MARINE TURTLES TAGS

G.H. BALAZS FILE

CARETTA RESEARCH

P. O. DRAWER E
SANIBEL ISLAND, FLORIDA 33957

December 8, 1975

George H. Balazs
Hawaii Institute of Marine Biology
P. O. Box 1346
Kaneohe, Hawaii 96744

Dear Mr. Balazs:

This is in reply to your recent note re tag application sites we use in our marine turtle studies.

We permit our cooperators to utilize two options in applying monel tags. 1.) A pilot hole may be punched prior to tagging, or 2.) the tag may be used as a self-piercer. In option one generally only individuals that are turned over (examination, weighing, etc.) are pre-punched. Option 2 is routinely used where tagging is accomplished in a saturation manner and workers simply don't have time to collect the amount of data that those which use option one do. In other words self-piercing application is more commonly used, however, we are insistant that the tag be rotated through the puncture for visual affirmation that the tag has properly locked.

Some of our cooperators select a site close to the shell while others prefer to attach at the large scales. Through the years we have consistantly attached tags to the turtles front left flippers; unless, of course, that appendage should be too damaged. I am marking on your illustration the two sites used.

While I am in contact with you there is something that you can possibly help me with. We have been attempting to acquire, for our study collection, an adult *Eretmochelys imbricata* skull -- complete with both jaw plates. Juvenile skulls are available here in Florida but we are interested only in the skull of a mature adult. Perhaps you know of a collection that would be a source for this material.

I hope that the information that we have provided is satisfactory.

Sincerely,

Charles R. LeBuff, Jr.

Charles R. LeBuff, Jr.,
Project Director

Enclosure

10-17-85
Received

This tag is just like the ones I received from Limpus except it is rougher around the edges. I like the locking mechanism very much. What do you think of it? I have had to pre-punch turtles to use this tag successfully, but I go through scales.

Good talking to you the other day. Congratulations again on the new baby & your permanent status. Delay in turtle preservatives is due to my trying to find out best ones to use of the wide variety available. I am still very, very excited about it. Delay is not due to lack of interest.

Best regards,

Karen

WESTERN ADMINISTRATIVE SUPPORT CENTRE (WASC)
FINANCE DIV. MAIL CODE RAS/WC1
7600 SAND POINT WAY, NE
SEATTLE, WA 98115

HONOLULU, HI 96822
ATTENTION: WILLIAM GILMARTIN.

DATE	INVOICE No.	ORDER No.	ACCOUNT No.	SALES TAX No.
12/7/85	40760	40ABNFS 1994		

INVOICE

INVOICE No. 40760

CODE	DESCRIPTION	QUANTITY	PRICE	DISC.	AMOUNT	S/TAX %
	TITANIUM TURTLE TAGS	500	1.00ea		500.00	
	Mkd: WRITE TO NMFS BOX 3830 HONOLULU HI 96812					
	Nod: 15001-15500					
	APPLICATORS	2PRS	18.00ea		36.00	
			FREIGHT AIRMAIL SAL		23.20	

NET INVOICE	559.20
SALES TAX	
AMOUNT DUE	AUST$559.20

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DATE: 12/7/85

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2570 DOLE ST. HONOLULU

FROM: STOCK BRANDS CO. PTY. LTD.
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OSBORNE PARK, WA 6017

REFERENCE/INVOICE No. HOABNFS 1994

RECEIVED IN GOOD ORDER AND CONDITION:

QUANTITY	DESCRIPTION
500	x TITANIUM TURTLE TAGS.
2	x APPLICATORS

NOTE: Any complaint as to condition or quality of these goods must be made on delivery.

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SIGNATURE: _____

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NOAA, NATIONAL MARINE FISH. SVC
2570 DOLE STREET,
HONOLULU HI 11 UT 96822

5/9/84

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Dear George:

Sorry I'm late as usually in getting back to you. I guess PCHP set up a booth at Archie's banquet (see enclosure) and hit up the crowd much like our Moskito Indian friend did at WATS. A copy of Carr's F. Osborn Lecture is being published, so look for a copy sometime this year. If I hear about it I'll get copies in case none get out your way.

I hope I can put something together to qualify for travel to Hawaii. Perhaps I can document Capt. Wotherspoon's observations of last December — a sea of plastic wrapped up in some giant eddy system that separates east and west Gulf circulation regimes (see enclosure) If Dave's the captain, he'll back "her" down to collect turtles if we spot any!

Thanks for the offer of additional case histories for the Pacific area to flesh out what I could put together, appreciate that.

In the meantime, my boss (Eugene Nakamura) said to put in for the travel to Hawaii — it will fall under FY 85 travel, so there is a chance if I get his endorsement.

Yes, I'll be looking forward to Ken's review too. I know he can do a thorough job of setting things straight when he wants to! He'd be an asset to SSC, I agree.

Thanks for the morel tags — I'll give you complete histories as I use them. Also, Karen simply wanted to remove all questions concerning her tagging experiments and keep any possible variables to near zero. That's all George.

Best ever
Jerry

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USDC-NOAA-National Marine Fisheries Serv.
SEFC, Panama City Lab.
3500 Delwood Beach Road
Panama City, FL 32407

March 11, 1985

"OUR 83rd YEAR"

Attn: Larry Ogren

Dear Larry:

Confirmation is made of our phone conversation recently concerning the Inconel turtle tags. I spoke with Fred about your comments before he went out of town this week, and he advised that as far as he can foresee at this time, an initial order for the size 681 Inconel tags could be priced the same as the tags we made for Dr. Balazs in 1980. At that time, the size 681 tags were priced at $553.00 per 1000 and there was a $175.00 die alteration charge.

We appreciate your keeping us up-to-date on the needs for this tag.

Thanking you, we remain,

Sincerely,

NATIONAL BAND AND TAG COMPANY

Linda Collins

Linda Collins

lc/1

JAMES COOK UNIVERSITY OF NORTH QUEENSLAND

POSTAL ADDRESS:
James Cook University
TOWNSVILLE Q 4811
AUSTRALIA

TELEPHONE:
Townsville (077) 81 4111

TELEX:
AA47009

SG:BG
Ext. 4252

SCHOOL OF BIOLOGICAL SCIENCES
Department of Zoology.

13 July 1984.

Dr. G.H. Balazs,
Wildlife Biologist,
National Marine Fisheries Centre,
P O Box 3830,
HONOLULU, HAWAII 96812,
U.S.A.

Dear George,

I am sorry I have written so infrequently. I've been waiting to send you a copy of the basking article from Copeia but it is like waiting for the second coming! I liked your article on flipper tags - that is a spectacular recovery from Truk. You never actually commented on the success or otherwise of your auto-grafting but I agree that a visible, written tag is far more likely to be recovered. In my work with rearing hatchlings in Torres Strait I picked unique combination of four of the twelve posterior marginal scutes with a sterile needle then wiped the scar with antiseptic. Despite the cleanliness of the procedure, the marks were visible throughout the eleven months I had them in captivity although in one or two they became ambiguous. I had initially tried using Col's method but the shocking hygeine in the farm-periodic rather than continuous water change-meant that most of the relatively enormous scars became septic. I think my method is useful for marking hatchlings in captivity with minimum trauma but could not be applied in the wild.

The article, alleged to be in Biotropica, is by Snell and Fritts. Hopefully I shall be able to track down my copy of the proofs Tom Fritts sent me and enclose them with this letter. As far as I know the issue of Biotropica is 6 months late and has not come out yet. It will probably appear as 'in press' in our article to be coming out in Copeia soon.

Kind regards,

STEPHEN GARNETT

George, see: (paragraphs)

memorandum

DATE: July 10, 1984

REPLY TO ATTN OF: Refuge Manager, Culebra NWR

SUBJECT: Progress Report - 1984 Marine Turtle Activity

TO: Project Leader, Caribbean Islands NWR'S

The following information is a summary of marine turtle activity as of June 15, 1984. Personnel involved in it's compilation were the EARTHWATCH expedition staff, EARTHWATCH volunteers, the Caribbean Islands Refuge staff and many local and off-island volunteers. This report was written by Tony Tucker and Kathy Hall as were reports dated April 25th and May 21st, 1984.

Survey methods were restricted to nightly foot patrols of Playas Resaca and Brava by EARTHWATCH volunteers and every other day patrols of Playas Carlos Rosario and Blanca by William Gonzalez of the Culebra Conservation and Development Authority. These surveys by Mr. Gonzalez were discontinued on June 5th due to time constraints. It was later learned that Mr. Gonzalez was performing these surveys on his own with no prompting or support from the Authority. The DNR rangers continue to provide no support for the marine turtle activity survey program. Activities on Playa Flamenco are reported by Charlie Garcia of the RCA/Navy observation post. Sergeant Sanchez of the Culebra Police Department reported the daytime nesting of a hawksbill on Playa Negra while while searching the area for contraband.

Beaches, the dates they were checked and known turtle activities are listed below:

Turtle Activities/ May 15- June 15, 1984

Playa Negra (May 23).....1 Hawksbill
Playa Blanca (Checked Every Other Day, Discontinued June 5th).0 Activities
Playa Flamenco (Checked Daily).....0 Activities
Playa Resaca (Nightly Patrols).....24 Activities
Playa Brava (Nightly Patrols).....42 Activities
Playa Tortola (5/22, 5/30).....0 Activities
Playa Zoni (5/22, 5/30, 6/12, 6/13).....5 Leatherbacks
1 Green
Playa Larga (5/30 via air).....No Activity Noted on this Particular Day
Playa Tortuga (Culebrita) (5/22, 5/30, 6/2, 6/13).....0 Activities
Playa Este (Culebrita) (5/22, 5/30, 6/2, 6/13).....0 Activities
Playa Oeste (Culebrita) (5/22, 5/30, 6/2, 6/13).....0 Activities
Playa Norte (Cayo Norte).....Not Checked
Playa Mosquito (Ensenada Honda)(5/25).....0 Activities
Playa Punta Soldado.....Not Checked
Playa Carlos Rosario (Checked Every Other Day, Discontinued June 5th).....0 Activities
Playa Norte and Noreste (Cayo Luis Peña)(5/21, 6/13).....1 Green

Total Known Turtle Activities as of June 15, 1984

Playa Negra.....1 Hawksbill Activity
Playa Flamenco.....2 Leatherback Activities
Playa Resaca.....67 Leatherback Activities
Playa Brava.....87 Leatherback Activities
Playa Zoni.....6 Leatherback Activities
1 Green Activity
Playa Tortuga (Culebrita).....1 Hawksbill Activity
Playa Este (Culebrita).....2 Hawksbill Activities
Playa Carlos Rosario.....1 Green Activity
Playa Norte and Noreste (Cayo Luis Peña).....1 Green Activity

A total of 24 individual leatherback turtles have been tagged. The titanium tags resist abrasion well. Two problems with their application have been solved. By prebending and aligning the clasping tip, the problem of bent tips becoming metal fatigued and breaking due to the metal's brittleness is solved. Tag site as well as tag insertion have been chosen to minimize scarring. Our tagging site has been moved more distally to insure that the tag will only touch the carapace past the widest width measurement. This practice (along with pointing the clasping tip upwards when applying) minimize any scarring of the carapace. Tag loss has been 0% on the rear flipper tagging site and appears to be promising for future tag retention. No tags have been lost on front flippers yet but hole enlargement when tags were applied too proximal to the body has been noted.

24 turtles have been tagged on Playas Brava and Resaca. Observed nests are actual sitings of individual females and predicted nests are ones that a missed nest reliably fits an individual female's internesting interval. Nesting intervals have ranged from 7-13 days and have averaged 9.5 days.

	10x	9x	8x	7x	6x	5x	4x	3x	2x	1x
Observed Nestings/Female	1	0	1	4	6	4	0	1	0	6
Predicted Nestings/Female	1	2	2	4	6	1	1	0	2	5

Nesting beach fidelity for Playas Brava and Resaca (which should be considered together as one nesting area) is strong. Of 162 leatherback activities, Playa Brava hosts 51%, Playa Resaca hosts 41%, Playa Zoni hosts 4% and Playa Flamenco hosts 1% of the recorded leatherback crawls. Individuals do not show a sole preference for either beach but switch nesting attempts between the four beaches. Our only long range tag recovery has been of a leatherback nesting on Playa Resaca on May 22/23 and 45 days later observed nesting on Manchinell Bay, St. Croix on June 6/7. Our newest turtle was tagged on June 9/10. There have been a total of 18 non-nesting nights since May 30/31.

Since the arival of the large caliphers for straight line measurements of carapaces on May 7th, the size range has been a maximum of 170.5 cm. and the minimum has been 143.5 cm. The mean ($\bar{x}$) number of yolked eggs has been 82 with a range of 50 to 110. The mean ($\bar{x}$) number of yolkless eggs has been 28 with a range of 7 to 48.

Erosion from the surf washed away one nest on Playa Resaca that had been laid very close to the water's edge. The four month long drought was broken by 10 days of torrential rains which caused lagoons to overflow, and washed away parts of both beaches. This was worse at Playa Resaca, and three nests were lost between stakes #28 and #29 on the east end. None were lost on Playa Brava.

The first leatherback nest emerged on May 10/11 and as of June 15th a total of 6 had emerged and been excavated. Hatching success ranged from 21% to 90% with a mean of 66%.

A total of 198 island and off-island volunteers have helped with night beach patrols to date.

John P. Taylor

John P. Taylor
Refuge Manager

DATE: May 21, 1984

memorandum

REPLY TO ATTN OF: Refuge Manager, Culebra NWR

SUBJECT: Progress Report - 1984 Marine Turtle Activity

TO: Project Leader, Caribbean Islands NWR'S

Correction to Progress Report Dated April 25, 1984

A total of three hawksbill turtle activities had been found on Culebrita prior to April 15, 1984 instead of the one reported. Prior to April 15th, two hawksbill activities had been found on Playa Este and one hawksbill activity had been found on Playa Tortuga.

The following information is a summary of marine turtle activity as of May 15, 1984. Personnel involved in it's compilation were the EARTHWATCH expedition staff, EARTHWATCH volunteers, the Caribbean Islands Refuge staff and many local and off-island volunteers.

Survey methods were restricted to nightly foot patrols of Playas Resaca and Brava by EARTHWATCH volunteers and every other day patrols of Playas Carlos Rosario and Blanca by William Gonzalez of the Culebra Conservation and Development Authority. Activities on Playa Flamenco are reported by Charlie Garcia of the RCA/Navy observation post. Beaches, the dates they were checked and known turtle activities are listed below:

Turtle Activities/ April 15- May 15, 1984

Playa Blanca (Checked Every Other Day).....0 Activities
Playa Flamenco (Checked Daily).....1 Leatherback
Playa Resaca (Nightly Patrols).....33 Leatherbacks
Playa Brava (Nightly Patrols).....30 Leatherbacks
Playa Tortola (Not Checked)
Playa Zoni (5/1, 5/7, 5/15).....0 Activities
Playa Larga (4/19, via air).....No Activity noted on this particular Day
Playa Tortuga (Culebrita)(4/30, 5/3, 5/12).....0 Activities
Playa Este (Culebrita)(4/30, 5/3, 5/12).....0 Activities
Playa Oeste (Culebrita)(4/30, 5/3, 5/12).....0 Activities
Playa Norte (Cayo Norte)(4/21,5/2 Via Air).....No Activities Noted on These Days
Playa Mosquito (Ensenada Honda)(4/27, 5/4) .....0 Activities
Playa Punta Soldado (4/20).....0 Activities
Playa Carlos Rosario (Checked Every Other Day).....1 Green

Total Known Turtle Activities as of May 15, 1984

Playa Flamenco.....2 Leatherback Activities
Playa Resaca.....43 Leatherback Activities
Playa Brava.....45 Leatherback Activities
Playa Zoni.....1 Leatherback Activity
Playa Tortuga (Culebrita).....1 Hawksbill Activity
Playa Este (Culebrita).....2 Hawksbill Activities
Playa Carlos Rosario.....1 Green Activity

Regarding the EARTHWATCH leatherback project, a total of 18 individual leatherback turtles have been tagged. The new titanium tags appear to be wearing well with little abrasion. Two tags were replaced after the tips of the locking mechanism were noted as broken. This appears to be the weakness in this type of tag and the problem can be eliminated through improved design.

