed for
each species later in this chapter; however, it appears that the
green turtle is the most purposeful migrant, making journeys be-
tween well-defined and sometimes quite circumscribed nesting
and feeding grounds. The one-way journey may on occasion be as
much as 1,500 miles. The ridleys and the leatherback appear to dis-
perse widely after nesting and to re-concentrate for the next nest-
ing season; leatherbacks have been recovered over 3,000 miles
from the point of tagging. Loggerheads, which are typically tem-
perate-zone nesters, show a tendency to move into warmer, more
tropical waters during the winter months. Long-distance migra-
tions have not yet been demonstrated for the flatback or the
hawkbill. The mechanisms of sea turtle navigation have been the
subject of intensive experimentation and speculation, but we still
do not know what cues or sensory systems are involved.

GENUS CHELONIA

The green turtle, *Chelonia mydas*, may well be considered the
'archetypal' marine turtle; it is the largest of the hard-shelled spe-
cies, it is found in all the tropical oceans, and it is of such economic
importance that Archie Carr, the world authority of the species,
has called it 'the most valuable reptile in the world.' When Euro-
peans first penetrated to the tropical seas, it was in many cases the

Plastron coloration

green turtle that kept them alive; these big, succulent reptiles
abounded in many areas and could be captured without any equip-
ment or skill simply by turning them on their backs when they
emerged from the sea to lay their eggs. At the present time the
green turtle has lost its importance as a victualling source for
ships, but it still has great economic importance, not only as a pro-
tein source for subsistence-level coastal people, but also as the
only source of 'real turtle soup' beloved by high-living Europeans
and the source of most of the turtle steaks which are in ever-
increasing demand, more by novelty-seekers than gourmets, in
resort restaurants in the Caribbean, Florida, Hawaii, and other
places. In view of this enormous demand for green turtle products,
it is not surprising that whole breeding populations have been
wiped out within historical times and many others have been deci-
mated; indeed it is amazing that the species has managed to sur-
vive at all in some places where exploitation has been intensive for
generations.

The green turtle is a handsome, streamlined creature with a
smooth, heart-shaped shell and a rather small, anteriorly rounded
head. The flippers are long, and the normal mode of progression
both in the water and on land involves simultaneous sweeps of the
forelimbs.

The carapace of the green turtle is dark blue-black in the
hatchling, and this coloration may persist for several weeks or
months. However, before long the central part of each dorsal scute
lightens to a mid-brown color, and by the time a carapace length of
about one foot has been reached, the central and costal scutes have
assumed a pattern of radiating streaks of buff, brown, and black.
The intensity of this pattern is extremely variable even for turtles
of the same size and from the same population; in some individ-
uals light colors predominate, in others dark. The dorsal colora-
tion of the mature green turtle shows even greater variability; the
background color may be green, olive, brown, buff, or black; radi-
ating streaks, either entire or broken, may be present, or the juve-
nile pattern may break down completely, reduced either to irregu-
lar spots or to a plain overall slate-grey color. In some areas (e.g.
South Yemen) it has been observed that most of the turtles with
the spotted pattern are males, but this does not hold up in all other
areas, and it is possible that it is simply the oldest turtles that be-
come spotted and that, in areas where females are killed on the
nesting beaches, nearly all of the old animals are males.

The underside of *Chelonia mydas* is pure white in hatchlings
with the exception of a band of dark pigment along the underside of
the marginal scutes. This band varies in intensity from one popula-
tion to another; it may be intensely black in juvenile Ascension
turtles. The proximal parts of the flippers are white, but the distal

parts are black. The coloration of the head and flippers tends to be an extension of that of the shell. However, the edges of the head scales are pale throughout life, and the soft skin between the scales of the flippers is light-colored in juvenile specimens.

The plastron remains virtually unpigmented throughout life in green turtles from most parts of the world, merely becoming pale yellow instead of pure white in adults. However, in the East Pacific area, the plastron soon acquires extensive areas of grey. Details of this population, which is considered to be referable to a distinct subspecies (*agassizi*), are given below.

The squamation of the green turtle normally consists of four pairs of costal scutes, five central scutes, eleven pairs of marginals, a pair of supracaudals, and a single broad nuchal. The scutes are rather thin and are juxtaposed throughout life. The plastron includes the usual paired elements as well as one or two interguars and sometimes a narrow interpectoral scute. There are four pairs of inframarginals. The commonest variant dorsal scutation involves the inclusion of a small extra central scute between the fourth and fifth large scutes. Occasionally there may be an extra costal scute on one or both sides. The nuchal scute, unlike that of the ridleys and the loggerhead, does not make contact with the first costal scute on each side. The head sculation typically includes four postocular scutes and is normally symmetrical, without the extensive scale fragmentation shown by *Caretta* and *Lepidochelys*. The largest scale on the crown of the head is the frontoparietal, which is preceded by a smaller frontal and a single pair of elongate prefrontals. On each side of the frontal is a supraocular, and behind each of these is a temporal. A pair of parietals is situated behind the frontoparietal, with an additional temporal on the outer margin of each parietal.

The head of the green turtle is relatively small, with large orbits, more or less parallel sides, and a short, rounded snout. The alveolar surfaces are rather complicated, there being strong ridges parallel to the outer edge in both upper and lower jaws; the lower jaw has a strong 'tooth' at the rear of the symphysis, and this fits between and behind two similar though blunter 'teeth' in the upper tomium. The outer margin of the lower jaw surface is denticulate, especially in certain East Pacific populations, and these denticulations correspond to vertical grooves in the inner surface of the cutting edge of the upper jaw.

The adult size of the green turtle differs from one part of the world to another. A typical mature green turtle of either sex has a carapace length of about 40 inches and a weight of 300 to 350 lbs. East Pacific green turtles, which correspond to the subspecies *agassizi*, are smaller, averaging about 32" at maturity (smallest about 28"; largest about 39"). On the other hand, certain areas, in-

cluding Surinam and Ascension Island, are characterized by green turtles of enormous size. The average carapace length in Surinam is about 44", while the largest specimen known from there had a 48" carapace and weighed 483 lbs. In 1873, I found a green turtle in French Guiana measuring 50½" (over the curve). In Ascension the maximum size is still greater; the largest green turtle measured anywhere in recent years was a 55" female from Ascension. The heaviest green turtle caught in modern times was a pathologically obese sterile female from Grand Cayman Island; although only 49" long, it weighed 849 lbs. Its shell is still to be seen in Ira Thompson's Museum on Grand Cayman. The biggest specimen ever caught is supposed to have weighed 850 lbs.

At the present time, nesting of the green turtle in the continental United States is limited to a handful of females which come ashore each summer on the Atlantic coast of Florida. In former times, however, nesting was much more common in Florida, and immature green turtles were common even off North Carolina, where they are virtually unknown today. Moreover, a century ago green turtles of enormous size (up to 1000 pounds according to True, though this weight estimate is usually discounted nowadays) were common near Cedar Key, on the Gulf Coast of Florida. Today mature greens are rarely seen north of the Florida Keys, and the few still found at Cedar Key usually weigh fifty pounds or less. In the Caribbean there are still two major nesting sites for the green turtle: the beach that extends south for 22 miles from Tortuguero, on the Caribbean Coast of Costa Rica; and the half-mile sandbank known as Aves Island, in the middle of the East Caribbean, over 130 miles from the nearest land of any sort. On a peak-season night, two or three hundred turtles may nest along the entire beach at Tortuguero and two or three dozen at Aves. The Tortuguero rookery has been studied more intensively than any other. Dr. Archie Carr, of the University of Florida, has maintained a research camp there every summer since 1955, and a tremendous volume of data on the nesting population has been accumulated. Tortuguero was also the source for baby turtles for 'Operation Green Turtle,' a program designed by Dr. Carr, and supported by the U.S. Navy, for taking newly hatched green turtles to various Caribbean beaches from which the nesting population had been extirpated, in an attempt to imprint the babies on these beaches so that when they reached maturity they might return there to nest. Unfortunately no new breeding colonies appear to have been established, and a few years ago the experiment was discontinued.

*Nevertheless, some believe that the green turtle is making a comeback in Florida, and summer nesting emergences on Hutchinson Island and Merritt Island are becoming almost routine.

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.

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.



UNIVERSITY OF FLORIDA
GAINESVILLE, FL 32611

DEPARTMENT OF ZOOLOGY
223 BARTRAM HALL
904/392-1107

27 March 1985

Mr. George Balazs
U.S. Dept. of Commerce
NOAA/NMFS
P.O. BOX 3830
Honolulu, Hawaii
96812

Dear George:

This is just a quick note to say that I recently was looking through my photos showing the ventral surface of adult green turtles from Ascension Island. The ventral marginals in the adults are much darker than the same in Tortguero turtles. The coloring in the adults is, however, much lighter than in the *Ascension* hatchlings. Actually, it is about the same color as the 10 to 12 cm carapace length turtles that I looked at in the Florida State Museum.

I hope all is going well with your note, and with your life in general.

Warm regards,

UNIVERSITY OF FLORIDA

GAINESVILLE, 32611



DEPARTMENT OF ZOOLOGY
223 BARTRAM HALL
904-392-1107

18 March 85

Dear George —

Thank you for sending me a copy of your manuscript. Some new information about ontogenetic changes in plastron pigmentation very recently came to my attention. Here at University of Florida we have a new graduate student from Japan who wants to do his research on sea turtles, and who has worked on the project in the Ogasawara Islands of Japan. He showed us a portfolio of photos and other information from that study. His photos indicate that the Japanese green turtles do exactly what you have described in the Hawaiian turtles. He said that I could make the enclosed photocopy of a page from his photo album and send it to you. I don't know if you want to include this information in your paper or not. Perhaps you would rather just ignore it and go ahead and publish your note as is. The Japanese fellow could then publish his own data later. He said, however, that if you want to include his information in your paper it would be OK with him. I am sure that you would agree that if you do decide to use his information he should be fully cited. His name is Kazuo Horikoshi and he took the enclosed photos while working with H. Shuganuma at the Ogasawara Marine Center, Chichi-jima, Ogasawamura, Tokyo, Japan. (The preceding is the mailing address.)

I hope that you can read my "chicken scratchings" that I made on your manuscript. I think the paper looks good overall, but I felt that the introductory section needed a bit of work. Nothing serious really. I think that some statements in that section could be deleted without damaging the paper. I also think that if you re-order some of the sentences in the same section your arguments will flow a little better.

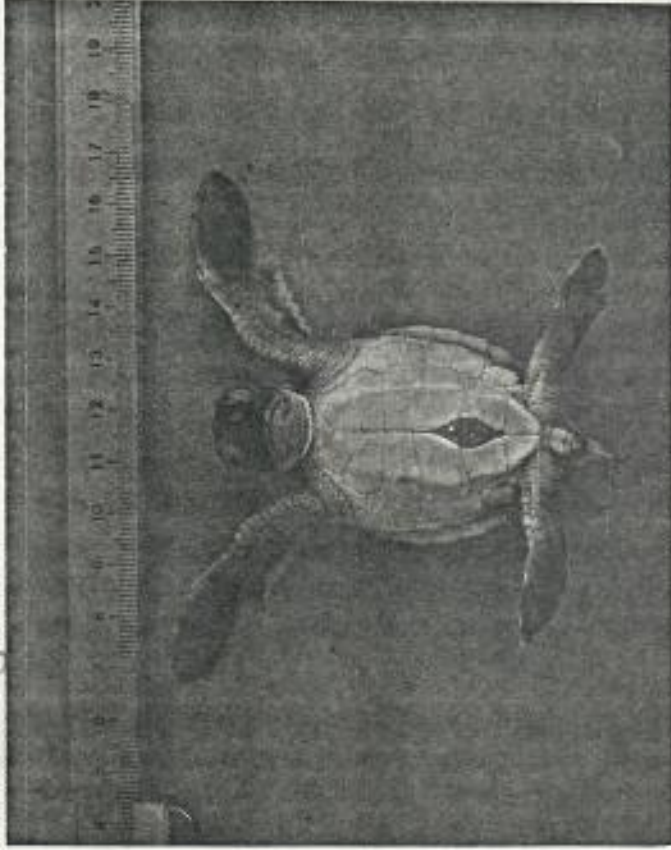
I didn't make many comments on the last 2 1/2 pages of the manuscript, partly because I wasn't sure if you wanted to include the information from Japan, and partly because I think that section is clearly written.

I guess that is about all for now. Once again thank you for the sand sample. I will let you know what I find when all my sand samples are analysed. During the last few weeks I have put my sand analysis aside and have been working on a manuscript of my Ascension Island study--Reproductive Homing and Interesting Behaviour. It is just about ready to submit to Animal Behaviour.

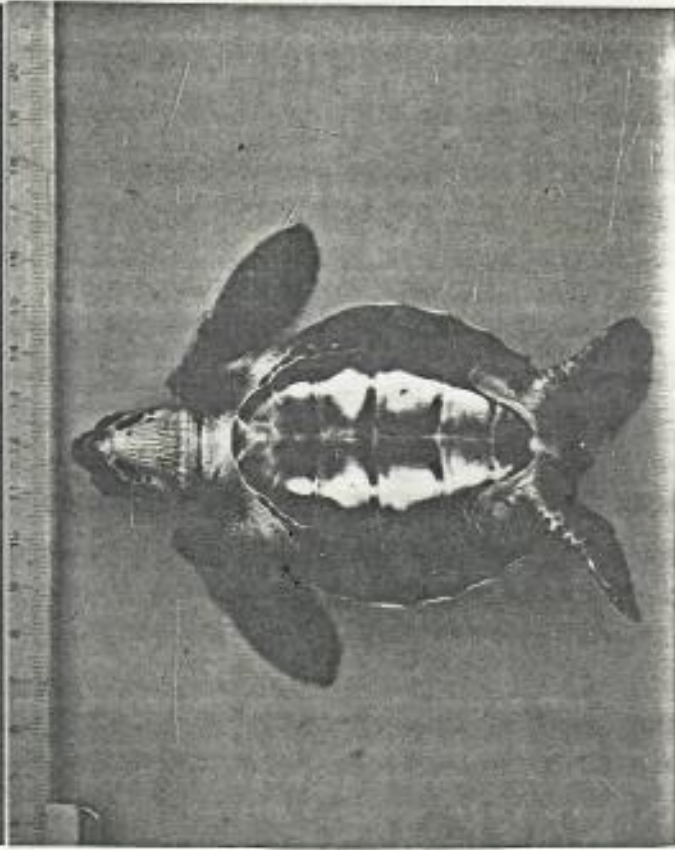
I hope that the enclosed is accepted for publication soon.

Warm regards,

a) Hatching Turtle



b)



Hatchlings reared in The OGASAWARA ISLANDS, JAPAN

c) Yearling Turtle



COLOR CHANGING OF PLASTOLON

FROM PERS.COMM.

KAZUO HORIKOSHI (a Japanese student in the
graduate school here in Zoology at the
University of Florida.)