Of the turtles which were successfully tagged and reobserved on Resaca and Brava beaches, one has appeared 7 times, three have appeared 6 times, three have appeared 5 times, two have appeared 4 times, four have appeared 3 times, two have appeared 2 times and three have appeared once. Six tagging or tag identification opportunities have been missed. Nesting intervals have been eight, nine and ten days.

There appears to be no beach specificity for Culebra leatherbacks since tagged individuals have nested on both Resaca and Brava beaches. Nesters on Playas Flamenco and Zoni are also thought to be primary nesters on Playas Resaca and Brava and these beaches are now considered as secondary nesting sites for Culebra leatherback turtles. The earliest non-returning turtle was last seen on April 23/24 after nesting three times. The two newest turtles were reported on May 3/4. There have been a total of 15 non-nesting nights on either beach since April 1/2 and all of these nights have been in blocks of two or more nights.

Since the arrival of the large caliphers for straight line measurements of carapaces on May 7th, the size range has been a maximum of 170.5 cm. and the minimum has been 143.5 cm. The mean ($\bar{x}$) number of yolked eggs has been 82 with a range of 50 to 110. The mean ($\bar{x}$) number of yolkless eggs has been 28 with a range of 7 to 48.

Beach erosion from surf and tidal flows has taken one nest to date at the east end of Playa Resaca on May 8/9. Ghost crabs depredated the eggs as they were washed away. Rain guages have been installed on each beach, however potential rain erosion from flooded lagoons behind the beaches has not occurred due to a current four month drought.

The first leatherback nest hatching occurred on May 10/11 with 40 to 50 nestlings emerging. Egg laying for this particular nest was not observed. As a general rule, the EARTHWATCH crews wait at least 10 days after the projected hatch date for each nest before considering excavation. After commencement of hatching is observed, the nest is excavated the following night to help along any stragglers and to check hatching success.

Our first poaching incident was reported on Playa Carlos Rosario on May 1/2 when a recent green turtle nest was robbed of eggs. No other incidents of poaching have been documented or reported on the beaches or in Culebran waters. More and more local people are responding to the protectionist spirit through nightly visits with the EARTHWATCH crews to Playas Brava and Resaca. 88 local and off-island volunteers have viewed and appreciated the phenomenon of leatherback turtle nesting. Our program of local involvement on this leatherback project is an overwhelming success.

John P. Taylor

John P. Taylor
Refuge Manager

Copy

AUSTRALIA
NATIONAL PARKS AND WILDLIFE SERVICE
NORTHERN REGIONAL CENTRE
BALLARENDA
TOWNSVILLE 4810, AUSTRALIA
ATTN: C.J. LIMPUS

June 15, 1982

"Our 80th Year"

AIR MAIL

Dear Mr. Limpus:

Confirming our telephone conversation today, the size #19 is manufactured from .035" x 3/8" material; the size #881 tag utilizes .030" x 5/16" material. Enclosed is a specification sheet which will provide you with a description of the chemical analysis and physical properties of the Inconel 625 that was used to manufacture the #681 tags for Dr. Balazs. Titanium would have to be supplied to us in the guages and widths mentioned above in CONTINUOUS COIL FORM and must possess the same workability, i.e., shearing, perforating, drawing, etc., characteristics similar to the Inconel 625 -- thus the Inconel 625 specification sheet, we would presume this inforamtion be necessary to your material source to allow compliance.

Unfortunately, the circumstances surrounding our further production of Inconel 625 tags has not improved during the last year. The project has been placed on "hold" because of lack of funding for the required equipment and dies. We can build the equipment and dies but must have funding to do so and this same obstacle would require resolving before undertaking the manufacture of tags from titanium, whether the titanium would be supplied by us or by you.

Otherwise, should we proceed on strictly a commercial basis, we would require an order for a minimum quantity of 7,000 of the size #681 tags -- manufacturing cost would be US$715.00 per hundred. The size #19 tag minimum quantity would be 3,000 at US$1667.00 per hundred. These costs cover only production -- no material, transportation, etc. After the original order the equipment and dies would be built and subsequent orders would cost substantially less.

Enclosed is our catalog, which will provideyyou with current descriptions and pricing on the standard monel metal tag series.

Thank you for telephoning and if we can be of further service, please let us know.

Sincerely,

NATIONAL BAND AND TAG COMPANY

J. R. Haas

JRH/sls/2

UNIVERSITY OF MIAMI
Dorothy H. and Lewis Rosenstiel
SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE

4600 RICKENBACKER CAUSEWAY
MIAMI, FLORIDA 33149
(305) 350-7211
Cable: UOFMIAMI

9 May 1978

George H. Balazs
Hawaii Institute of Marine Biology
P. O. Box 1346
Coconut Island
Kaneohe, Hawaii 96744

Dear Mr. Balazs:

Dr. Farrell must have lost my letter. In it, I gave the results of my freeze marking experiments on young green and loggerhead turtles. Here is a summary, as best my memory serves, of the methods and results.

1. The several dozen turtles were between 110 and 180 cm in carapace length.

2. The majority were green turtles.

3. They were marked on the fore flippers and carapace by placing pieces of dry ice directly on the surface for from about 15 to 45 seconds.

4. The resultant marks (after a few days) were white in color.

5. The carapace marks were much less noticeable.

6. The flipper marks were easily discernable to me for about six months. I say "for me" because by that time I could recognize many of the individuals by other characteristics.

7. There was considerable "natural" mortality, but enough survival for me to conclude that, marking by the method I used would be good for a maximum of about one year.

8. The marks appeared to simply re-pigment.

I hope that this information proves useful.

Sincerely,

Raoul G. Rehrer
Research Associate
Division of Biology and
Living Resources

RGR:sm

UNITED STATES DEPARTMENT OF AGRICULTURE
SCIENCE AND EDUCATION ADMINISTRATION

FEDERAL RESEARCH
WESTERN REGION

Pioneering Research Laboratory
202 Wegner, WSU
Pullman, Washington 99164

April 25, 1978

Mr. George H. Balazs
Assistant Marine Biologist
University of Hawaii at Manoa
Hawaii Institute of Marine Biology
P. O. Box 1346
Coconut Island, Kaneohe, Hawaii 96744

Dear Mr. Balazs:

Please excuse the delay in answering your letter of March 22. I regret to say I have a tremendous backlog in work, and correspondence has slowed me up. I had hoped to contact you in Hawaii. I am supposed to go to Hawaii on a study on the spinner porpoise for the NOAA.

I regret to say that I was not the individual who did the studies on alligators and sea turtles. The individual who was attempting flipper marks on the green sea turtle was Raoul G. Rehrer, Research Assistant, Division of Biology and Living Resources, School of Marine and Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, Florida 33149, telephone (305) 350-7211. I did invent freeze marking and have marked a great number of animals, but green sea turtles was not one of them. We never did get definitive data from the Florida experiment; perhaps you can follow that program up from your end.

I hold the patents relative to freeze marking and laser marking; both of these techniques should be given some thought. We just completed a fairly interesting study of laser on crab. My wife, Pat, has done some marking on terrapin, but I will be happy to discuss this with you in my next trip to Hawaii, as none of this material is published either.

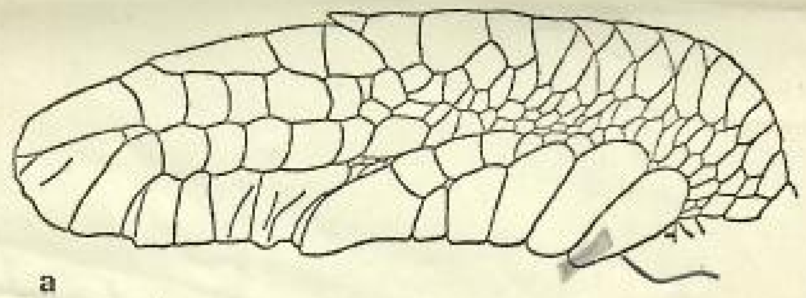
I imagine that I will be going to Hawaii sometime this spring, although, the dates have not been solidified. Perhaps that will not be handy. I see that you're not at Honolulu. I have a co-operator there that I work with, Bob Nakamura, whom you probably know. I would welcome a chance to talk with you, if you could make the trip to Honolulu to coincide with my visits there. I will for sure be going through in August, also, on the way to Tokyo for a meeting.

Sincerely,

Keith Farrell

R. Keith Farrell
Veterinary Medical Officer

cc: Raoul G. Rehrer

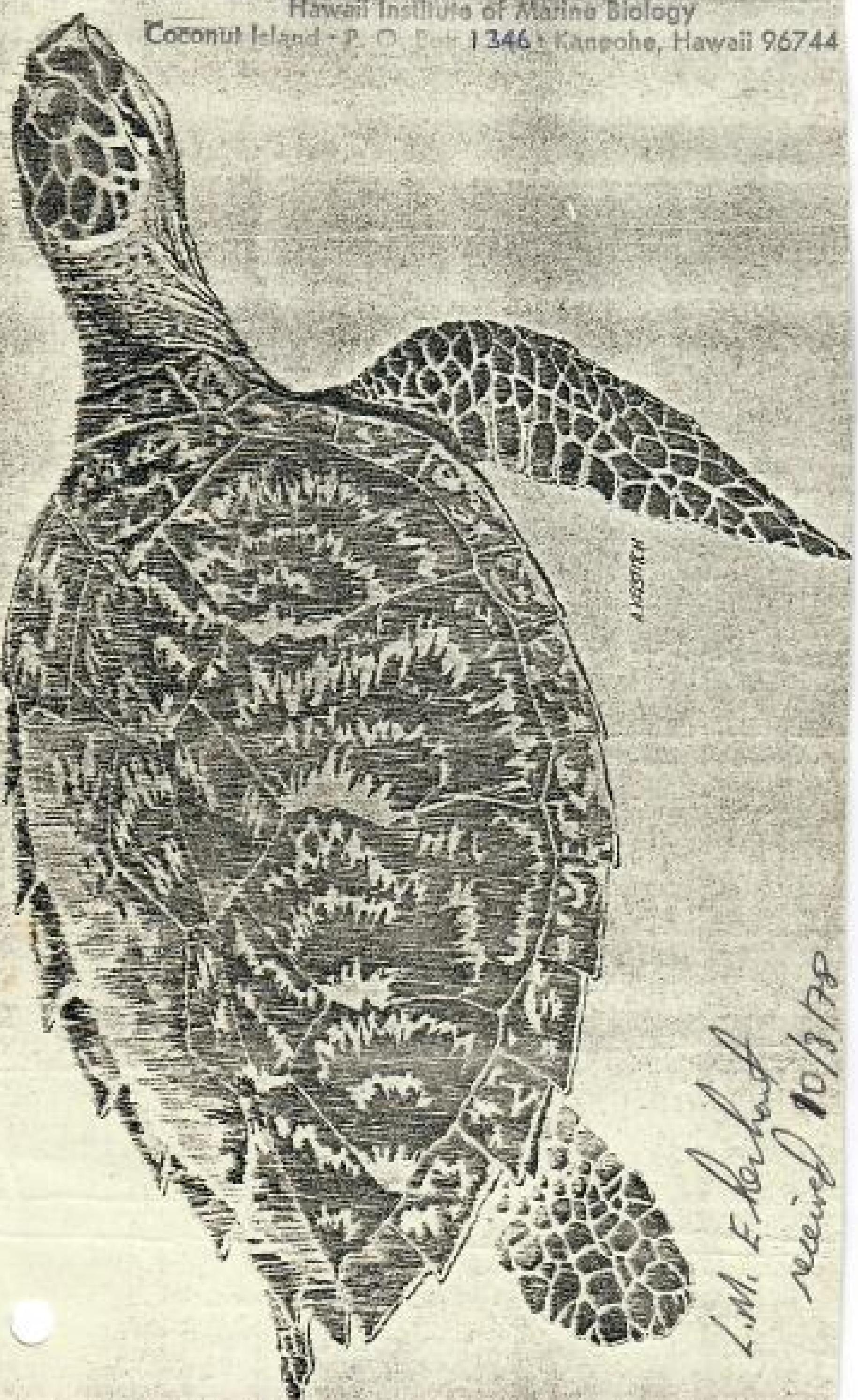


a

Please indicate tagging site(s) and return to:

George H. Balazs

UNIVERSITY OF HAWAII
Hawaii Institute of Marine Biology
Coconut Island - P. O. Box 1346 - Kaneohe, Hawaii 96744



L.M. Ehrhart
received 10/3/78

FLORIDA TECHNOLOGICAL UNIVERSITY
BOX 25000 ORLANDO, FLORIDA 32816

20 September 1978

Mr. George Balazs
Hawaii Institute of Marine Biology
P.O. Box 1346
Coconut Island
Kaneohe, Hawaii 96744
Cable Address: UNIHAW

Dear Mr. Balazs:

I am one of Dr. L.M. Ehrhart's assistants in his marine turtle tagging project at the Merritt Island National Wildlife Refuge. He is very apologetic that he has been unable to answer you sooner, but both full time field work and teaching duties have kept him extremely busy.

We tag mostly loggerheads and some greens, both in the nesting population and in a netted lagoonal population. National Band and Tag Co., Hasco #1005, #49 Monel tags are used, except on the smallest lagoonal turtles where Hasco #1005 Monel, size 681 are used. Corrosion is highly variable, sometimes it is seen after a few months and other times it is negligable after a few years. The lagoonal tags seem to corrode faster, possibly due to the often higher salinity of these waters. Also the tags often corrode at the point of attachment, probably because of certain factors in the body fluids. In the past we punched a hole in the flipper with an icepick before tagging, however now we have self piercing tags. We are sending you several reports in which you can read about the cold spell stunning of 1977 and the rest of the project.

I originally started working for Dr. Ehrhart in June of 1977 as a student, but have since then graduated and have stayed on, still on a part-time basis. Also, I was one of the four students sent by Dr. Peter Pritchard to Mexico to work during the Kemp's ridley nesting season this past spring. I have enjoyed sea turtle research, and thought perhaps you might know of an opportunity for me to continue in this field in Hawaii, either by means of regular employment, or as a graduate student. Any information you could send me would be greatly appreciated.

Sincerely,

Kathleen L. Valentine

Kathleen L. Valentine
1920 Strathaven Rd.
Winter Park, FL 32792

L. M. Ehrhart

MEMBER

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Telegraphic Address: ROTOTAG HENLEY-ON-THAMES (U.K.)

Telephone: **NETTLEBED 641457/641544/641377/641487/641498**

Telex No.: **847547**

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6th June 1978

G.H. Balazs Esq.
University of Hawaii at Manoa,
P.O. Box 1346,
Coconut Island,
Kaneohe,
Hawaii 96744

Dear Sir

On checking our files we find that we have not yet received a reply to our letter of the 2nd March 1978, enclosing comprehensive leaflet and samples.

We should be very pleased to supply any further information on our products and in the meantime we enclose our revised price list for your information.

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George Balazs, HIMB, U of H Manoa, POB 1346, Coconut Isl, Kaneohe, Ha. 96744

In talking w/ tag Mfg'rs I learned of a researcher using Poly vinyl (UV stabilized) Peterson disc tags on Sea turtles. His Name:

Dr. Dagmar I. Werner
University of Basel
Biologische Anstalt
der Rheinsprung 9
4051 Basel, Switzerland

⇒ works in Galapagos:

CDRS Galapagos
Casilla 58-39
Guayaquil, Ecuador.

Might this be of assistance for your project?

Sincerely,

Bob [illegible]

Hi George,

Will have a copy of the manual sent to you soon. Sorry you could not have been along.