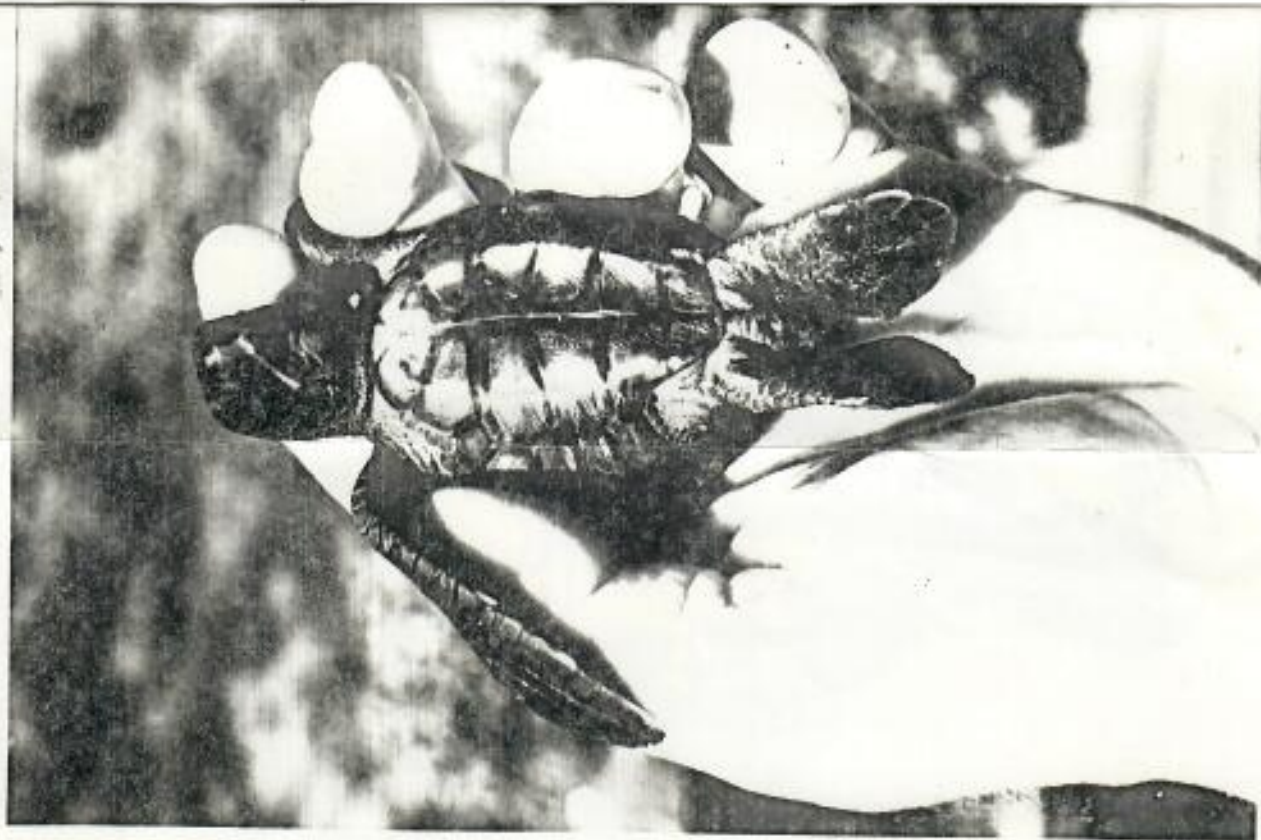
DATA FROM WERE DONE IN COLLABORATION WITH:

H. SHUGANUMA
OGASAWARA MARINE CENTER
CHICHI-FIMA, OGASAWARA MURA
TOKYO, JAPAN



ABOUT FEMACE - MARQUATA BAY, MEXICO

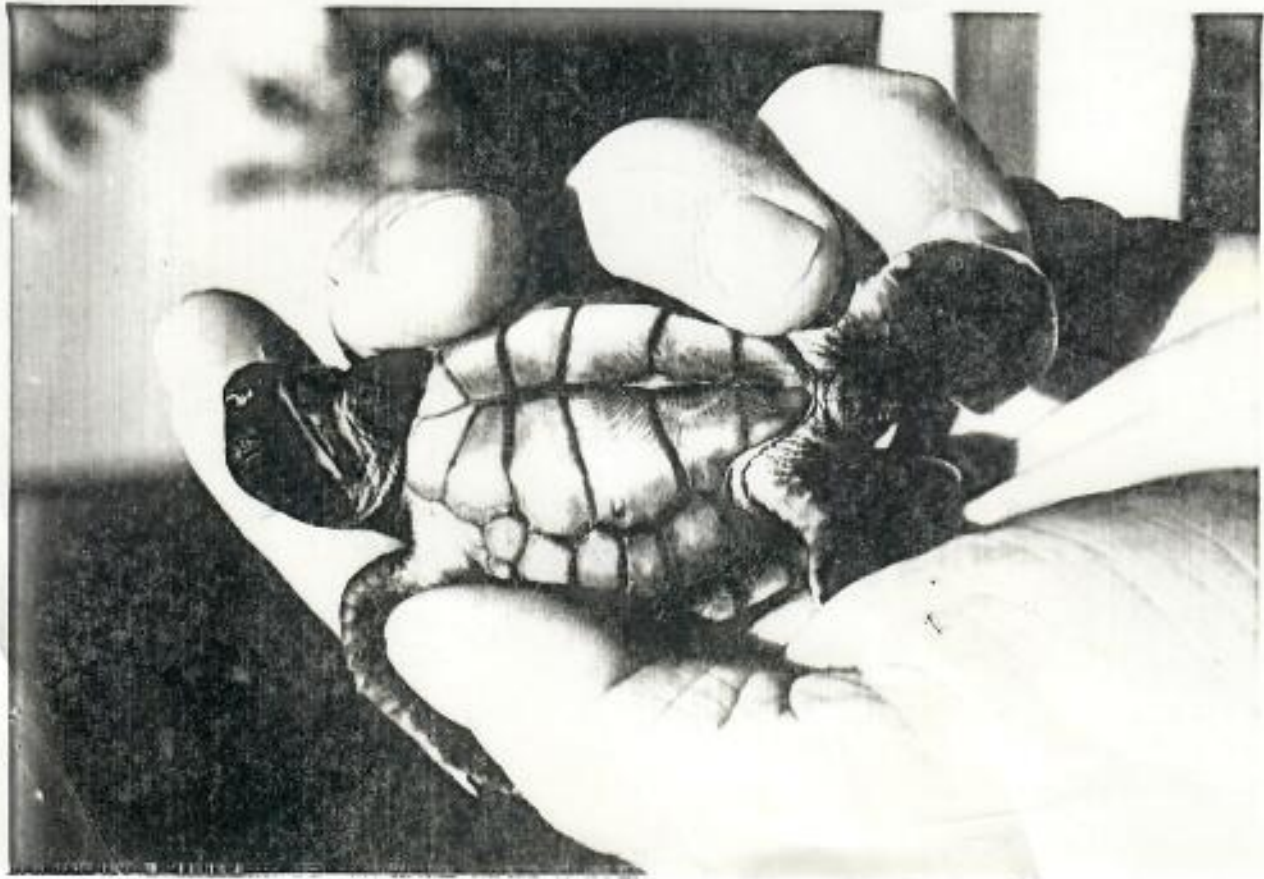
SMP. NEW =



b Bb

10/7/80
30 DAYS OLD

65 7.0 cm



4. a

9/21/80

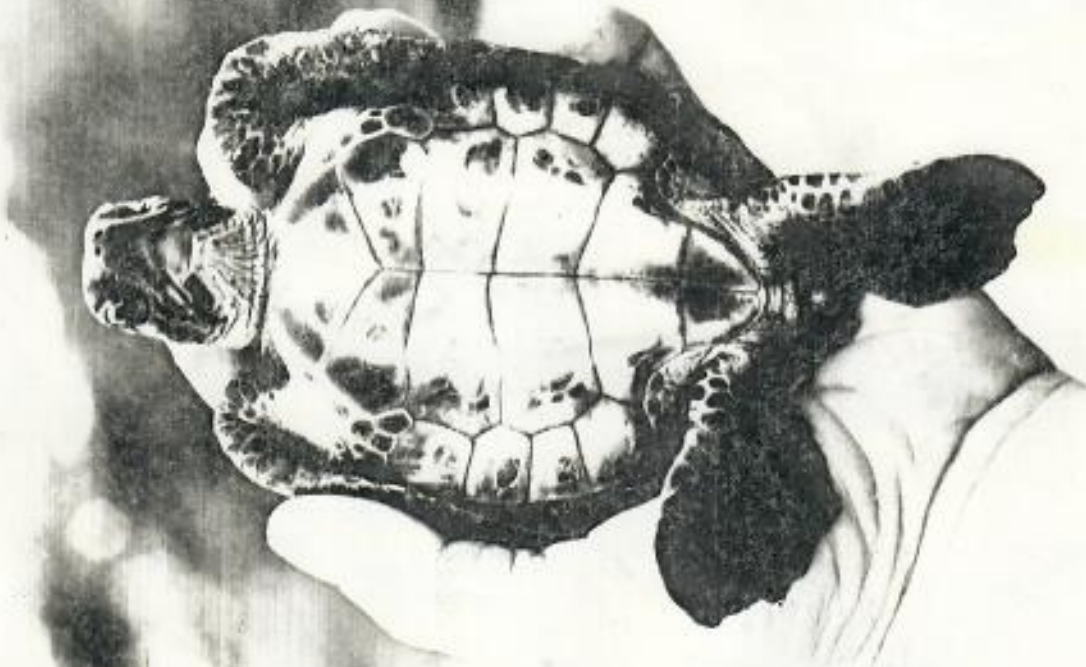
1C NEW
5.2

15 DAYS OLD = 5.8

INCREASE ~ .5cm

48-59 mm
53 mm

3/9
25-35g



C. D. Straight length - 11.2 cm

12/30/80
~ 114 days old



Jan 21 09/12/81
5.72 cm
800 mg



(a)



(b)



(c)

KYOTO UNIVERSITY
DEPARTMENT OF ZOOLOGY FACULTY OF SCIENCE
KITASHIRAKAWA-OIWAKECHO, SAKYO-KU, KYOTO, 606 JAPAN

10 February 1989

Dr. GEORGE BALAZS
SWFC Honolulu Laboratory
PO Box 1306
Honolulu, HI 96812
U.S.A.