Bob

R. L. DeLong

U. S. DEPARTMENT

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

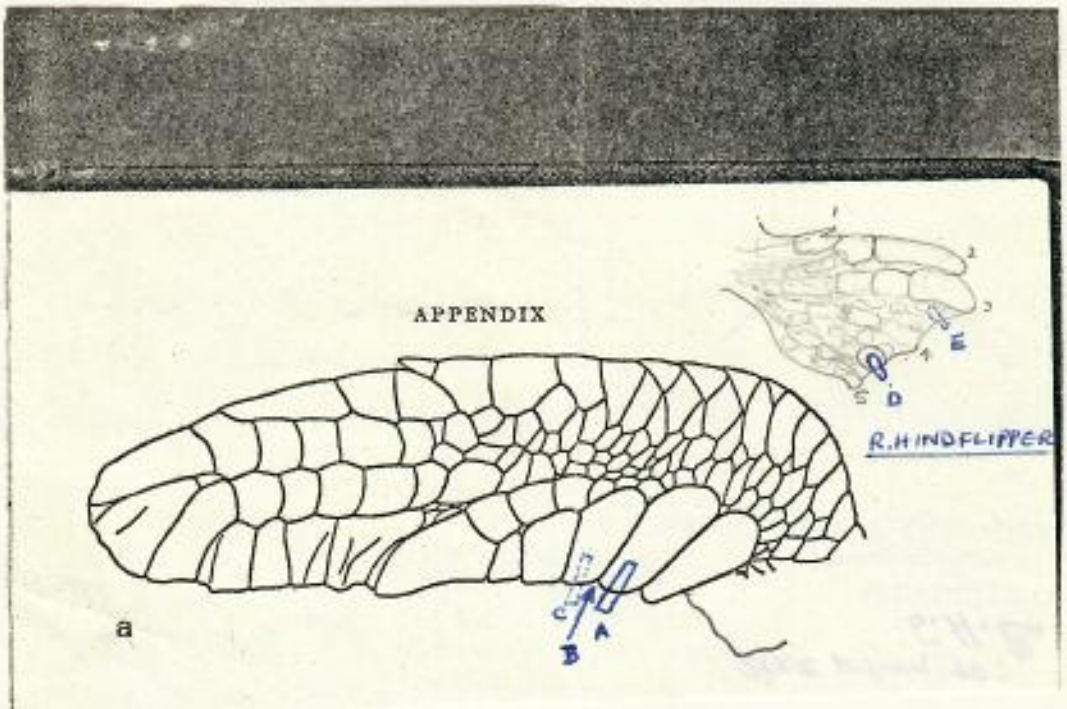
NOAA, NATIONAL MARINE FISHERIES SERVICE, NWFC

MARINE MAMMAL DIVISION

7600 SAND POINT WAY, N.E.

SEATTLE, WA 98115

APPENDIX



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ESTACION BIOLOGICA CHARLES DARWIN
ISLA SANTA CRUZ, GALAPAGOS

May 13, 1977

REF. No CDRS-0603

Mr. George H. Balazs
University of Hawaii
Hawaii Institute of Marine Biology
Coconut Island
P.O. Box 1346
Kaneohe, Hawaii 96744

Dear George:

Thank you for your letter of March 24 with a copy of your paper on turtle migrations -it was waiting for me upon my eventual return from the field 2 days ago. In answer to your questions on the tags that I use: the metal one is the standard monel metal cattle-ear tag issued by the National Band and Tag Co, 721 York St., Newport Ky. 41072, U.S.A. It is approximately 4 cm long and 1 cm wide. On the front is a number and on the back the offer of a small reward with the address. To give you some idea of the space available, my tags are engraved with PREMIO REMITE ESTACION DARWIN GALAPAGOS ECUADOR. They are inserted in the trailing edge of the right foreflipper in the second proximal scale as in the diagram (position A). Sometimes this scale is too thick to allow penetration and so is inserted in the next scale (position C). Sometimes it is better to insert the tag in the skin in between these two scales (position B).

The second tag is a plastic one- JUMBO ROTOTAG, from DALTON SUPPLIES LTD., NETTLEBED, HENLEY-ON-THAMES, OXON RG9 SAB, ENGLAND. This is numbered on both, one, or neither side as required and inserted in the trailing edge of the right hindflipper in the skin between the 4th and 5th digits as in the diagram (position D). There is usually a largish scale which accommodates this tag rather conveniently and to facilitate insertion I normally make a hole with a leather punch first. The tag can also be inserted between the 3rd and 4 th digits (position E) if desired. My results have shown these plastic tags to have by far the much greater staying power, but suffer the disadvantage of becoming encrusted with epizooites fairly readily. "You pays the money and takes the choice!"

With respect to my non-growing juveniles and subadults it appears that you have misinterpreted my interpretations. All turtles encountered in the lagoons in question whether male, female, subadults or juveniles never stayed for periods of more than 3-5 days. The only feeding they did inside the lagoons was to graze algae such as Bostrychia from mangrove stilt roots. They would leave periodically in order to feed further along the coast i.e. outside the lagoons. The lagoons were used mainly as a "stop-over" or resting area. The "non-growing"

recaptures had indeed led a sedentary existence (indicated by a heavy algal growth and the attachment of a specimen of Muricanthus princeps (fam. Muricidae) to the carapace of one subadult) but were never-the-less still feeding (as dissections of several of them showed), probably on a maintenance or subsistence level.

The land-basking habit also exists here in Galápagos, but unlike yourself, I have only so far seen females basking and only on beaches bordering "resting lagoons" inside which active copulation takes place or on nesting beaches themselves, again where males also occur and active copulation takes place. I have also only ever seen them doing this just prior to or during the first part of the nesting season when active copulation is still taking place. Unfortunately my observations are limited but I have not had reported to me any cases of males basking anywhere or of females basking on beaches near feeding areas. This adds weight to the suggestion by other researchers that the basking habit in part is an active effort by the females to escape the attention of "over-keen" males.

Thank you for your very kind offer to identify limited amounts of dried algae - I will undoubtedly take you up on this in the future.

Sincerely,

Derek Green,
Principal Investigator
Galapagos Green Sea Turtle Ecology Study

DG/ab

NATIONAL PARKS AND WILDLIFE SERVICE

Mr. C. Limpus,
Zoologist,
National Parks and Wildlife Service,
Northern Regional Centre,
PALLARENDA. TOWNSVILLE. Q. 4810.

16 Sept
~~3rd August~~, 1976.

Dr. G.H. Balazs,
Hawaii Institute of Marine Biology,
P.O. Box 1346,
Coconut Island,
Kancohe, Hawaii. 96744.

Dear George,

Thanks for your note. It arrived as I was leaving for Florida and Costa Rica so I'll try to answer some of your questions as we fly. I'm attending the 5th International Symposium on Toxins in Costa Rica but hope to see some of the turtle people at the same time.

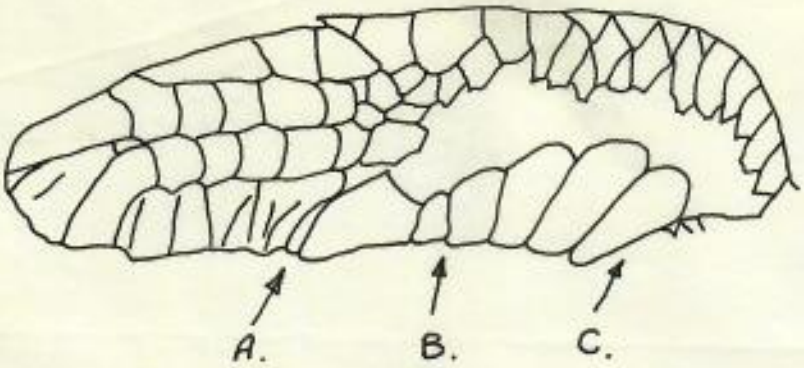
Re tags: It seems I'm not the only one (north) complaints about the National Band and Tag Co. Monel tags. My problems have been as follows (Initially I was using tags purchased by Dr. Bustard).

Dr. Bustard's series "ANU" up to No. 4000: these tags applied easily and seem to have been the best I've ever had in this regard.

Dr. Bustard Series "Reward, Return Bustard etc" No. 4000 → end of his series: these tags were of a less pliable metal and were harder to close correctly. In addition the angle of the spiked end of the tag was such that often for whole cards of tags unless they were individually re-shaped the spike missed the end of the tag and so was easily sprung apart.

National Parks and Wildlife Series up to X5000: these tags are fairly easy to close correctly provided the spike of the tag is at the correct angle. Angle varied widely, the spike sometimes missing the end, sometimes coming down on the cross bar of the tag with resulting flattening of the bar. This latter leaves the tag open. The other disconcerting problem with regard to these tags was that where the bar had been punched up from the base of the tag there was often a distinct ridge which caught the spike so preventing its passage beneath the bar. With this condition the top of the tag usually buckled as the tag applicators were completely closed. We cope with these problems by closely examining each tag after application, & replacing where incorrect closure occurs. We are currently working on about a 30% wastage in tags as a result of these problems even though we try to check each tag for correct shape before application.

Tag positions used in Queensland Sea Turtle Project as descriped in attached letter.



Tag position: all our tags are applied on the trailing edge of the front flipper - usually the left. I currently use 3 positions on the flipper for tagging - see attached diagram.

Position A: tagging position for C. mydas, C. depressa and all immature C. mydas, C. depressa and E. imbricata.

loggerheads tagged here returning to nest 2 weeks after tagging have more than 50% of the tag bitten (?) i.e. buckled tags. This can also result in tag loss at this stage.

....2/..

Position B: all Caretta. Since shifting to this tag position with Caretta we rarely have a tag bitten (?). Thus what I previously was attributing to other turtles biting the tag now seems to be due to Caretta biting their own tags in position A. Position B is thicker than position A and there is a higher failure in correct tag closure in position B.

Position C: all large Eretmochelys, all male C. mydas, copulating male Caretta. Attendant Male C. mydas bite severely on trailing edges of flippers of other males successfully mounted in courtship. Position C appears to be the only part of the flippers relatively undamaged in male C. mydas. The disadvantage of this area is that the tag often is deeply buried in flesh obscuring the number.

Tag loss: Within a nesting season I expect much less than 5% of the turtles recorded to return with fresh tagging scars indicating recent loss of a recently applied tag. I call these "within season retags". In successive seasons I find now that after 8 years of tagging that my current "interseason return retag" is much higher representing 20-25% of the total interseason return turtles for the season i.e. at Mon Repos I would expect about 400-450 caretta this summer with about 100-120 turtles with tags from previous seasons and about 20 turtles with old healed tag scars (lost from previous seasons tagging).

This high interseason return retag group probably results from: (a) faulty tag application, (b) turtles (?) biting off tags or springing them open, (c) corrosion.

I have little measured data on corrosion. It occurs in all the above series of tags. Within any one series some tags are badly corroded and can be broken off with finger pressure after 1 or more years while other tags are almost perfect. This patchyness of the corrosion in a series suggests variation in alloy quality contrary to the manufacturers expectations.

Tag loss worries me. Especially as I am placing an order for 15,000 tags to use this summer. I'll be interested in hearing more from you on this. The above information has been from memory. Hope there was not too much padding with the main ideas. The Heron Island C. mydas tag data is not as readily recalled as the Caretta data. C. depressa tagings are less than 200 but the tags are no less satisfactory for them than C. mydas despite this turtles smaller size.

By the way I have no Ph. D., thanks. Working on it though.

All the best,

Col

Col Limpus,
Zoologist.

the animal care people

FEARING

October 30, 1975

Mr. George H. Balazs
Jr. Marine Biologist
University of Hawaii at Manoa
P O Box 1346
Coconut Island
Kaneohe, Hawaii 96744

order # 2001 +

Dear Mr. Balazs:

Thank you for your recent letter.

To my knowledge, we have never found it necessary to test our Tuff-TEX tags in saltwater and, therefore, have no valid results to pass on to you. We have conducted numerous and exhausted tests regarding the effect of ultra-violet and sunlight on the tags, and found they will withstand almost any extremes of this type. At the present time, we do not manufacture a Tuff-TEX product out of the Tuff-FLEX polyurethane material, primarily because of the cost factor regarding this product and its end use.

We would be more than happy to send you a series of samples for your own individual testing if you should want to continue your research.

We will wait to hear from you and hope to be of any service we can.

Sincerely yours,

J. H. Melchior SE

J. H. Melchior
President

JHM:sh

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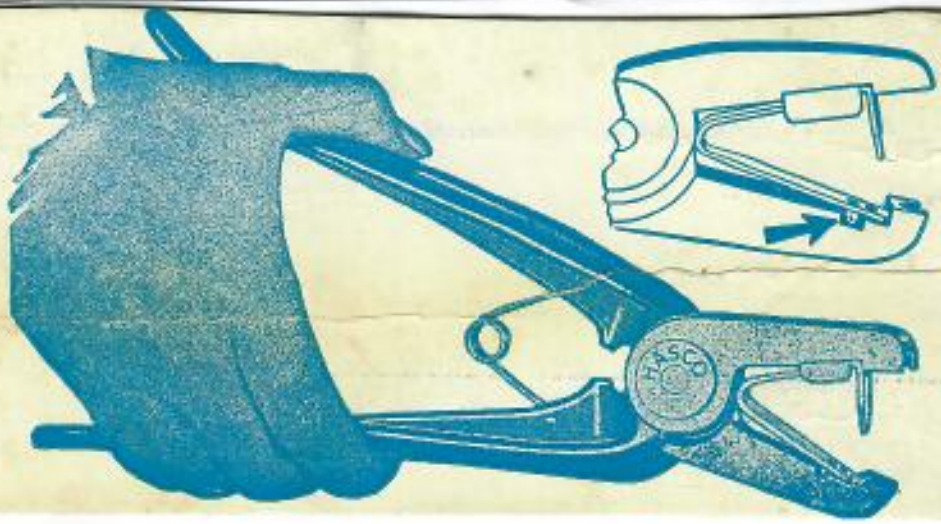

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PLANT PROTECTION PRODUCTS PTY. LTD.

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Dudley,
Newcastle N.S.W. 2290

15th November, 1976.

Mr. George H. Balazs,
Marine Biologist,
University of Hawaii at Manoa,
P.O. Box 1346,
Coconut Island,
KANEOHE. Hawaii. 96744.

Dear Mr. Balazs,

Thank you for your letter October 28.

We have pleasure in enclosing for your consideration a few stainless steel tags as supplied Honiara.

Orders ex stock consecutively numbered are $9.00 per 100. or numbered to clients specification $11.00 per 100. (Up to six digits can be placed on the front face and four on the reverse side) Applicators $14.00 plus freight. Dispatch four days.

Sincerely,

Douglas V. Ridley

Douglas J. Ridley.
Managing Director.

Enc.

ISLAND RESOURCES FOUNDATION

September 20, 1976

Dr. N. Mrosovsky
Departments of Zoology and Psychology
University of Toronto
Toronto M5S 1A1 Canada

Dear Dr. Mrosovsky:

Having looked over the first Marine Turtle Newsletter with great interest, I would like to throw in some additional information on the tag loss question.

At Isla Aves, where I have been tagging since 1971, tag loss through failure of monel cattle ear tags is a major problem. For example, last year, we had two remigration returns with tags and twenty without. The latter were unquestionable tag losses which carried a callous with a central perforation in the area we normally position the tag. Additional possible tag losses with flippers torn or suspiciously scarred in that area were tallied separately.

This rate of loss does not reflect poor application techniques. Because of the small number of turtles handled each season (150-200), each tag is examined for proper clenching before an animal is released. As an aside, the number of tags damaged in application has been reduced by prepunching a hole through the flipper with a modified Vise Grip welding clamp. This is a quick procedure and almost assures proper clenching.

Based on the use of a fairly permanent secondary mark, the rate of tag loss during our brief tagging season at the nesting site (3-6 weeks) is almost nil, contrary to Schulz's experience. Since the tag loss problem became apparent two years ago, we have been cutting coded notches in the marginal bones using a simple system derived from my computer work, which permits individual recognition of animals independent of the monel tags. Whether these notches will persist over a remigration interval remains to be seen, but particularly on animals whose plastral seams are obliterated (i.e., essentially no growth) it seems likely that they will.

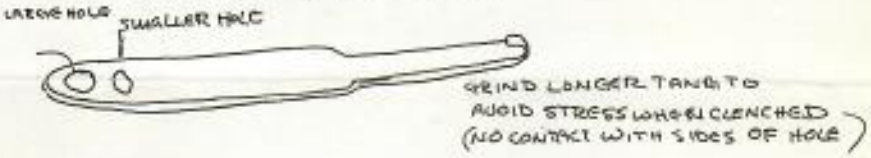
As you saw from the pictures at Jensen Beach, we have also painted the tag number on the carapace of nesting females with lacquer-based spray paint to facilitate recognition underwater. The persistence of these marks is quite

low, generally only a few days, and they are clearly lost to abrasion. Whether this is exclusively from the action of wave surge in rocky shelters or partly results from repeated mating is not apparent.

The sample of recovered tags I have examined is small, but at least one shows significant corrosion and in another the clenched tip appeared to have been gradually straightened out. A significant proportion of smaller tags (chicken-wing) of the same style which were applied to animals held in captivity for a year showed corrosion and some were ready to break in the portion of the tag embedded in the flipper tissue.