Dear Colleague:

I am writing to you inquiring about the possibility of your sending me some photographs of the green turtle in Hawaii.

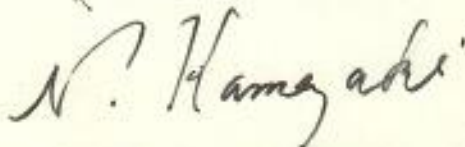
Recently I had noticed the difference of the plastron coloration between two C. mydas's population of Ogasawara and Ryukyu Archipelago. Most of hatchlings plastron of Ogasawaras population tend to become to be partially blackish one month old. But that of Ryukyu Archipelago is white completely.

Now, I am interest in a plastron coloration of hatchlings from one month old to one year old in Hawaii and another population very well, and I need those pictures by which I will be able to know the coloratin of plastron in that population.

If you have some pictures which I need, please duplicate and send them to me. Your cooperation will be highly appreciated.

I am looking forward to hearing favorably from you soon.

Sincerely yours,



Mr. Naoki KAMEZAKI

KYOTO UNIVERSITY
DEPARTMENT OF ZOOLOGY FACULTY OF SCIENCE
KITASHIRAKAWA-OIWAKECHO, SAKYO-KU, KYOTO, 606 JAPAN

6 March 1989

Dr. GEORGE BALAZS
National Marine Fisheries Service
2570 Dole St.
Honolulu, Hawaii 96822-2396
U.S.A.

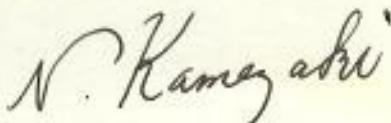
Dear Dr. Balazs

Thank you for your letter dated February 21, 1989 and a reprint of your paper. I have read the paper with a interest.

All hatchlings of *C. mydas* from Ogasawara Islands have black pigments on a underside of a body certainly. But, a little hatchling from the Ryukyu Archipelago have these pigments. During this nesting season, I hope to examine the phenomenon in detail. After that, I will send a letter to you.

I would like to thank you once again for your co-operation.

Sincerely yours,



Mr. Naoki KAMEZAKI

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

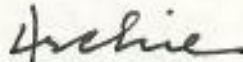
Dear George:

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.

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.

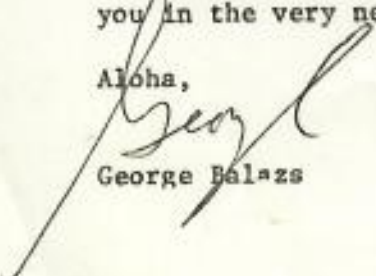
I'm still working on the proposal's budget, but assuming my salary is derived from elsewhere, the cost should be something under \$20,000. As you know, it is by no means cheap to raise turtles when you consider food, student helpers, facilities improvement, as well as shipping costs and photography supplies.

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. FWS 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

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 its 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 its becoming increasingly harder at both Univ.Hawaii and NMFS 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

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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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 ^{significantly} 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 *agassisi* 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 *agassisi*-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.

Ogasawara Marine Center



Byobudani, Chichijima Ogasawara-mura Tokyo 100-21 Japan

Head office: MARINE ENVIRONMENTAL ASSOCIATION OF TOKYO

Yurakucho Bldg No. 1008, 1-10-1 Yuraku-cho, Chiyoda-ku Tokyo 100 JAPAN

Mr. George H. Balazs
Southwest Fisheries Center
Honolulu Laboratory,
National Marine Fisheries Service,
2570 Dole Street, Honolulu, Hawaii

Hiroyuki Suganuma
Ogasawara Marine Center
Chichijima, Ogasawara-mura
Tokyo, Japan 100-21
Tel 81/4998/22830
Fax 81/4998/23258

June 25, 1991

Dear Mr. Balazs,

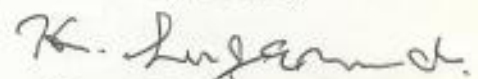
I am writing to reply you what you asked to Kazuo Horikoshi in your letter of 26 May, 1991. I understand that you wish to get information on the occurrence of dark pigment in the plastron of young *Chelonia* from Japan and the history of Hawaiian people settling in Ogasawara Islands during the 1800's.

About the settling of the Hawaiian people in Ogasawara, I will enclose some papers. They had settled down here to build the American whaling bases for sperm whales in 1830. At the same time, they had begun to catch green turtles also. If you would like to gather more informations about the Ogasawara Islands (Bonin Islands), you will be able to get them from Bishop Museum that have many references of enclosing list.

About the dark pigment, there are not any records in Japan except Ogasawara from Japan. I asked to my colleague about the young green turtles of Ryukyu Archipelago. But they don't have the dark pigment on their plastron either. Green turtles have been nesting on Ogasawara Islands, Yaku Island where is located southern part of Kyushu and the islands of Ryukyu Archipelago especially Ishigaki Island.

If you would like to know more information, please let me know.

Sincerely yours,


Hiroyuki Suganuma

UNIVERSITY OF FLORIDA
ARCHIE CARR CENTER FOR SEA TURTLE RESEARCH
223 BARTRAM HALL
GAINESVILLE, FL 32611

TELEPHONE 904 392-5194
FAX 904 392-9166

TO GEORGE BALAZS
HONOLULU LABORATORY
SOUTHWEST FISHERIES CENTER
2570 DOLE STREET
HONOLULU, HI 96822-2396

JUNE 16, 1991

Dear Balazs

About your inquiry, I last week talked with Mr. Suganuma by phone, Ogasawara Marine Center, Japan, because he can access the information much easier. He will send the good references on "Hawaiian Tribe Issue in Ogasawara" to you soon. As long as my understanding, first habitants on the Ogasawara islands were KANAKA people settled in 1830 although the islands were discovered by Japanese Samurai, Mr. Ogasawara much earlier. For more detailed information, please wait the references. Although the references are in Japanese, we assume that you have no difficulties to interpret them into English in Hawaii. If you have or in a hurry, please let me know.

On issue of dark pigments in the plastron, we did not get new information outside of the Ogasawara so far. As you know, to study this phenomenon, we need to get a specific small size of turtles which are only found in captivities and such facilities are quite rare. Besides juvenile, I was informed an interesting aspect of the plastron color of Pacific Costa Rican green turtles from Anney Chaves. Some of nesting females have white plastrons, not like black ones of Pacific Mexican black turtles. I really think that in relating to both black turtle classification and Mitochondria DNA analysis issues, this black pigmentation phenomenon is quite worth to study further.



UNIVERSITY OF FLORIDA
GAINESVILLE, FL 32611

DEPARTMENT OF ZOOLOGY
223 BARTRAM HALL
904/392-1107

Right now, I am planning to graduate LIF at the end of this year and to take a job offer as a research position at the Ogasawara Marine Center. Japanese government at last starts showing some interest in funding green turtle study and two year project of satellite telemetry experiment on Ogasawara green turtles will just start this summer. I am very excited for coming back to the Pacific again.

Sincerely Yours

KAZUO HORIKOSHI



Moses Savory, 77, says World War II was tough. "But I'm content now."

Descendants of American, European Settlers Find Island of Acceptance Among Japanese

By KARL SCHOENBERGER
TIMES STAFF WRITER

CHICHLIIMA, Japan—Moses Savory is not your typical Japanese fisherman.

He grew up harvesting the abundant reefs around the Ogasawara Islands and knows these waters like few other men. A Japanese citizen who attended only Japanese schools, his gestures and speech are pure Japanese. But he has always looked as different as his name sounds.