Correspondence on these issues and the question of Inconel tags with National Band and Tag Company was unsatisfactory and lead me to do a bit of research and consult a metallurgy/heat treating specialist (J. Carter). The overall impression is that in a corrosive environment like sea water the monel tags in common use today are designed to self destruct at the small retaining bar which holds the clenched tip of a closed tag. Corrosion is excited at sharp, deformed corners, such as are adjacent to the bar and will produce cracks, eventually causing it to break away. The implication in the Newsletter that some sort of relative motion is necessary for crack formation is erroneous, but it would accelerate the process.

The form and mode of application of the present tag are convenient, but it needs to be redesigned so that there are no sharp corners in the closure. A minimum modification approach would be to lengthen the tang which is clenched and put round holes in the lower bar (see sketch).



A change of materials for the tag would be beneficial, but would not eliminate tag need for redesign. Contrary to the statement in the Newsletter, the present alloy, monel, Inconel, and a third Chromel A (which was suggested to me as the most resistant) all contain substantial amounts of nickel:

	Fe	Mn	Cu	Ni	Cr
Monel	1.5	1.0	20	67	
Inconel	5			80	15
Chromel A				80	20

Inconel work hardens rapidly so probably some modifications of the curr-

ent tag-making process would be required. I do not favor a shift to a plastic tag, because, despite the superior resistance of some plastics to sea water, they are vulnerable to abrasion long-term.

Temporarily setting aside the option of modifying tags on hand to the pattern above with drill and file, there is one relatively simple tag modification which is at least palliative, if not genuinely constructive. I presume, but do not know, that the monel tags currently sold are not bright annealed after they are stamped out. Simple annealing should reduce the brittleness of the tag retaining bar which I have heard people complain about. Heating the tags to 1600° - 1800° F for approximately one minute (in a laboratory muffle furnace) and allowing them to quench in air should relieve the high stresses induced around the bar during forming and does result in a blue-grey coat of protective oxides. If this coating persists it may help to protect the tag and might dampen complaints I have received that shiny tags increase the likelihood of predation on small turtles. I have done this to all the tags we are using this year, but realizing this does not affect corrosion due to design errors mentioned earlier, am continuing to investigate the possibility of redesign.

My recollections of it are a bit vague now, but I viewed askance Hirth and Schaeffer's Copeia note modeling hatchling survival, aside from a somewhat patronizing tone, it seems to me that it assumes without much discussion that the exceedingly high rates of adult mortality postulated (which are based on human-exploited populations) represent a sustainable condition. Thus, I wonder about the relevance of their calculations to conservation programs without an effort to also vary adult survival in the model.

The Newsletter represents a valuable forum. I am glad you have committed the time to preparing it.

Sincerely yours,

Bill Rainey

William E. Rainey
Island Resources Foundation

cc: George Balazs

Telephone
Alyth 501
(STD Code 082 83)

From: Dr. H. R. Bustard

Airlie Brae,
Alyth,
Perthshire, PH11 8AX,
Scotland.

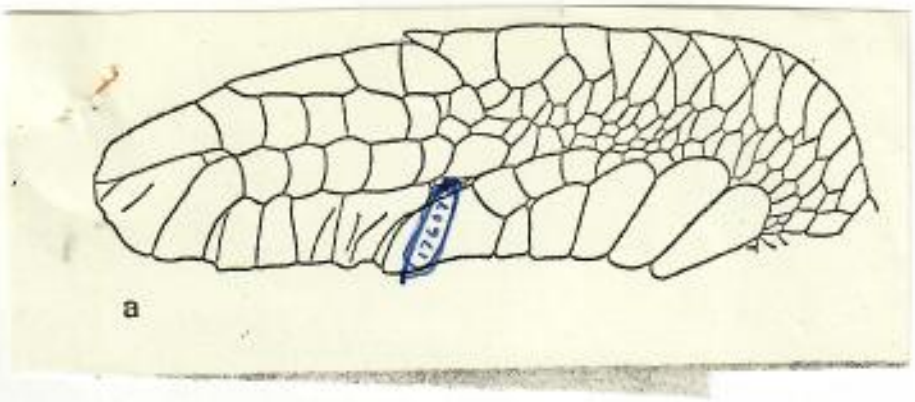
15th September 1976.

Dear Mr Balazs,

I havejust seen your letter of February 6 on one of my (rare) visits to the UK. You should lways write to me in India - c/o F.A.O. 55, Lodi Estate, New DELHI.

There must be an error in my turtle book. All tagging is done on the trailing edge of the left FRONT flipper. The area selected (to just miss the finger bones) is indicated on the enclosed sketch.

Yours sincerely,



a

University of Hawaii at Manoa

Hawaii Institute of Marine Biology
P.O.Box 1346 • Coconut Island • Kaneohe, Hawaii 96744
Cable Address: UNIHAW

March 28, 1976

Dr. Peter Greenham
Department of Zoology
The Australian National University
Canberra, A.C.T.
Australia

Dear Dr. Greenham:

I am in the process of trying to gather information on the tagging site(s) used by various marine turtle researchers around the world. Your assistance in this project would be most appreciated as an earlier inquiry to Dr. Bustard in Scotland has thus far not resulted in a response.

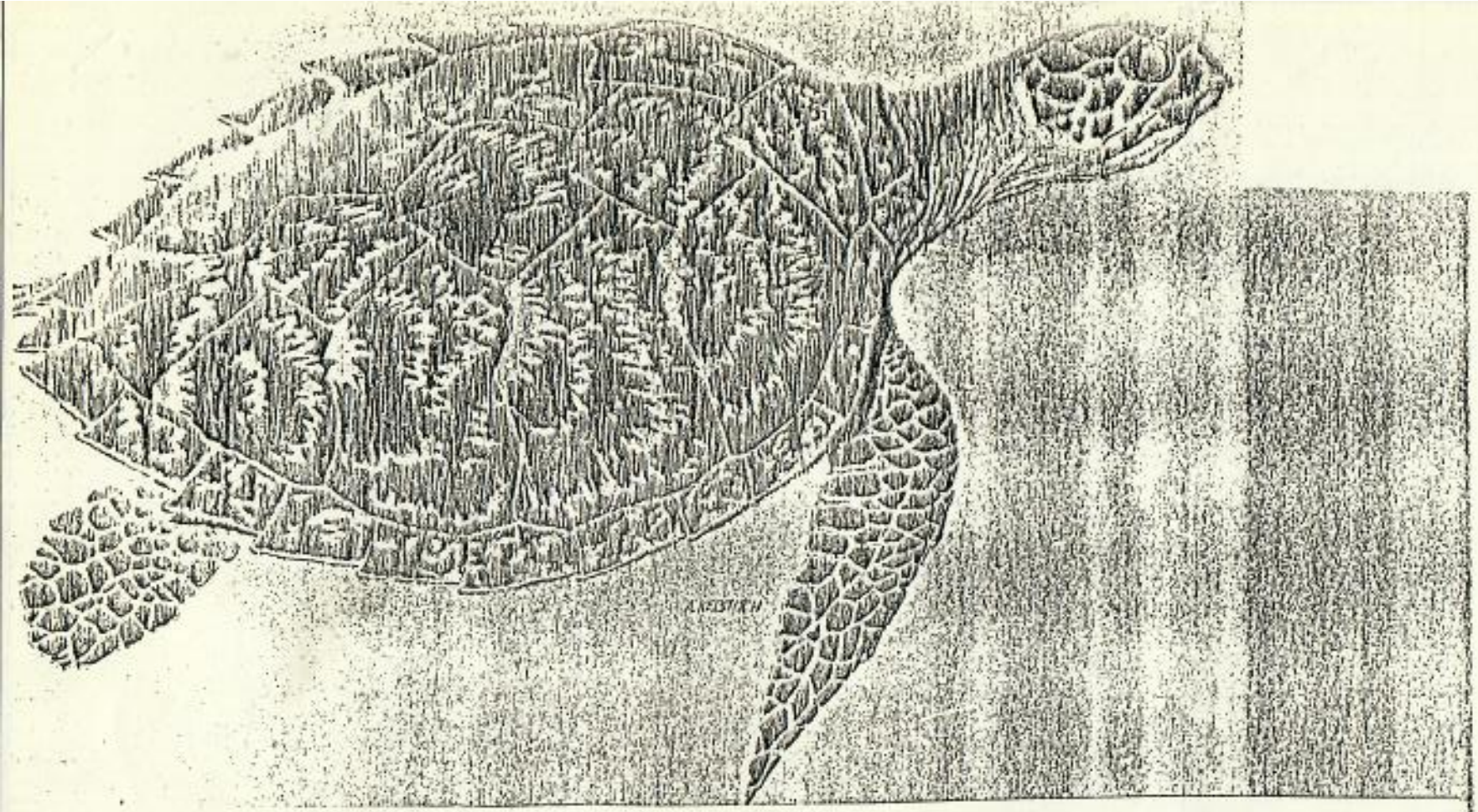
On the enclosed illustration, would you kindly indicate the exact sites where tags have been affixed to turtles nesting on the Great Barrier Reef. On page 116 of Dr. Bustard's 1973 book it is mentioned that the tag is sited about mid-way on the trailing edge of the front flipper. However, in the article "Queenland Protects Sea Turtles" (ORYX,1969), a photograph shows the tag situated near the end of the front flipper. Were several sites used over the years and, if so, which was found to be the most successful? Is a hole first pre-punched before affixing the tag? Are you still observing the return of tagged turtles on the nesting beaches? Has tag corrosion or loss been a problem in your work? I am assuming that all tags used, or still in use, are made of Monel alloy and are the size 49 produced by National Band and Tag Company of Newport, Kentucky, USA.

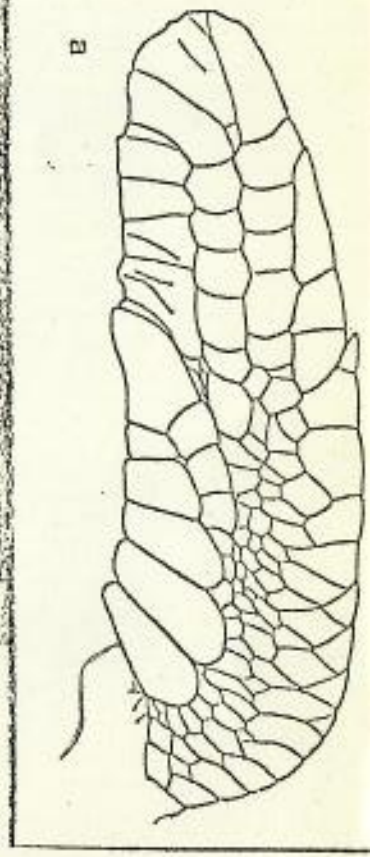
I look forward to your answers to these questions and I certainly thank you in advance for taking the time to respond. Inquiries are being made to numerous researchers and I will send you a summary of the data when it has been compiled.

Sincerely,

George H. Balazs
Jr. Marine Biologist

enclosure





Please Return To: George H. Balazs

UNIVERSITY OF HAWAII
Hawaii Institute of Marine Biology
Coconut Island · P. O. Box 1346 · Kaneohe, Hawaii 96744

Trust Territory of the Pacific Islands
Department of Resources & Development
Marine Resources Division

MICRONESIAN MARICULTURE DEMONSTRATION CENTER

June 28, 1976

Goerge H. Balazs
University of Hawaii
Hawaii Institute of Marine Biology
P.O. Box 1346
Kaneohe, Hawaii 96744

Dear Mr. Balazs:

Our turtle tags and applicators can be obtained from National Band and Tag Co. Newport, KY.

Sincerely,

McDonald May
Acting Chief, M.M.D.C.

P.O. Box 359, Koror, Palau, Western Caroline Islands 96940

University of Hawaii at Manoa

Hawaii Institute of Marine Biology
P.O.Box 1346 • Coconut Island • Kaneohe, Hawaii 96744
Cable Address: UNIHAW

June 3, 1976

Mr. Lucas Chin
Curator
Sarawak Museum
Kuching, Sarawak
East Malaysia

Dear Mr. Chin:

A portion of my research deals with Chelonia in the Hawaiian Islands. For the past four years I have been tagging green turtles and monitoring nesting activity at the small islets of French Frigate Shoals (23°N 166°W). This site is located about 800 kilometers northwest of Honolulu and is the last colonial breeding site in the Archipelago. I have enclosed a reprint covering some of this work which you may find interesting.

One of the serious problems which I have had to contend with is corrosion in the Monel tags that are used. Although considerable variation exists, I have found tags that are significantly corroded in as short a time as two years after being placed on adult nesting turtles. In order to learn as much as possible about the scope and magnitude of this problem among other sea turtle researchers, I have been making inquiries to various people around the world. Hopefully, you will assist me in this effort by providing answers to the following questions. Your responses will, of course, be particularly important as I believe personnel of the Sarawak Museum have been tagging turtles with Monel tags since 1953. This would certainly be longer than any other sea turtle research program in existence.

Specifically, I would like to know if tag corrosion has been observed in your program and, if so, to what degree of severity and in what percentage of the turtles tagged? Also, what is the longest period of time that a tag has been on a turtle and subsequently recovered? Are you still observing any of the turtles that were originally tagged during the early 1950's?

On the enclosed illustration, could you kindly mark the location where your tags are now being attached on the turtles. Please return this form to me at your convenience.

I want to thank you in adavance for your cooperation in this matter. After analyzing the information that I receive from the various researchers, I intend to make the findings available to each of the contributors.

Sincerely,

George H. Balazs

GEORGE H. BALAZS

University of Hawaii at Manoa

Hawaii Institute of Marine Biology
P.O.Box 1346 • Coconut Island • Kaneohe, Hawaii 96744
Cable Address: UNIHAW

October 1, 1975

Mr. Siow Kuan Tow
Director of Fisheries
Fisheries Office
Kuala Trengganu
Malaysia

Dear Mr. Siow:

Mr. Ong of the Fisheries Research Institute in Penang recently visited Hawaii and told me of your studies of the leatherback turtle. In addition, Dr. Nicholas Mrosovsky stopped off on his return from Malaysia.

A portion of my research deals with Chelonia in Hawaiian waters. For the past three seasons I have been tagging green turtles and monitoring nesting activity at the small islets of French Frigate Shoals (23°N 166°W). This site is located approximately 800 km northwest of Honolulu and is the last and only colonial breeding site in the Archipelago.

I was most interested to learn that you are using plastic Rototags on leatherbacks. Along with others, I am trying to find a better way of tagging turtles. Our success with Monel "cattle ear tags" has been limited due to corrosion. I am wondering if you have also used monel tags and, if so, what problems were encountered? Are your plastic tags proving to be satisfactory? How long have you been using them? Any information along these lines would be most helpful to my work. Also I would be pleased to receive any publications or reports that may be available on your leatherback work. If I can ever be of any assistance to you here in Hawaii, please feel free to contact me.

Sincerely,

George H. Balazs
Marine Biologist

黃 家 星
ONG KAH-SIN

FISHERIES RESEARCH INSTITUTE
GLUGOR, PENANG,
MALAYSIA.

TEL. 81241

AN EQUAL OPPORTUNITY EMPLOYER

Ref: TINP/11/1/24

Tel: .....

Office of the Park Warden,
The Sabah National Parks Trustees
P.O. Box 768, Sandakan,
Sabah, East Malaysia.

Date 30th April, 1976.

Mr. George H. Balazs,
Hawaii Institute of Marine Biology,
P.O. Box 1346,
Coconut Island,
Kaneohe,
Hawaii 96744.
U.S.A.

Dear George,

Turtle Tags.

Many thanks for your letter of 21st November, 1975 and must apologise for the delay in replying.

I have left the Forest Department and presently with the National Parks; actively continuing my turtle work. Incidentally, the islands together with the adjoining reefs and sea will in the near future be constituted a 4,000 acre marine park for marine forms including the amphibious turtle. I have also been away for some time on long leave. A few days ago, I had a very welcome visit from Wayne King and took the opportunity of showing him the turtle islands.

The diagram and the required information is attached. The tag is always applied on to the left flipper. After observing several, perhaps over a hundred, I am of the considered opinion that the monel tag which we use sometimes drop off. When adequate funds are available a double tagging project will be undertaken. The second tag, made of plastic will be placed in the same position on the right flipper and bear the same number and legend as the monel tag.

While in Singapore recently, I found hundreds of carapaces for sale at Collier Quay. The suppliers are from Manila. The stockists in Singapore mentioned a source in Trengannu, Malaysia. The Japanese are the best buyers.