Savory inherited a square jaw, a ruddy complexion and a rather prominent nose from his great-grandfather, Nathaniel Savory, the Massachusetts whaler and adventurer who led the first settlers to these remote islands in the western Pacific, 600 miles south of

Tokyo.

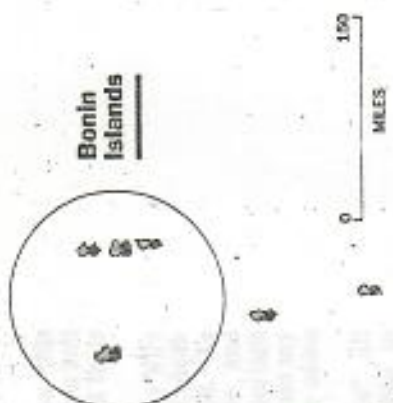
He looked different enough that during World War II, in the intolerant mood of those times, people derisively called him *keto*—"hairy barbarian."

The military police harassed him as a suspected spy because he spoke English to his kinsmen, or mixed it with Japanese in the local pidgin. Wartime prejudice barred him from finding a wife on the island where his family had thrived for more than a century.

Yet Savory adapted and endured—and stayed. Today, at 77, he is a respected elder in a small and unique community of Japanese with American and European ancestry.

"I had some terrible experiences during the war," Savory said in his native Japanese, which he prefers to

Please see **BONIN, E2**



ISLANDS

Continued from E1

English. "But I'm content now. This is my home. This is where I'm from."

Japan is a country with few minorities. A stubborn aversion to ethnic diversity on the main islands has prevented generations of Korean and Chinese residents from assimilating fully. And Westerners who have put down roots in cosmopolitan cities like Yokohama and Kobe or even Tokyo must resign themselves to being emotionally quarantined as *gaijin* (foreigners) in perpetuity.

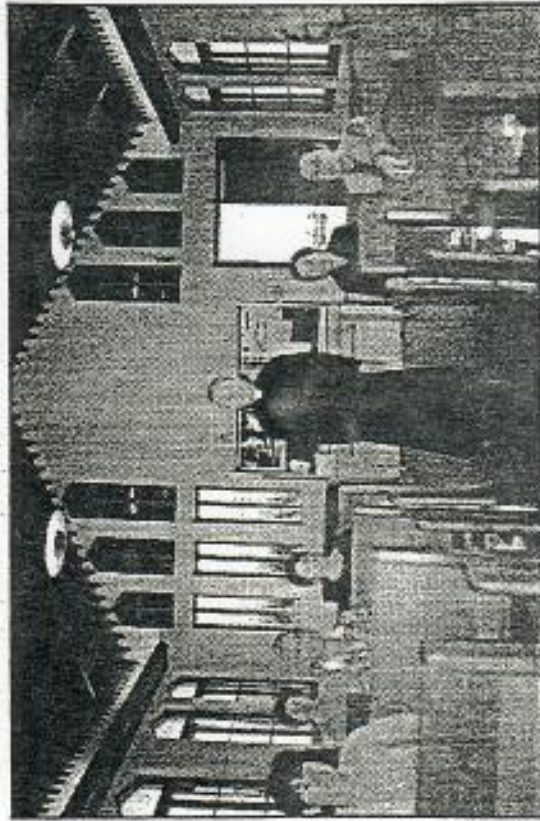
But an accident of history has seen Ogasawara's Western "barbarians" integrated meaningfully into rural village life. They were here first, after all. When patriarch Nathaniel Savory charted his course across the Pacific in 1830 with a mixed crew of 31 Americans, Europeans and Hawaiians, the subtropical islands were empty.

Indeed, scholars think their original name, the Bonin Islands, derived from *burin*, an archaic Japanese word for "uninhabited" that apparently was marked on early maps.

Japanese who migrated to the islands under claim of sovereignty in the latter half of the 19th Century classified the Savorys, the Webbs, the Gilleys and the other Western clans as *zairai tomin*—"native islanders." They came with the territory, which Japan considered its own because a seafaring feudal lord named Sadayori Ogasawara "discovered" the islands in 1593, half a century after the Spanish explorer Francisco de Vilalobos first touched ashore.

The Civil War-era American government looked the other way, Victorian England abandoned its tentative claim, and Japanese settlers soon took control.

The accident repeated itself in



KARL SCHROEDER / Los Angeles Times

Episcopal priest Aisaku Ogasawara oversees a congregation, composed mostly of Japanese with roots in the West, at St. George's.

"This cluster of 103 islands, four of which are inhabited, has no airport. The only regular transportation linking Chichijima to the outside world is a 3,500-ton passenger ship that sails about once a week and takes 28 hours to reach Tokyo—at a cost of \$350 round-trip, in steerage. One in every three jobs in Ogasawara is in civil service, mostly in the Tokyo Metropolitan government, which subsidizes as well as administers the islands.

Even though nearly all of Bonin's *zairai tomin* consider themselves Japanese, some greatly emphasize their Western roots. One of Moses Savory's second cousins, Jerry, 76, boasts of sending his three sons to the United States after the islands reverted to Japan 23 years ago.

"The Savory clan has returned to the U.S.," he said. "I'm very proud of that. The Savory name is back."

Jerry Savory was attending St. Joseph's College in Yokohama when he was drafted into the Imperial Japanese Army under his

tilled the volcanic soil. The Ogasawara Yankees ate traditional chicken dinners on the Fourth of July.

Moses Savory recalls how his grandfather, Horace Perry Savory, forbade the speaking of Japanese in his home, even though the children studied in Japanese at school. Moses' own daughters studied in English in school and spoke Japanese at home.

During World War II, Jerry Savory's older brother, Fred, painted "YANKEE TOWN" in bold letters on the rooftops in Okumura, the quarter where many of the *zairai tomin* lived. American planes pummeled the island with bombs but spared the neighborhood until the final days of the war.

During 23 years of U.S. occupation rule, the Navy refused to let the islanders move back into Yankee Town.

"They said, 'You're Japanese, and this is an occupation,'" Moses Savory said. "What choice did we have but to go along with them?"

After reversion, the Yankees went to great pains to adopt a low profile. Many took on Japanese names. Washington became Kimura, Savory became Sebori or Okumura, Webb became Uebu or Uwabu. People took a chameleon approach to survival.

"When the Navy was here, we picked up American gestures and patterns of speech, but when the Japanese returned our gestures and even our faces started looking more Japanese," said Aisaku Ogasawara, who before 1968 went by the name Isaac Gonzales.

"But there is no feeling that we're foreigners on our own island," said Ogasawara, pastor of St. George's Episcopal Church, founded in 1909. "Our faces may be different, but inside we are Japanese."

marriage with Japanese, meanwhile, have softened Western features so that many blend in physically with their neighbors from the interior.

The population of Chichijima and nearby Hahajima, the other main island in the chain, totals about 2,000, and about two-thirds of the inhabitants are *skin tomin*, or "new islanders," who wandered this way over the past two decades. These people came in pursuit of Ogasawara's pristine environment and Florida-latitude climate, and they form the backbone of a fledgling tourist industry.

The rest are so-called *kyu tomin*, "old islanders"—ethnically pure Japanese with pre-war roots. They dominate local politics, run the construction industry and have the greatest clout with the administrators from Tokyo. Even today, *kyu tomin* are given priority in obtaining public housing, a fact that can irritate some with the "wrong" pedigree.

"I don't want to call it discrimination, but we've had to deal with a lot of problems," Washington said. "But on a small island like this, you

1974, which occupies the administrative center of the Bonins and the Volcano chain—World War II killing grounds of Iwo Jima to the south.

Ogasawara's civilian population had been evacuated in anticipation of an American assault, which never came. After Japan's surrender, the U.S. military sealed off the chain, except to a group of about 130 islanders—people of Western heritage and their families. Thousands of ethnic Japanese were not permitted back until 1968, when the islands reverted to Tokyo's rule.

Savory, who returned from Yokohama in 1946 with a new Japanese bride, was classified like the others as an "enemy national" by the U.S. Navy. Still, the Navy shipped his fish to market in Guam and gave him odd jobs around the base for \$3 a day.

Even that ambivalent status brought relief after years of repression under militarist Japan. Nearly 50 years later, Savory softens his bitter wartime memories with wry humor.

"They accused me of being a spy, but if I had the brains to be a spy, I wouldn't have been on an island like this," he said. "I would have been in a much bigger place."