I trust that you and Linda are in good health and that you have caught up with your studies.

With all good wishes to both of you.

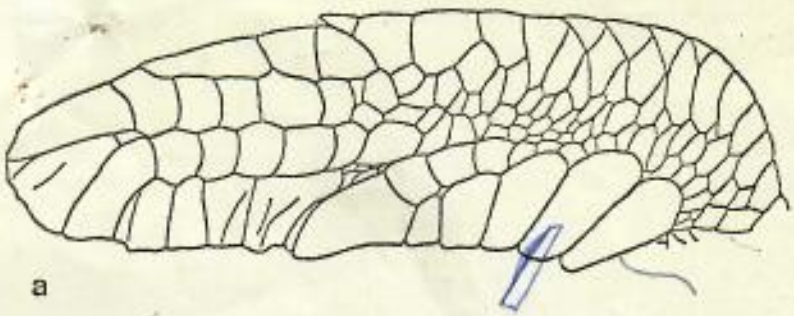
Yours sincerely,

Stanley.

G. S. de Silva.

Mr Siow Kuan Tow,
Director of Fisheries,
Fisheries Office,
Kuala Trengganu,
MALAYSIA.

APPENDIX



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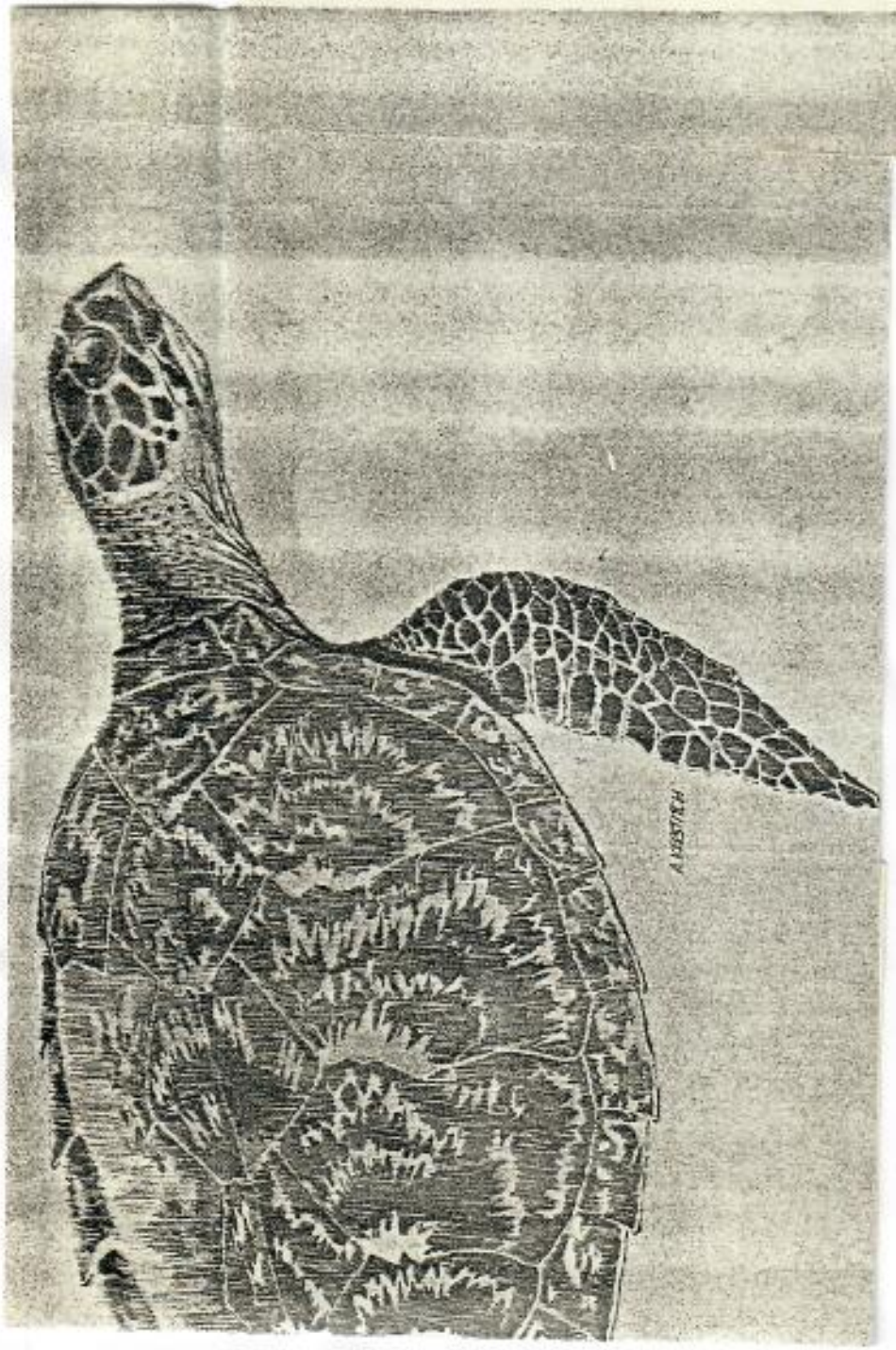


TRUST TERRITORY OF THE PACIFIC ISLANDS
OFFICE OF THE DISTRICT ADMINISTRATOR
Marine Resources Division
YAP, WESTERN CAROLINE ISLANDS 96943

CABLE ADDRESS
DISTAD YAP

April 6, 1976

Mr. George Balazs
Hawaii Institute of Marine Biology
P. O. Box 1346
Kaneohe, Hawaii 96744

Dear George,

Peter left here after two or three days of gathering information. I gleaned a bit of information from him as well. An interesting and obviously knowledgeable man, easy to talk to. Thanks for letting me know of his impending arrival in the TT, he had not notified anyone in my department.

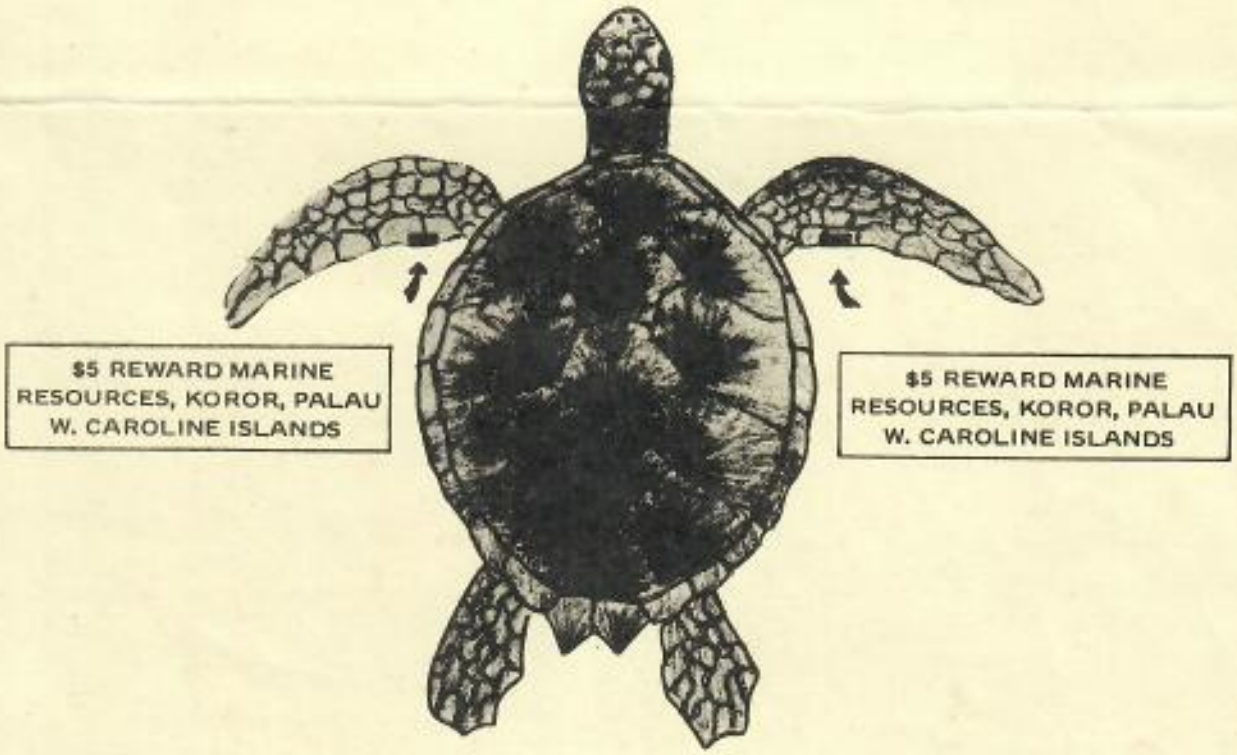
Enclosed is your 'tag site' diagram. Please note that I have tagged only green turtles (and one leatherback). No problems with the corrosion of tags (but no returns from anywhere but nesting beaches). I utilize tags made by NELCO, of Modesto, California. Please also note that we tag both flippers inasmuch as I figure nipping during mating occurs fairly frequently, and tags stand a chance of getting lost. These are usually consecutive numbers in the tag sequence.

Am also enclosing a picture of our tag poster.

Sincerely,

Mike McCoy
District Fisheries Officer, Yap

REWARD $5.00



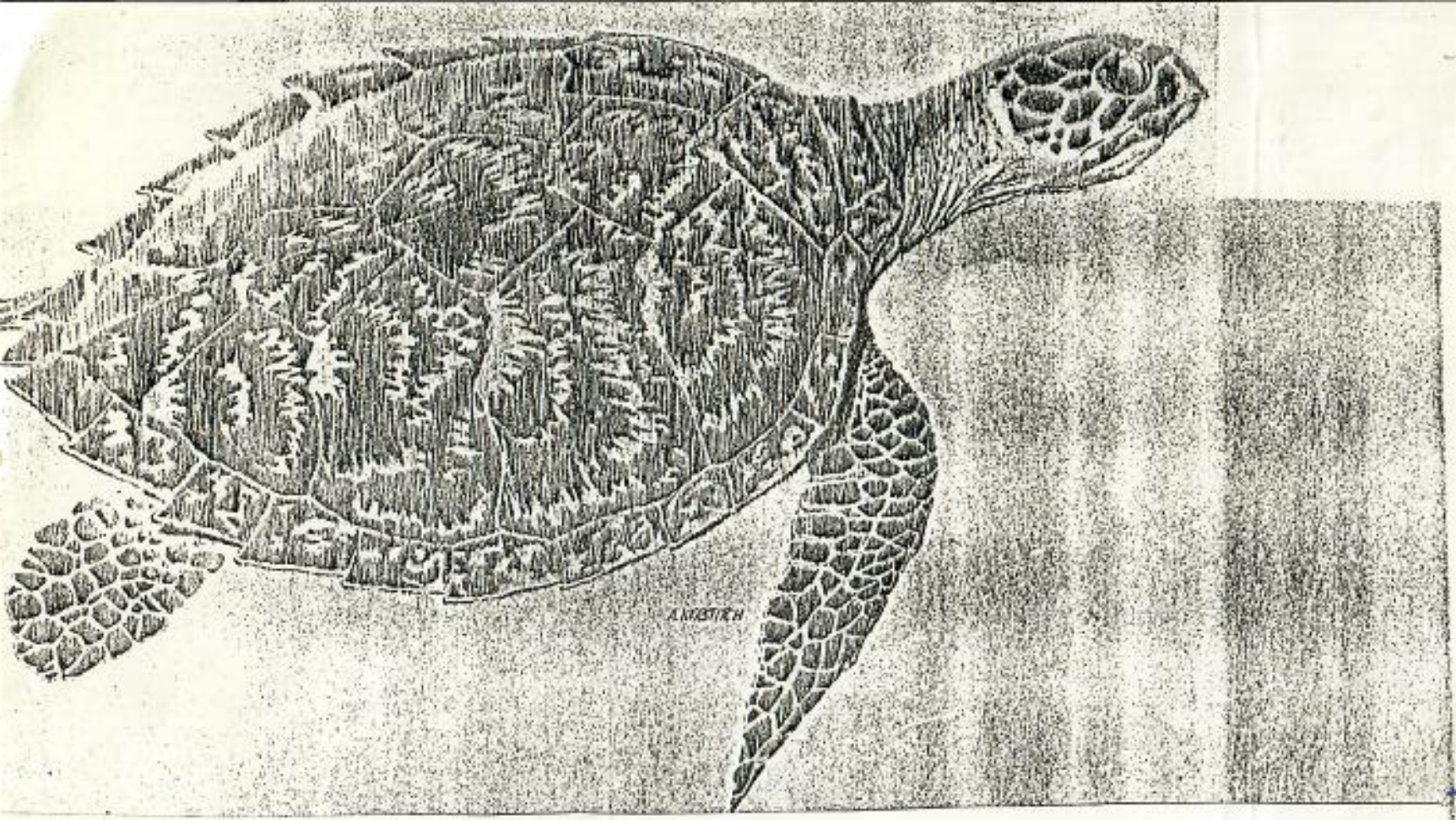
FOR TAGS RETURNED FROM GREEN SEA TURTLES (CHELONIA MYDAS).

SEND DATE AND LOCATION OF CAPTURE ALONG WITH THE TAG TO:

Micronesian Mariculture Center
Koror, Palau
Western Caroline Is. 96940

And your $ 5 REWARD will be sent to you

DISTRICT FISHERIES OFFICER
MARINE RESOURCE DIVISION
YAP, W. CAROLINE IS.
96943



Please Return TO: George H. Balazs

UNIVERSITY OF HAWAII
Hawaii Institute of Marine Biology
Coconut Island • P. O. Box 1346 • Kaneohe, Hawaii 96744

NATIONAL BAND & TAG CO.

GENERAL OFFICES - 721 YORK ST. • NEWPORT, KY. 41072 U.S.A. • AREA CODE 606 261-2035

BLUE - Factory **WHITE - Shipping** **PINK - Office**

YELLOW COPY is a reminder of your order placed last year. May we suggest you check your inventory? Can we be of service again?

GREEN COPY is an ACKNOWLEDGMENT of your order. Please review the specifications and advise if not correct. Thank you!

GOLDENROD COPY is the ORIGINAL INVOICE. Please refer to our invoice number and pay total itemized under AMOUNT below. (No statement will be sent).

P/L	COP	INV	ANS	ACK
1	-	4	-	1

FILE CODE HAWAII UNIV.AT MANOA | 4B1 CLASS

CHARGE TO:

4B1 HAWAII UNIV AT MANOA
INSTITUTE OF MARINE BIOL.
P O BOX 1346 COCONUT ISLAND
KANEOHE,HAWAII 96744

SHIP TO:

VB CUST. ORDER NO. 4/5/76 Letter DATE REQ.

NB & T ORDER NO. 037975

DATE ENTERED 4/12/76

TERMS: CASN-CHARGE NPT., KY

CLASS	ORDER NO.	INVOICE DATE	SHIPMENT
0481	037975	4-15-76	001

SHIPMENT REQ:

VIA: AIR MAIL

ANTICIPATED WEEK ENDING: 4/16/76

UNIT PRICE	QUANTITY	REFER TO THESE NUMBERS WHEN YOU INQUIRE ABOUT THIS INVOICE	QUANTITY BACK ORD.	INVOICE PRICE	QUANTITY SHIPPED	AMOUNT
10.35 each	1	(4-1005-681S) Applicator	0	10.35	1	10.35
			0	.00		.00
				SUBTOTAL		10.35
				TRANSPORT		2.07
				TOTAL		12.42

Paid by check #150 59-185/1213 4/26/76

10.35 CUSTOMER REMITTANCE TO BE CREDITED..... -10.35

BALANCE DUE.....$ 2.07

MAILING INSTRUCTIONS	ITEM	PRICE	MIN QUAN	MAX QUAN	DATE EST	ORD NO	NO ORD	TRANS CHG

NATIONAL BAND & TAG CO.

GENERAL OFFICES - 721 YORK ST. • NEWPORT, KY. 41072 U.S.A. • AREA CODE 606 261-2035

BLUE - Factory **WHITE - Shipping** **PINK - Office**

YELLOW COPY is a reminder of your order placed last year. May we suggest you check your inventory? Can we be of service again?

GREEN COPY is an ACKNOWLEDGMENT of your order. Please review the specifications and advise if not correct. Thank you!