Savory's four daughters attended high school in Guam and all have immigrated to the United States, a pattern that is not unusual among Ogasawara's fifth-generation *zairai tomin*, considering the limited economic opportunities here.

He read English books in secret to keep his language skills from getting rusty. During the U.S. Navy's rule over the Bonins, he was one of the island's two civilian health care workers. When Japanese administrators regained control of Ogasawara in 1968, he changed his legal name to Jerry Savory out of spite.

"I'm a Japanese, but my feeling is different—America is my mother country," Savory, who runs an inn called Silver Moon, said in halting English. "I worked, very hard not to lose my ancestors' language. They brought it here and left it to us, and we should respect that."

Making the abrupt switch from English-language schools under the Navy to compulsory Japanese education was a traumatic one for many Bonin youth.

Consider Johnson Washington, 42, son of Joji Washington and great-grandson of a Portuguese-African cabin boy who deserted his whaling ship during a port call at Chichijima, then known as Peel Island. In 1843, Washington did all his schooling in English and had to teach himself how to read and write Japanese.

"For the first five years it was really bad. We still thought in English; we dreamed in English," said Washington, who works at a marine research center. "I'm doing OK now, but it's still a struggle to write those Chinese characters."

No one seems to know exactly how many descendants of the *zairai tomin* remain on the island, but the number may be near the 200 who lived here at the time of reversion. Generations of inter-

can't focus on the differences if you're going to get along. We depend on each other, so nobody tries to make a big deal about our backgrounds."

Kunio (Ping) Uebu, 70, the descendant of a British sailor named Webb who found his way to Nathaniel Savory's Pacific paradise in the mid-19th Century, scoffs at questions about his family roots.

"Don't ask me about my ancestors, because they don't have anything to do with my life," said Uebu, a white-haired fisherman with craggy eyebrows who lost an arm fighting for the Imperial Japanese Army in Manchuria. "I don't have any interest at all in the past."

Yet for Takashi (Jonathan) Savory, 33, one of Moses Savory's nephews, genealogy has become an obsession. A bureaucrat at the Ogasawara Village Office, he has visited Massachusetts twice over the past two years to explore the Essex County origins of Nathaniel Savory, his great-great-grandfather. In March, he succeeded in tracking down the American branch of the Savory family and held a reunion with about 50 relatives.

He plans another reunion this year, this one including uncles and cousins from Ogasawara and their offspring in America.

"My mother is Japanese, my wife is Japanese, and my children speak no English at all," Savory said. "As the blood ties get thinner and thinner, I decided it was important to research our heritage. I want my children to know where we came from."

Bonin's "native islanders" all received Japanese citizenship in 1882, eight years after Nathaniel Savory died at the age of 80, and their story since then has been one of adaptability and resilience.

After the American whaling industry died out with the switch to fossil fuels, Bonin men shipped out on seal hunting expeditions and fished the island waters in outrigger canoes while Japanese settlers

Catalog of the Library of the Bernice P. Bishop Museum

<p>DF 12 D 41</p> <p>SOUTH ISLANDS Beachey, F. W.</p> <p>Narrative of a Voyage to the Pacific and Bearing's Strait...in...Ship Blossom, under the command of Captain F. W. Beachey...in...1826-29. Vol. 2. pp. 229-240; 435-438. London. 1831. 8vo.</p> <p>The same...New edition. London. 1831. 8vo.</p> <p>locked case</p>	<p>GU Hist. Soc. 204</p> <p>SOUTH ISLANDS Coat, Ross II.</p> <p>"South Islands' story," with maps, old and new. Privately printed. 1846. 50 pp. 8vo.</p>	<p>DU 12 L 41</p> <p>SOUTH ISLANDS (1) Dyce, James</p> <p>An account of the discovery of a Great of Islands in the north Pacific Ocean, by Capt. James Dyce, in the ship <i>Largaret</i>, of Boston, in his run from Canton toward the N. E. Coast of America. Extracted from his log-book. (Massachusetts Hist. Soc. Collections for the year 1795, pp. 561-582, 290)</p>
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VOYAGE OF THE NYANZA

R. N. Y. C.

BEING THE RECORD OF A
THREE YEARS' CRUISE IN A SCHOONER YACHT
IN THE ATLANTIC AND PACIFIC, AND
HER SUBSEQUENT SHIPWRECK

BY
J. CUMMING DEWAR

LATE CAPTAIN KING'S DRAGOON GUARDS AND
11TH PRINCE ALBERT'S HUSSARS

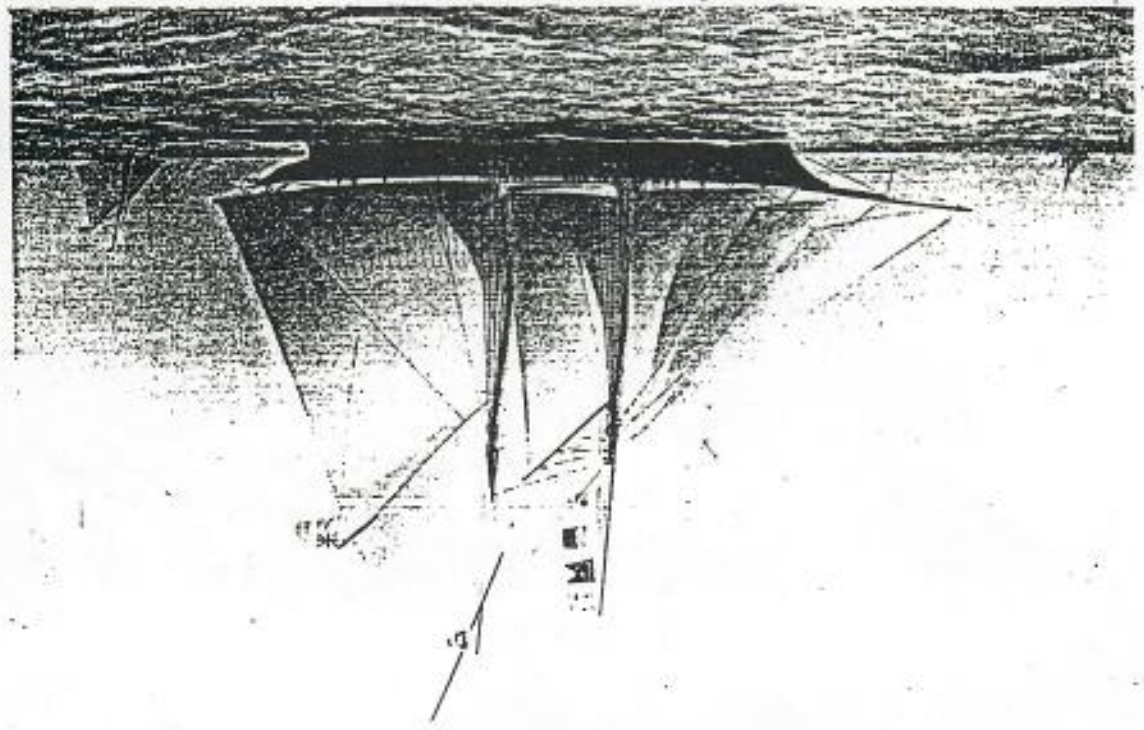
With a Map and Illustrations

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The Nyanza under sail.



us on our way. We had met with much courtesy and kindness at several places on our voyage, but never had we encountered warmer, heartier cordiality and generosity than we had at this little group of Spanish islands. At a quarter past three we got under way, and by four o'clock the pilot had left us. We now sailed for Port Lloyd in the Bonin Islands, distant 850 miles from Port San Luis d'Apra.

The first three days we went along at a fair speed, averaging about five knots an hour; but after this the wind died away, and we did not reach Port Lloyd until the tenth day after leaving the Ledrones.

The weather was terribly hot during most of that time, and on Sunday, July 21, we noticed large quantities of pumice-stone floating on the surface of the water, evidently the result of the upheaval of some marine volcano, many of which are known to exist in this region. That day counted the second year of our voyage after leaving Plymouth, and it was noted also in the log-book on account of a large shark which we managed to catch and kill.

At 9.45 A.M. of July 22 we sighted Hillsborough Island, the largest of the Coffin or Bailey group, distant about 55 miles. Another island of the same group appeared on the horizon about five o'clock in the afternoon. A gigantic shark came alongside the yacht this day, and all agreed that it was the largest monster they had ever seen. It must have measured from 25 to 30 feet in length, and was at least eight feet across the shoulders. The colour was of a bluish grey, dotted with large white spots: as I afterwards discovered, it was a shark belonging to that known as the tiger species, which is extremely rare, and indeed is only found in the Indian Ocean and North Pacific. Two pilot-fish escorted him, swimming in front. We made several efforts to harpoon him, and to shoot him with a rifle; but unfortunately they were not successful, and after about an hour he swam away, and we saw nothing of him again.

The Coffin Islands were so named from the commander of a whaler which visited them in 1822; and they form the southern group of the Bonin Islands, the largest of which is known as Peel Island. The Coffin or Bailey group consists of four principal islands besides some smaller ones, all of which are barren, and many are mere rocks. Hillsborough, the largest of the group, had apparently little or no vegetation. Its shores were bold and precipitous, and numerous large land-slips had evidently taken place recently. No signs of habitation were visible as we coasted along the island, though from time to time we saw the smoke of fires.

Captain Beechey of H.M.S. Blossom visited the Bonin Islands in 1827, and took formal possession of them in the name of Great Britain. In 1830 a molley colony settled on Peel Island, which up to that time had been uninhabited. This colony, which was connected with the whaling business, consisted of one Englishman, one Dane, two Americans, and fifteen Sandwich Islanders, five of the last-named being men and ten women. They claimed the protection of England, but the British sovereignty was never actually asserted over the islands; and they were formally claimed in 1878 by the Japanese Government, whose right to their possession was admitted by us. Some few descendants of the original British and Sandwich Island settlers are still to be found on Peel Island, but the majority of the present inhabitants are Japanese, the total population of the group now numbering 1460, of whom 840 reside on Peel Island. The principal articles of cultivation are sugar, indigo, maize, and vegetables, the first of which is by far the most important. The operations of crushing sugar-cane are primitive in the extreme, being chiefly done by hand, the few mills in existence being turned by oxen. The domestic animals consist of a small number of cattle and pigs, besides which, fowls, ducks, and turkeys are numerous and fine. The island boasts of one horse.

Deer, goats, and boars are found in the island in a wild state; but they are rapidly becoming scarce, a reward of 50 cents per head being paid by Government for their destruction. There are very few birds upon the islands. In certain seasons of the year great numbers of turtle frequent the harbour, and these are caught and kept in pens, their flesh being sold for 4 cents a lb. As many of the turtles weigh from 250 to 350 lb. apiece, their values range from 2½ to 3½ dollars. The salaries of the Japanese officials are miserably poor, the acting Governor only receiving 32 yen or about £5, 10s. a-month, whilst the doctor is paid fifteen yen or £2, 8s. a-month, and is not allowed to undertake private work. He is obliged, moreover, to find his own medicines, but for this he is allowed to charge the patients 5 sen or 2d. a-day.

The principal harbour in Ueel Island is called Port Lloyd, and it is really very beautiful, surrounded on all sides by hills clothed to their summits with cabbage palms and other tropical vegetation, while at the entrance of the port stand out several conspicuous rocks of curious and fantastic aspect. The harbour is provided with a well-built, substantial stone wharf, at which I landed soon after anchoring on the morning of Wednesday, July 24; and accompanied by an interpreter, I walked through the village, which was invisible from the harbour, being hidden amongst the trees. The place interested me greatly, it being my first practical experience of anything Japanese. It was prettily laid out, the principal street being planted on either side with trees, and the stores and houses being beautifully clean. An artificial stream, crossed by several rustic bridges, ran through the village, completing the picturesque appearance of the spot. The acting Governor, upon whom I called, was unacquainted with English, but I conversed with him through an interpreter, and he received me with the greatest civility. Upon

about fifty children, who were being taught a geography lesson. Compulsory education is in vogue on the island, the schools being free and maintained by Government. English is taught as a voluntary subject. On the shores of the bay I stopped to watch some boat-builders at work: their tools and modes of labour differed considerably from those to which we are accustomed. At a small store, the floor of which was covered with beautiful, fine, and scrupulously clean matting, I purchased some specimens of Japanese pipes, curious little things with bowls no larger than a pea, some of them made entirely of metal, and some having bamboo stems. The appearance of my yacht created great excitement amongst the Japanese, for I was the first that had ever put into the harbour of Port Lloyd. They came off in crowds to visit her; but I can bear testimony to the fact that they were all exceedingly orderly and well-behaved. In the afternoon I walked up to a small Buddhist temple upon a hill overlooking the harbour; but I was disappointed with my visit, for the place was fast falling into decay, and there was absolutely nothing of interest to be seen about it.

On the following day I went across in the ferry-boat to a village on the eastern side of the harbour. The shape of the boat was something like a punt, and it was rigged with a big lug-sail. It would not go to windward, and therefore when the wind was not fair, the ferryman sculled it by means of a huge sweep, working on a pin aft. The ferryman had a couple of daughters, bright, bonny little things of about eleven or twelve years of age. They begged so eagerly to be allowed to visit the yacht that I took them back with me. Their excitement when they had got on board was intense beyond description, and it was the most amusing thing in the world to see them running about and examining everything without the least shyness, yet without forwardness. The Japanese, from what I saw of them in this island with

specimens of unaffected naturalness that I had ever met with anywhere.

We found a Swedish naturalist, called Mr H., staying upon the island. He had been there for the last three months collecting birds, but had only obtained twenty-five different species; and he told me that he was convinced that he had exhausted the number existing on the island.

CHAPTER XXXIII.

A JAPANESE GOVERNOR—A CURIOUS CAVE—BOUND FOR JAPAN—
SIWO POINT—THE KII CHANNEL—SUMI STAIRS—KOBE—A
HIDE IN A JINRIKSHA—A CURIO-SHOOP—THE EUROPEAN
QUARTER—HOGO—A JAPANESE TEMPLE—EXHIBITIONARY PHOTOS
—A FAIR IN HOGO—ARIBA—HOT BATHS—BASKET-WORK—A
KANGO—KIOTO—A SERIES OF INTERESTING TEMPLES—A JAP-
ANESE THEATRE—AN ACHORATIC PERFORMANCE—OTSU—LAKE
BIWA—BIHIYAMA—A CELEBRATED TEMPLE—OSAKA—A TEMPEST.

July 25-August 15, 1859.

ON Friday, July 26, I received a return visit on board the yacht from the acting Governor and the Paymaster at Port Lloyd. The Governor was attired in Japanese costume, with a black silk over-cloak, on which were several circular white patches: these, I was informed, were the distinguishing marks of the particular clan to which he belonged. The general effect of his appearance, however, was somewhat marred by a very seamy European lillycock hat which he wore upon his head. He displayed a very intelligent interest in all that he saw upon the ship.

An hour after his departure I called to say Good-bye, accompanied by Captain Garrington, and he gave us each a neat cigarette-case which had been made upon the island. I also obtained in the village some wood peculiar to the island, and afterwards went in the dingy to examine a curious cave in South Head, the entrance to which was wide

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THE ADAPTIVE SIGNIFICANCE OF COLORATION IN HATCHLING GREEN SEA TURTLES

H. ROBERT BUSTARD

ABSTRACT: The color pattern of hatchling green turtles is an example of countershading. However, the black dorsal coloration has the disadvantage of making the hatchlings conspicuous to predators when crossing pale-colored sand to the sea. Furthermore, those hatchlings which emerge during the day rapidly reach lethal body temperatures through radiation effects (potentiated by the black carapace). It is suggested that the black carapace plays an important role in elevating the hatchling turtles' body temperatures when they are floating at the surface of the sea. Experimental data are given to demonstrate this effect. Increased body temperature will result in faster growth due to the stimulatory effect on metabolism. A more rapid growth rate during an extremely vulnerable stage of the life history will have survival value. Presumably the black dorsal coloration is retained because this increased survival more than offsets the loss from terrestrial disadvantages.

Hatchling green turtles, *Chelonia mydas* (L.), are black on the dorsal surfaces and immaculate white below, an example of countershading. Many fish have developed countershading and are almost invisible when viewed from the side (Cott, 1940). Hatchling turtles occupy a similar environment with surface-swimming fish like the mackerel which are dark blue on the back and silvery-white on the belly. The black upper surfaces of the turtles when viewed from above match the sea and camouflage them from sea birds. The white lower surfaces blend in with the sky when viewed from below and camouflage the turtles from deeper swimming fish.