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P/L	COP	INV	ANS	ACK
1	-	4	-	1

FILE CODE HAWAII UNIV.AT MANOA

4B1 CLASS

SHIP TO:

CHARGE TO:

4B1 HAWAII UNIV AT MANOA
INSTITUTE OF MARINE BIOL.
P O BOX 1346 COCONUT ISLAND
KANEOHE,HAWAII 96744

VB CUST. ORDER NO. 4/5/76 Letter DATE REQ.

NB & T ORDER NO. 037975

DATE ENTERED 4/12/76

TERMS: CASN-CHARGE
NPT., KY

CLASS	ORDER NO.	INVOICE DATE	SHIPMENT

SHIPMENT REQ: VIA: AIR MAIL

ANTICIPATED WEEK ENDING: 4/16/76

[redacted]	QUANTITY	REFER TO THESE NUMBERS WHEN YOU INQUIRE ABOUT THIS INVOICE	QUANTITY BACK ORD.	INVOICE PRICE	QUANTITY SHIPPED	AMOUNT	LINE
[redacted]	1	(4-1005-681S) Applicator			1		

CUSTOMER REMITTANCE TO BE CREDITED.......................

...G INSTRUCTIONS | ITEM | PRICE | MIN. QUAN | MAX. QUAN | DATE SET | ORD. NO | NO. ORD | TRANS. CHG

NATIONAL BAND & TAG CO.

GENERAL OFFICES - 721 YORK ST. • NEWPORT, KY. 41072 U.S.A. • AREA CODE 606 261-2035

BLUE - Factory **WHITE - Shipping** **PINK - Office**

YELLOW COPY is a reminder of your order placed last year. May we suggest you check your inventory? Can we be of service again?

GREEN COPY is an ACKNOWLEDGMENT of your order. Please review the specifications and advise if not correct. Thank you!

GOLDENROD COPY is the ORIGINAL INVOICE Please refer to our invoice number and pay total itemized under AMOUNT below. (No statement will be sent).

P/L	COP	INV	ANS	ACK
1	-	4	-	1

FILE CODE HAWAII UNIV.AT MANOA | 4B1 CLASS

CHARGE TO:

4B1 HAWAII UNIV AT MANOA
INSTITUTE OF MARINE BIOL.
P O BOX 1346 COCONUT ISLAND
KANEOHE,HAWAII 96744

SHIP TO:

VB

CUST. ORDER NO. 4/5/76 Letter | DATE | REQ.

NB & T ORDER NO. 037975

DATE ENTERED 4/12/76

TERMS: CASN-CHARGE NPT., KY

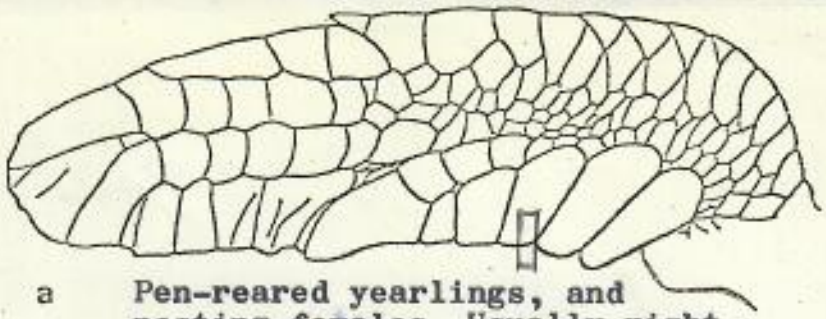
CLASS	ORDER NO.	INVOICE DATE	SHIPMENT

SHIPMENT REQ: | VIA: AIR MAIL

ANTICIPATED WEEK ENDING: 4/16/76

UNIT PRICE	QUANTITY	REFER TO THESE NUMBERS WHEN YOU INQUIRE ABOUT THIS INVOICE	QUANTITY BACK ORD.	INVOICE PRICE	QUANTITY SHIPPED	AMOUNT	LINE
10.35 each	1	(4-1005-681S) Applicator					
10.35		CUSTOMER REMITTANCE TO BE CREDITED.....					

MAILING INSTRUCTIONS | ITEM | PRICE



a Pen-reared yearlings, and nesting females. Usually right front flipper.

April 5, 1976

Dear George:

Twenty six returns from over 4,700 tagged, yearling green turtles. One tag was corroded (looked more like electrolysis) and the turtle may have spent considerable time in estuarine conditions). These were tagged with the 681 tags. I have no figures on lost tags using the 49 tags, but there is evidence that the clinching strap corrodes and the tags spring apart. Changing the clinching method on the 49 tags to the method used for the 681 tags might be useful.

Best regards and I don't know Hawaiian! Except, of course, Aloha.

Rees

Rossleithead

Please Return To: George H. Balazs

UNIVERSITY OF HAWAII
Hawaii Institute of Marine Biology
Coconut Island · P. O. Box 1346 · Kaneohe, Hawaii 96744

George: The 4,700 releases represent ones made in 1975 and prior years. The last long term tag return (over 2 months is my arbitrary time) was for a 1975 release. Including this year's releases over 5,700 have been tagged.

FLORIDA DEPARTMENT OF NATURAL RESOURCES
MARINE LABORATORY
P. O. Box 941 Tel. 334-1667
JENSEN BEACH, FLORIDA 33457

FLORIDA DEPARTMENT OF NATURAL RESOURCES
MARINE LABORATORY
P. O. Box 941 Tel. 334-1667
JENSEN BEACH, FLORIDA 33457

MICRONESIAN MARICULTURE DEMONSTRATION CENTER
TRUST TERRITORY OF THE PACIFIC ISLANDS
POST OFFICE BOX 359
Koror, Palau, Western Caroline Islands 96940

April 15, 1976

George H. Balazs
University of Hawaii
Hawaii Institute of Marine Biology
P.O. Box 1346
Kaneohe, Hawaii 96744

Dear George:

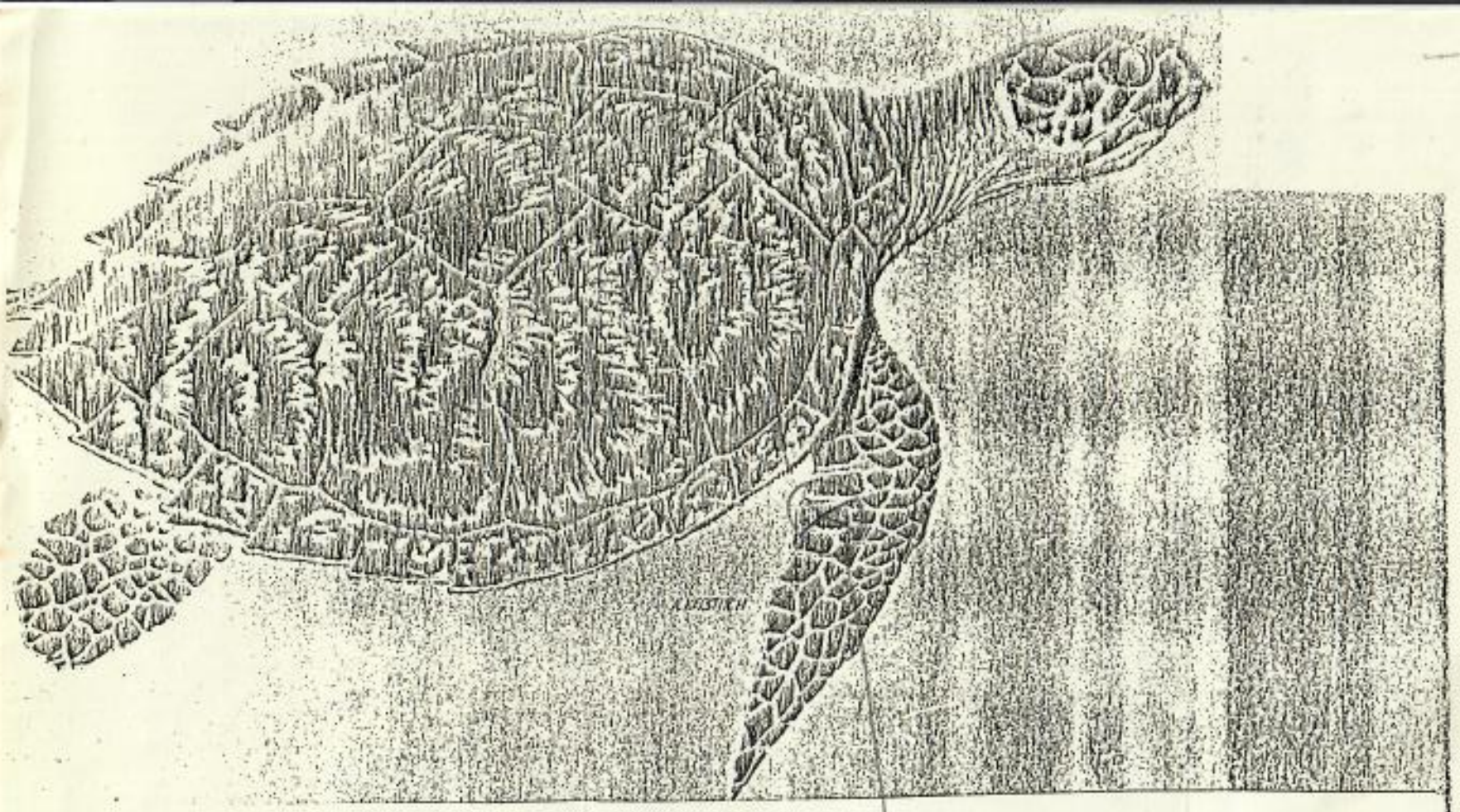
Enclosed is your diagram showing where we have been tagging our turt les. If you require other information please let me know.

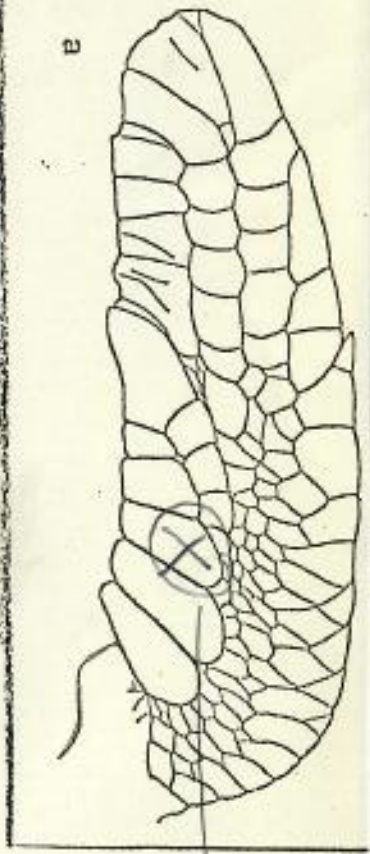
Sincerely,

Jim

James P. McVey, Ph.D.
Chief MMDC

JPM/rh





Please Return TO: George H. Balazs

UNIVERSITY OF HAWAII
Hawaii Institute of Marine Biology
Coconut Island • P. O. Box 1346 • Kaneohe, Hawaii 96744

MMDC
Tagging location
using Monel cattle
ear tags.

May 28, 1976

Mr. James W. Young
Market Coordinator
Huntington Alloys, Inc.
Huntington, West Virginia 25720

Dear Mr. Young

Thank you for your letter of May 24th which explained why you cannot be of assistance in providing the proper INCONEL alloy 625 material directly to National Band and Tag Company. Unfortunately, you did not mention the name and address of the company which does the converting. I would greatly appreciate receiving this information at your earliest convenience.

Sincerely,

GEORGE H. BALAZS
Jr. Marine Biologist

GHB:ec

University of Hawaii at Manoa

Hawaii Institute of Marine Biology
P.O.Box 1346 • Coconut Island • Kaneohe, Hawaii 96744
Cable Address: UNIHAW

March 28, 1976

Dr. Peter Greenham
Department of Zoology
The Australian National University
Canberra, A.C.T.
Australia

Dear Dr. Greenham:

I am in the process of trying to gather information on the tagging site(s) used by various marine turtle researchers around the world. Your assistance in this project would be most appreciated as an earlier inquiry to Dr. Bustard in Scotland has thus far not resulted in a response.

On the enclosed illustration, would you kindly indicate the exact sites where tags have been affixed to turtles nesting on the Great Barrier Reef. On page 116 of Dr. Bustard's 1973 book it is mentioned that the tag is sited about mid-way on the trailing edge of the front flipper. However, in the article "Queenland Protects Sea Turtles" (ORYX,1969), a photograph shows the tag situated near the end of the front flipper. Were several sites used over the years and, if so, which was found to be the most successful? Is a hole first pre-punched before affixing the tag? Are you still observing the return of tagged turtles on the nesting beaches? Has tag corrosion or loss been a problem in your work? I am assuming that all tags used, or still in use, are made of Monel alloy and are the size 49 produced by National Band and Tag Company of Newport, Kentucky, USA.

I look forward to your answers to these questions and I certainly thank you in advance for taking the time to respond. Inquiries are being made to numerous researchers and I will send you a summary of the data when it has been compiled.

Sincerely,

George H. Balazs
Jr. Marine Biologist

Telephone: 076-21246

Your Ref:
Our Ref: Prk.Tr.2600(74)

MALAYSIA

STATE FISHERIES DEPARTMENT,
KUALA TRENGGANU,
MALAYSIA.

21st October 19 75

Mr. George H. Balazs,
Hawaii Institute of Marine Biology,
P.O. Box 1346,
Coconut Island,
Kaneohe,
Hawaii 967444,
United Stated of America.

Dear Mr. Balazs,

Thank you for your letter dated October 1, 1975 and the papers enclosed.

2. I enclosed herewith a copy of the notes "Tagging of Leathery Turtle in Trengganu, Malaysia", that I sent to Dr. N. Mrosovsky for the news letter on Marine turtles. I hope that the information is of use to you. Please contact me again if you need further informations.

With best regards.

Yours Sincerely,

(Siow Kuan Tow)
Pengarah Perikanan Negeri,
Trengganu.

Tagging of Leathery Turtle (Dermochelys Cariacea) in Trengganu, Malaysia

Rantau Abang in the State of Trengganu, Malaysia is one of the two known major nesting beach for the Leathery Turtle (Dermochelys Coriacea). The 12 miles nesting beach is facing the South China Sea. Turtles start to come in early April, and by the end of September, they disappear completely.

2. Trial tagging was conducted by the late Dr. E. Balasingam of the University of Malaya in 1966. The work was reported in the Malayan Nature Journal Vol 25 (1972) by Balasingam and Tho Yow Pong as follows.

> "During the trial tagging two types of tags were used to mark and identify the female turtles, namely Monel metal tags and plastic tags. The former was obtained from the National Band and Tag Company, U.S.A. The plastic tags which are ordinary cow tags were obtained from Dalton Suplies, United Kingdom. Both types of tags were fitted on to the animal with the aid of tag applicators. The tags were applied approximately half way down the fore flipper and about 1½-2 inches from the trailing edge of the flipper. The plastic tags were applied on the right flipper and the Monel metal tags on the left flipper.

Some initial difficulties were experienced in the application of the tags. This was particularly true of the Monel tags, some of which did not fit firmly into the flippers. This was possible due to the fact that the flippers were too thick to accommodate the tag's clinching mechanism. Another common snag was that the turtle's flipper being rather fleshy, the Monel tags, expecially when loosely applied, tended to enlarge the perforation and tear the flesh at the region of the application. A number of Monel tags were lost in this manner after tagging. The plastic tags on the other hand were far more satisfactory because they were easy to apply and fitted well into the flippers. Among turtles which returned to nest after tagging, no losses of the plastic tags were recorded.

The most satisfactory time for the application of tags was when the turtle had just finished egg-laying. The turtle then did not reach adversely to the application of the tags."

3. Following the successful application of the plastic cow tag, full scale tagging was launched in 1967. Personnels engaged by the Fisheries Department patrol the entire nesting beach throughout the night starting in April and ending in September, recording and tagging all turtles coming ashore. Up to the end of this year's season a total of 9533 tags were applied. The return of tagged

2/..

turtles are satisfactory, and a number of reports on sighting of the tagged turtle were received from Japan, Philippines, and Indonesia. In 1973 orange coloured tags with the appeal "Please release this turtle and inform Fisheries Department, Kuala Trengganu, Malaysia" were introduced to replace the original white tags with numbers only.

4. So far only a few turtles were found with enlarged hole on the right flipper indicating the lost of the plastic cow tag. However, these tags might have been removed by human beings as one report in 1972 informing us that the tag was removed and kept as souvenior before the turtle was released.