Most hatchlings emerge from their nests after dark (Moorhouse, 1933; Bustard, 1967) when they may be preyed upon by land crabs such as *Ocypode*. Even at night the black upper surfaces are a distinct disadvantage on pale-colored sand making the hatchlings clearly visible as they make their way to the sea. (Although some important green turtle rookeries are on dark sand beaches the majority occur on pale sand. Many major rookeries are on coral cays or reef-fringed islands where the sand is virtually white.) This undoubtedly increases predation by crabs which depend on visual cues (Bustard, unpubl.). Similarly it makes them more readily visible to gulls which patrol the beaches on clear nights when the moon is nearly full.

Some hatchlings emerge during the day (Moorhouse, 1933; Bustard, 1967) when their black upper surfaces again make them clearly visible to seabird predators on pale sand beaches. Furthermore, during the heat of the day temperatures may be lethal for hatchlings. Field studies have indicated that radiation is critical in causing heat death in the field. The black dorsal surfaces potentiate this by absorbing heat rapidly. Often hatchlings emerging during the heat of the day and orienting towards the sea are unable

to reach the beach before being overcome by heat stress. A shade-seeking behavioral mechanism, which occurs when their body temperatures exceed about 36 C, has recently been discovered (Bustard, unpubl.).

In the laboratory 10 hatchling turtles with an internal body temperature of 36 C survived surface sand temperatures of 50-56 C for 15 min in the absence of a radiation source. The air temperature 2.5 cm above sand at 51 C was 35 C. At the end of this period the turtles' rectal temperatures were between 36 and 40 C, suggesting that they gained little heat by conduction. This result was borne out by a similar experiment in which 10 hatchlings with body temperatures of 33 C were placed on sand at 40 C with an air temperature 3.5 cm above the sand of 30 C and left there for 30 min. At the end of the experiment their rectal temperatures averaged 34 C (range 33.0-34.8, SD \pm 0.54). These experiments demonstrate that an exceptionally hot substrate by itself does not cause lethal body temperatures, even when the exposure to it is many times longer than would occur naturally. The color of the undersurfaces does not affect the rate of temperature gain by conduction from the substrate.

The effects of radiant heat are, of course, dependent on the color of the upper surfaces. In a laboratory experiment, the rectal temperatures of 10 turtles with the upper surfaces whitewashed were monitored and compared with 10 untreated hatchlings. The two groups were kept in identical conditions before the experiment and subjected to the same radiant heat environment. The experiment was conducted on coral sand with a surface temperature (shaded while measured) of 40-42 C. The time taken for a turtle to show locomotory loss from heat exhaustion, which in nature would have resulted in death, was recorded. This averaged 45% longer for "white" compared with normal turtles. Presumably the black dorsal coloration occurs despite terrestrial disadvantages because its advantages at sea far outweigh these disadvantages.

The hatchlings are extremely buoyant and at rest float at the surface of the sea with a considerable portion of the carapace out of the water. Parts of the head and front flippers are usually also exposed (Fig. 1). The figure illustrates one of two typical front flipper resting positions; in the other the flippers are folded back on top of the edges of the carapace. Under these conditions it seems feasible that the black dorsal surfaces promote an increased body temperature by absorption of radiant heat.

A laboratory experiment was carried out to test this hypothesis. The experiment was performed on 10 one-week-old hatchlings since newly emerged turtles swim continuously and do not spend long periods resting at the surface. The upper surfaces of 5 hatchlings were painted white 3 days before the experiment. This caused no detectable differences in their behavior compared with untreated

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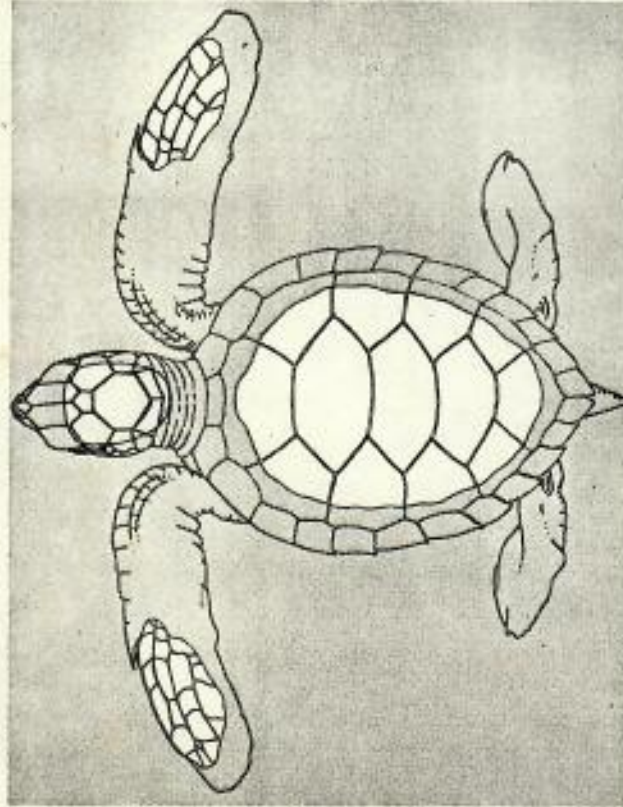


FIG. 1.—Hatchling green turtle floating at the water surface. The pale areas are out of the water.

hatchlings. The experiment was carried out in an aquarium with a radiant heat source which provided shaded air temperatures of 24–25 C, equivalent to a hazy sun in the tropics, and temperature of 23 C near the surface. The water was moved in order to simulate a slight sea swell. Periodic temperature readings of the turtles were taken with a Schultheis rapid-recording thermometer inserted into the cloaca. The mean temperature of normal hatchlings was 1.7 C (range 1.1–2.3, SD \pm .41) above water temperature whereas the mean for the white painted hatchlings was only 0.3 C (range 0.0–0.6, SD \pm .32) above the water temperature, i.e., the cloacal temperature of the black hatchlings averaged 1.4 C above the mean for the white painted hatchlings. In the absence of a radiation source the temperature of 10 one-week-old unpainted hatchlings was similar to water temperature.

I consider that the heating effect in the open ocean would be at least as great as in the experimental situation where it was reduced by additional turtle activity resulting from the hatchlings banging against the sides of the aquarium.

An increased body temperature will result in more rapid food-assimilation because of the stimulatory effect on metabolism. This will lead to a faster growth rate during a vulnerable stage when the hatchling turtles cannot dive well and are subject to aerial as well

as aquatic predation. Hence any factors tending to increase body temperature, such as the dark dorsal coloration, have survival value.

Two other observations lend support to the suggested adaptive value of black coloration while the hatchlings are small and at the water surface. Hatchling green turtles start regular diving at 2–3 months of age when their weight has increased from about 22 g at birth to about 1,200 g. At 6 months of age they have become much lighter in dorsal coloration (Tanis, pers. comm.). The black coloration is lost with increase in size and regular diving.

Hatchlings of the other member of the genus, *Chelonia depressa*, are pale grey in dorsal coloration when hatched. *C. depressa* hatchlings average 40% heavier at birth than hatchling *mydas* (Bustard and Limpus, 1969) which are at the maximum size that gulls can swallow. Since *depressa* hatchlings are above the critical size for bird predation, there would be no survival value in having black upper surfaces for camouflage purposes. Darker upper compared with lower surfaces still provides countershading. The black upper surfaces have presumably either not been developed in this species or have been eliminated because of their terrestrial disadvantages. The only obvious explanation for the immaculate white undersurfaces of hatchling *mydas* is for camouflage. It is noteworthy, therefore, to find that *depressa* hatchlings also have white lower surfaces. Although they are too large at birth to be eaten by seagulls, *depressa* hatchlings must have many fish predators. Unfortunately the behavior of juvenile *depressa* is unknown.

Not all hatchling sea turtles are dark above and light ventrally. Hatchling loggerheads (*Caretta caretta*) are a similar color on both surfaces or may even be darker ventrally. Since the principle of countershading is widely followed, it seems likely that predation is reduced by other means. Loggerhead hatchlings, for instance, have rough carapaces which become spinose within several months of hatching, a probable deterrent to predators.

I thank John Harris for a discussion of the problem and John Harris and Peter Greenham for critical reading of the manuscript.

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