5. On the whole, we found that the plastic cow tag or the "Jumbo Rototag" as the supplier calls it, is satisfactory for this tagging work, and it has the following advantages over the metal Monel tag:-

1) It is easy to apply,

2) It secure firmly on the flipper.

3) It does not corroda.

4) It can have the colour wanted and with wording printed.

SIOW KUAN TOW,
State Director of Fisheries,
Kuala Trengganu,
Malaysia.

10.10.75

University of Hawaii at Manoa

Hawaii Institute of Marine Biology
P.O.Box 1346 • Coconut Island • Kaneohe, Hawaii 96744
Cable Address: UNIHAW

February 24, 1976

Mr. J.R. Haas
National Band and Tag Company
721 York Street
Newport, KY 41072

Dear Mr. Haas:

Concerning your letter of February 18, I have decided on the following slightly abbreviated legend.

WRITE HIMB
UNIVERSITY
HAWAII 96822

It is always a hard decision trying to decide what will prompt people to contact us when they come across a tag. I suspect that many end up in a desk drawer. Of course a reward would help, but I presently do not have the funds for such an offering.

The 1/16" letters will be fine. Also, if possible, the inscription IN MEMORY OF TH would be perfectly acceptable on the inside.

Please include one pair of size 681 applicators in my order.

Sincerely,

George H. Balazs

GEORGE H. BALAZS
Jr. Marine Biologist

Inquiry Letter to Hirth 2/9/76

THE UNIVERSITY OF UTAH

SALT LAKE CITY 84112

DEPARTMENT OF BIOLOGY

February 3, 1976

Mr. George Balazs
Hawaii Institute of Marine Biology
P.O. Box 1346
Coconut Island
Kaneoke, Hawaii 96744

Dear George,

My tags were purchased in the mid-60's from National Band and Tag, Co., in Kentucky and were billed as "stainless steel." They probably were monel alloy; I do not have any left to verify the composition, but I will check the next tag return, if appropriate.

Sincerely,

Harold F. Hirth
Professor

HFH/mlu

Manufacturers of IDENTIFICATION TAGS for

AGRICULTURE • HORTICULTURE • BIOLOGICAL • SCIENTIFIC RESEARCH

AIRCRAFT • RADIO • ELECTRICAL • MARINE • INDUSTRIAL USES

NATIONAL BAND AND TAG COMPANY

Established 1902 • • GENERAL OFFICES: 721 YORK ST. NEWPORT, KY. 41072 U. S. A. • • Phone: Area 606 - 261-2035

University of Hawaii at Manoa
P.O.Box 1346 - Coconut Island
Kaneohe, Hawaii 96744

Attn: Mr. George H. Balazs
Jr. Marine Biologist

February 19, 1976
"OUR 74thYEAR"

Dear Mr. Balazs:

In answer to your letter dated February 9th., "No", we have never furnished these tags from stainless steel material. They are always supplied from monel and some clients will refer to the monel as stainless steel, regardless of how many times we offer correction or clarification.

Yours truly,

NATIONAL BAND & TAG COMPANY

J. R. Haas

JRH:vb
(2)

January 13, 1976

Managing Director
Dalton Supplies Ltd.
Nettlebed
Henley-on-Thames
RG9 5AB ENGLAND

Dear Sir:

I would appreciate a price quotation for the following items shipped by air mail to Hawaii.

100 Rototags (dark blue) numbered 2051 to 2150 and embossed with - UN. HAWAII

1 application pliers for Rototags

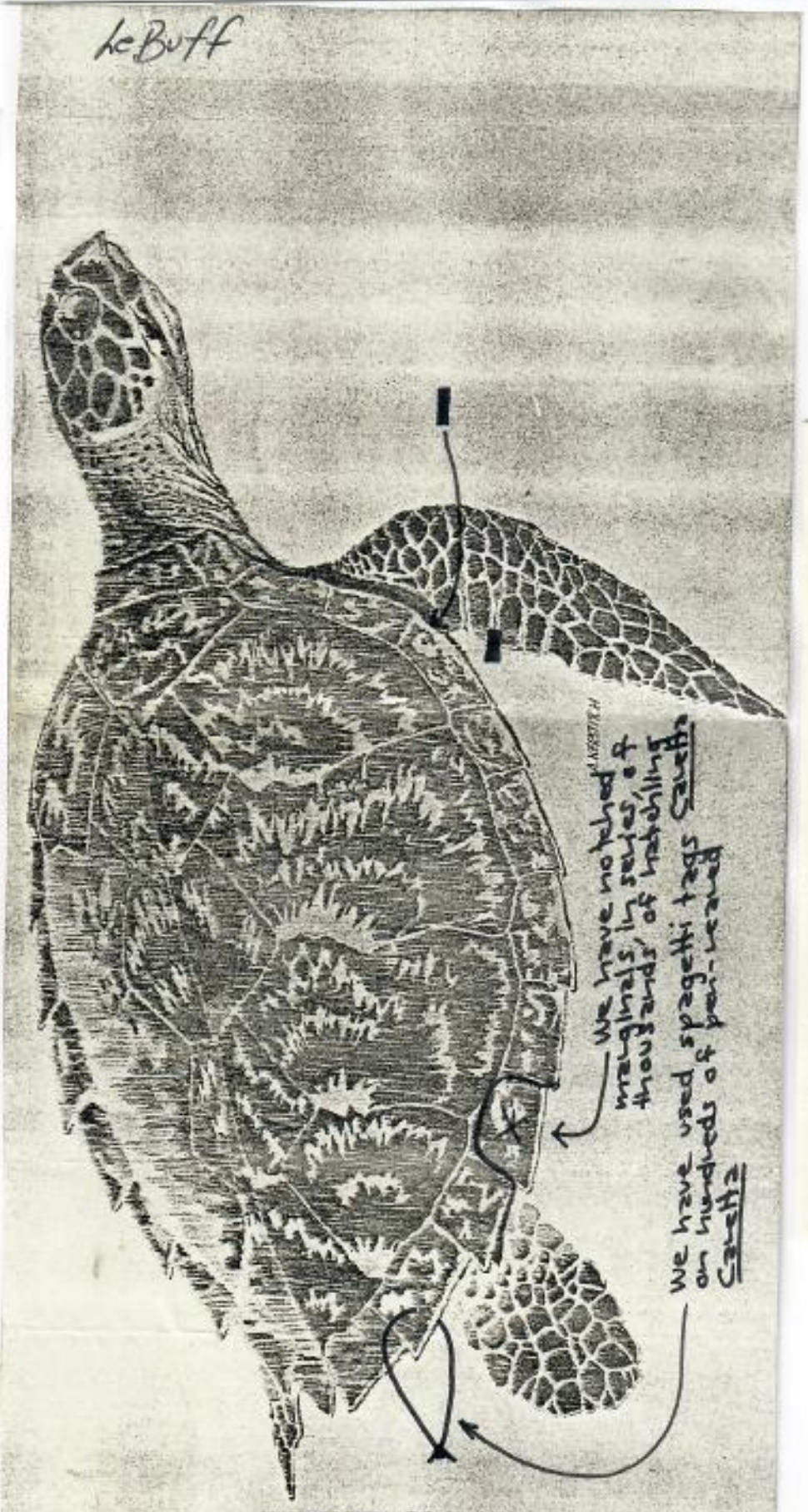
Thank you in advance for your assistance in this matter.

Sincerely,

George H. Balazs
Jr. Marine Biologist

GHB:md

LeBuff



UNIVERSITY OF HAWAII
Hawaii Institute of Marine Biology
Coconut Island • P. O. Box 1346 • Kaneohe, Hawaii 96744

APPENDIX

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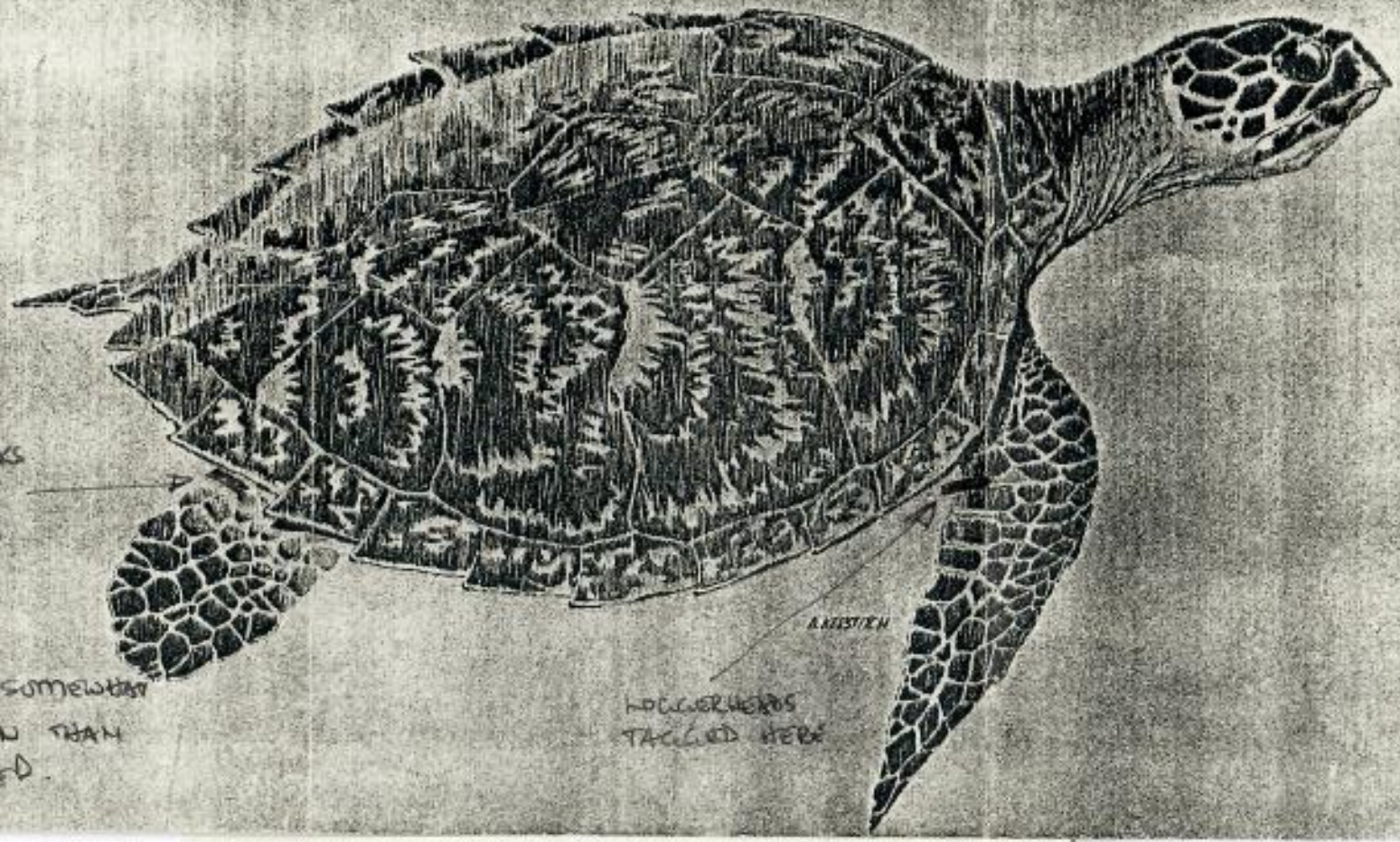


LEATHERBACKS TAGGED TWICE ON INSIDE OF HIND FLIPPERS. ACTUALLY SOMEWHAT FURTHER IN THAN ILLUSTRATED.

HAWKSBILLS TAGGED HERE

APPENDIX

NATAL PARKS, GAME AND FISH PRESERVATION BOARD

TELEGRAPHIC ADDRESS / TELEGRAMADRES "FAUNA"

RESERVATIONS ONLY / SLEGS BESPREKINGS 53641

TELEPHONES / TELEFONE 51221/8

RAAD VIR DIE BEWARING VAN NATALSE PARKE, WILD EN VIS

P.O. BOX/POSBUS 662

PIETERMARITZBURG

3200

YOUR REFERENCE
U VERWYSINGSNOMMER

PLEASE QUOTE OUR REFERENCE 10/2
MELD ASSEBLIEF ONS VERWYSINGSNOMMER

3rd November, 1975.

Mr. George Balazs,
Hawaii Institute of Marine Biology,
P.O. Box 1346,
Coconut Island,
Kaneotie,
HAWAII : 96744.

Dear George,

Thanks for your letter and enclosures. Very pleased to see that you are well.

To answer your questions:-

One lot of plastic tags (Rototags) were too brittle and the female half often cracked and I assume were lost. They also deteriorated in time both in colour and strength becoming, I thought, more brittle.

Another lot of tags - the ORI tags - were simply too soft and were, I think, ripped off either during feeding or by other turtles. Even monel tags are crushed by other turtles - well at least I cant think of any other agency that could flatten the tag *in situ* as has often been observed.

The corrossion is certainly centred around the locking mechanism and almost always where the tag is in contact with the flesh.

As requested I have marked the tag sites on the attached drawings. We have not had any noticeable problems with leatherbacks. Either the tag falls out or its not corroded.

...../2

I agree that we cant be sure that a monel tag cut might not heal over and leave no callus but I doubt it personally. If the tag remained for only a few days the separated sections of flesh would never bond clearly again.

Please keep in touch and good luck with your work.

Yours sincerely,

George.

For: DIRECTOR

Enclosure:
GRH/LH

MEMO-letter®

Rhett Talbert

Belle W. Baruch Coastal Research Institute
University of South Carolina · Columbia, South Carolina 29208
Phone (803) 777-2692

To George H. Balazs
Hawaii Inst. of Marine Biology
P.O. Box 1346 Coconut Island
Kaneohe, Hawaii 96744

Date 11/21/75

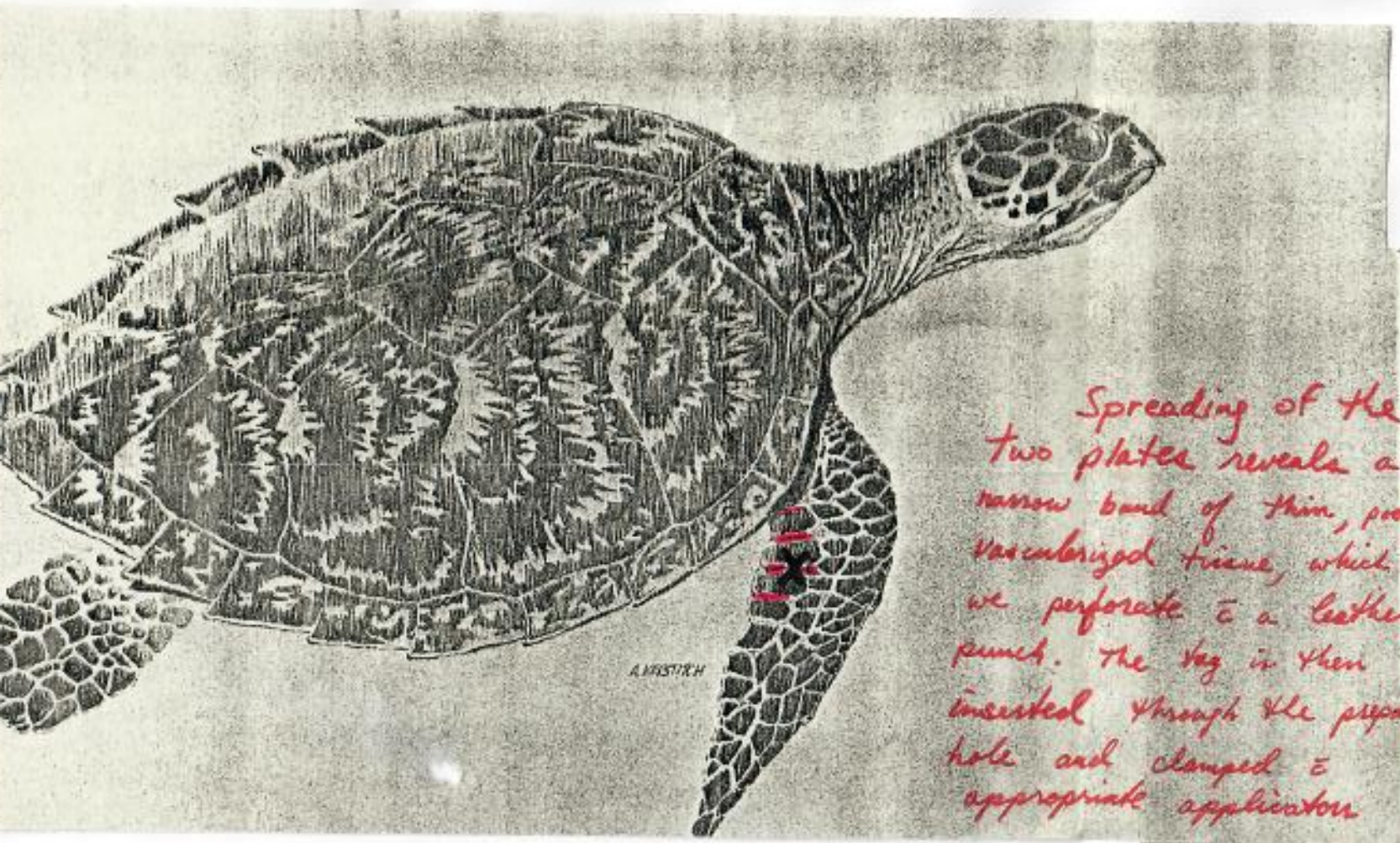
Subject Tags

- George -

Your idea on size 681 sounds worth a try to me, but I have a question. With a different locking apparatus from size 49, does 681 have a special applicator? I'm not sure a size 49-type applicator will work. If this can be resolved, we would be willing to order 500 of our 2000 tag order in size 681. Splitting the $100.00 sounds fine.

Let me know the results of your communication with the N.Y. nickel folks. Also, who have you contacted about supplementing our 3000 tag order? I'd be glad to contact anyone in turtle tagging you may have overlooked or not been aware of.

Happy tracks, Rhett



Spreading of the two plates reveals a narrow band of thin, poorly vascularized tissue, which we perforate w a leather punch. The tag is then inserted through the prepared hole and clamped w appropriate applicator

TELEGRAPHIC ADDRESS } "FAUNA"
TELEGRAMADRES

RESERVATIONS ONLY
SLEGS BESPREKINGS

TELEPHONES
TELEFONE } 51221/5

RAAD VIR DIE BEWARING VAN NATALSE PARKE, WILD EN VIS

PIETERMARITZBURG

P.O. BOX / POSBUS 662

YOUR REFERENCE
U VERWYSINGSNOMMER

OUR REFERENCE 10/2
ONS VERWYSINGSNOMMER

11th November, 1975.

Mr. George H. Balazs,
University of Hawaii at Manoa,
P.O. Box 1346,
Coconut Island,
KANEOHE,
Hawaii 967444,
United States.

Dear George,

Your letter of 30th October was received today and I cant add much to my earlier remarks. Our monel tags, now implanted well on the inside of the hind flippers appear to work well and so far no signs of loss or corrossion but we have not yet been going long enough to say that this site is the best. I would be prepared to bet that it is a better site than the hard distal edges of either the fore or hind flippers.

Our season has just begun and one leatherback has returned with both monel tags safely in place after two years at sea. Loggerhead tags last anything from two to five years (60% recoveries so far this season).

Personally I am convinced that the new inconel tag with the inner rear flipper site will be the best for leatherbacks.

Yours sincerely,

George.

for DIRECTOR

GRH/LH

EROGRAM

PER LUGPOS
BY AIR MAIL
PAR AVION

AEROGRAMME

AAN/
TO Mr. George H. Balazs,

Hawaii Institute of Marine Biology,

P.O. Box 1346,

Coconut Island,

KANEOHE,

Hawaii 967444, : UNITED STATES.

TWEEDE VOU—SECOND FOLD

NAAM EN ADRES VAN AFSENDER / SENDER'S NAME AND ADDRESS

NATAL PARKS, GAME AND FISH PRESERVATION BOARD

RAAD VIR DIE BEWARING VAN NATALSE PARKE, WILD EN VIS

P.O. BOX/POSBUS 662

PIETERMARITZBURG

EERSTE VOU—FIRST FOLD

NBS Monograph 106

Nickel and its Alloys

U.S. Dept Commerce
Nat. Bureau of Standards 1968
156p

TN799
N6 R67

by Samuel J. Rosenberg

Trademarks

A number of alloys discussed in this compilation are marketed under the following various trademarks:

Trademark	Owner
ALUMEL	Hoskins Manufacturing Company
CARPENTER STAINLESS NO. 20	The Carpenter Steel Company
CARPENTER 426	The Carpenter Steel Company
CHROMEL	Hoskins Manufacturing Company
COBENIUM	Wilbur B. Driver Company
CONPERNIK	Westinghouse Electric Corporation
COR-TEN	United States Steel Corporation
CUFENLOY	Phelps Dodge Corporation
DISCALOY	Westinghouse Electric Corporation
DURANICKEL	The International Nickel Company, Inc.
DYNALLOY	Alan Wood Steel Corporation
DYNAVAR	Precision Metals Division
ELGILOY	Elgin National Watch Company
ELINVAR	Hamilton Watch Company
GEMINOL	Driver-Harris Company
HASTELLOY	Union Carbide Corporation
HI-STEEL	Inland Steel Corporation
HIPERNIK	Westinghouse Electric Corporation
HP	Republic Steel Company
HY-TUF	Crucible Steel Company
ILLIUM	Stainless Foundry & Engineering Inc.
INCOLOY	The International Nickel Company, Inc.
INCONEL	The International Nickel Company, Inc.
INVAR	Soc. Anon. de Commentry-Fourchambault et Decazville (Acieries d'Imphy)
KANTHAL	The Kanthal Corporation
KOVAR	Westinghouse Electric Corporation
MAGARI-R	Bethlehem Steel Corporation
MANGANIN	Driver-Harris Company
MINOVAR	The International Nickel Company, Inc.
MONEL	The International Nickel Company, Inc.
MONIMAX	Allegheny Ludlum Steel Corporation
NICROTUNG	Westinghouse Electric Corporation
NIMOCAST	The International Nickel Company, Inc.
NIMONIC	The International Nickel Company, Inc.
NISILOY	The International Nickel Company, Inc.
NI-SPAN-C	The International Nickel Company, Inc.
PERMALLOY	Allegheny Ludlum Steel Corporation
PERMANICKEL	The International Nickel Company, Inc.
REFRACTALOY	Westinghouse Electric Corporation
RENE 41	Allvac Metals Corporation (Division of Teledyne)
RODAR	Wilbur B. Harris Company
SD	The International Nickel Company, Inc.
SIMINEX	Allegheny Ludlum Steel Corporation
SEALMET	Allegheny Ludlum Steel Corporation
STAINLESS STEEL W	United States Steel Corporation
STAINLESS STEEL 17-4PH	Armco Steel Corporation
SUPERMALLOY	Allegheny Ludlum Steel Corporation
T-1	United States Steel Corporation
TRI-TEN	United States Steel Corporation
TRW	TRW, Inc.
UDIMET	Special Metals Corporation
UNITEMP	Universal Cyclops Specialty Steel Division, Cyclops Corporation
USS STRUX	United States Steel Corporation
WASPALLOY	Pratt and Whitney Aircraft
WELCON	Japanese Steel Works, Ltd.
WEL-TEN	Yawata Iron & Steel Company, Ltd.
YOLOY	Youngstown Sheet & Tube Company

also

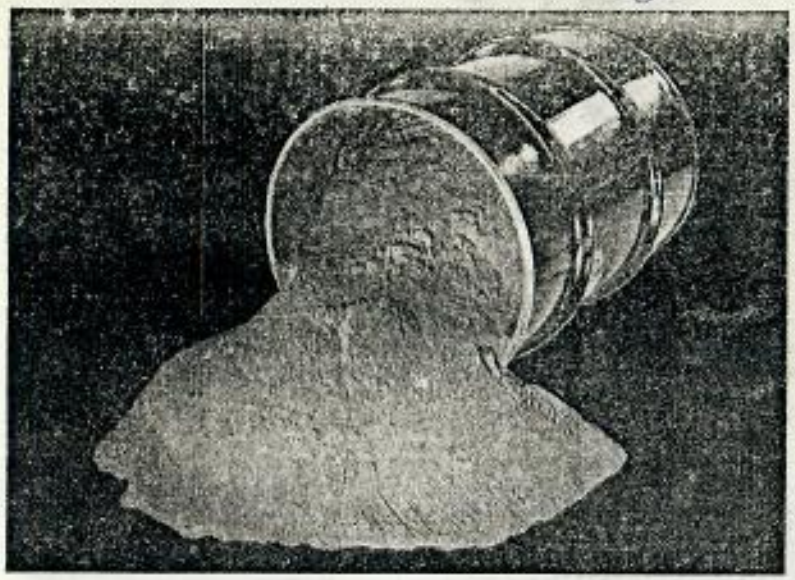
Nickel Bulletin – Ref TA480 N6A2 through 1968

and

Nickel Digest TN799 N6N5

V2 N1 1971 p10 – xeroxed table p11

V1 N1 1970 p11 – xeroxed



Carbonyl Nickel Powder

iron. That matte was then refined by a process similar to that in use at the Le Havre refinery of Le Nickel. In order to take advantage of the increased call for nickel in the United States, Ballande later (1909–10) formed, in that country, a subsidiary called the United States Nickel Company. The company had a refinery at New Brunswick in New Jersey, where the iron-free converted matte from Duffel was roasted and reduced to metallic nickel. At first it was produced in cube and rondelle form, but subsequently only nickel shot and ingots were made by Ballande, for the American market.

Nickel silver at that time was a major outlet for nickel, and someone had had the idea that it might be possible to make, direct from matte, a nickel-copper alloy suitable for the manufacture of nickel silver. A prime mover in

this significant development was Robert C. Stanley, who had been transferred from the Camden Works to the Orford Copper Company works at Bayonne, where he had materially improved the efficiency of the Orford process, lowered costs, and stepped-up production.

On 30th December, 1904 the Orford Copper Company enquired whether the Canadian Copper Company could supply a carload of bessemer matte 'free from iron or blown down to as low an iron content as possible'. When the carload of matte arrived at Bayonne, Stanley started calcining, saying 'we will draw the furnace only when it is right and after we have learned how to make the material, then we will work on increasing the draw'.[10]

The experiment was successful from the beginning, and to Stanley belongs the credit of being the man who first converted the idea into a material, thus becoming the 'father' of the nickel-copper alloys thereafter marketed under the trademark Monel. The first batch of oxide so made was taken to the refinery, put in a crucible with some charcoal, brought to the right carbon content and malleablised by the addition of metallic magnesium. Some of this metal was cast into a test bar, hammered out on the forge, and sent to Ambrose Monell in the New York office: the test piece made from that first melt was in fact stamped 'Monell Metal'. This was soon changed to 'Monel' with one 'l', in connection with trademark registration. Other nickel-copper alloys were later added to the Monel series, and this first alloy is currently designated Monel alloy 400.

The composition, as originally announced, consisted of 68–72% nickel with the balance copper, except for trifling impurities (0·5–1·5% iron, 0·073–0·15% carbon

and 0·014% sulphur).[11] It was further stated that 'the proportion of nickel to copper are those of the ore now worked by the Canadian Copper Company, so that the alloy may be produced directly from the matte, at a cost not much greater than that of copper'.

Having this new alloy, it was necessary to learn its properties and possibilities, so that it could be developed commercially. As a consequence, in 1906 John F. Thompson, who at that time was teaching in the metallurgical department of the Columbia University School of Mines under Professor Henry M. Howe, was engaged to design, build and operate the company's first Research Laboratory, originally called the Physical Laboratory, which was to be located at the Orford Works.

It became apparent at once, however, that it would be fruitless to investigate the properties of the alloy until economic methods of manufacture had been stabilised. The two lines of research were therefore carried out side by side, and the alloy thus became the first material to benefit simultaneously from a broad and balanced programme of determination of properties and methods of manufacture, along with a search for markets which its properties would justify. Naturally, since this was the first time that such an activity had been undertaken, the 'broad and balanced' programme was a matter of gradual growth as the company felt its way along a hitherto unexplored, even untrodden, path. One activity after another was initiated and developed as the need for it became clear. These efforts resulted in many applications of this white metal having sufficient strength and ductility to make it suitable for engineering and structural uses where corrosion-resistance and

permanence were required; for example, some 300,000 square feet, in the form of sheet, was used to roof the Pennsylvania Railroad Station in New York City.[12] It may be mentioned, in passing, that over half a century later that roof is still in excellent condition.

In the United Kingdom no less important progress had been made. By 1905 the capacity at Clydach had been doubled, and nickel sulphate was being produced, followed, a year later, by the marketing of nickel-ammonium sulphate, both of which salts were needed for the ever-growing electroplating industry. Two copper-sulphate plants were soon in operation and the stage was set to develop concentrating operations for the recovery of the valuable precious metals present in the Sudbury ore. Within two years a reverberatory furnace and cupola were installed, as part of the cycle of operations of the process and to clean up wet-treatment and other residues, and in the following year still further expansion was being contemplated.

Ludwig Mond died on 11th December, 1909, at the age of 70. He had won universal recognition in the field of science and established himself, against heavy odds, as a successful producer of nickel. No one can deny his lasting influence also on the heavy-chemical industry in Great Britain.[13]

Alfred, the younger son of Ludwig, succeeded his father as Chairman of the Mond Nickel Company. After graduating at the Universities of Cambridge and Edinburgh, he had been called to the English Bar. From his earliest days he had been drawn to politics, and this led to his representing, at various periods, three constituencies in the House of Commons. He possessed great financial acumen, and industry soon claimed him.

nickel alloys, the combination which continues, even at the present time, to provide the basis for strengthening and hardening nickel alloys at high temperatures.

Among the topics given closest attention in those early days was the combating of corrosion, by using corrosion-resistant alloys or by electroplating. It was already apparent that alloying with nickel imparted considerable corrosion-resistance to many metals, although a full understanding of its appropriate fields of application had yet to be established. Results of research projects gradually provided a greater understanding of the rôle of nickel-containing materials in that field and several nickel-base alloys were developed, including, in 1931, the first of the series of nickel-chromium alloys to which the trademark Inconel was later applied.

In the middle 'twenties the Mond Nickel Company, then under the Chairmanship of Sir Alfred Mond, embarked upon an appropriate programme of laboratory research, in the hope of finding new outlets for nickel. A fundamental study was made of the constitution, structure and thermal treatment of alloy steels, in relation to their mechanical properties; the results obtained represented a major contribution to metallurgical understanding of the complex reactions involved.[3] At a very early stage the research team in Great Britain also became concerned with the problem of alloys suitable for service in sparking plugs and for electrical-resistance heater elements. This experience in high-temperature nickel-chromium alloys was later to prove invaluable as a basis for development of alloys which made possible outstanding advances in the gas turbine.

Although the research facilities and budget were on a modest scale at the Bayonne laboratory in the early days,

bold and imaginative research programmes were organised. For example, a comprehensive study of the structure and characteristics of cast iron was carried out, in spite of the fact that this material had never provided a market for alloying elements. Particular attention was devoted to the problem of combining enhanced strength with machinability, and the studies soon proved that addition of nickel, with suitable adjustment of the carbon and silicon contents, was the answer to the problem.[4] The findings were duly communicated to the industry, and, as a result, foundrymen began to recognise the advantages to be gained by making appropriate alloy additions to their cast irons. First nickel, then nickel-chromium, and later nickel-molybdenum grey cast irons became standard for items in which a combination of good machining qualities and improved mechanical properties is mandatory.

It was found, too, that alloying with nickel and other elements was beneficial in white cast iron used for parts such as metal-working rolls, crushing balls and rolls in mining equipment, and for mill liners and other components. Addition of nickel (2·5–5%) and chromium (1·2–1·7%), produced a white cast iron which showed phenomenal hardness and high resistance to abrasion. To the first material of this type the trademark Ni-Hard[5] was subsequently applied.

There was need also for irons which would give good resistance to corrosion and to oxidation and heat, and there was growing interest in non-magnetic castings.[6] Research led to the discovery of certain high-nickel and nickel-copper cast irons, to which the trademark Ni-Resist[7] has been applied. The nickel content of these cast irons varies from 13·5 to 36%, with copper 0·5-

Canada
5 cent, 1922
Beaver

Irish Free State
3d 1928
Wild hare

Germany
1 mark, 1933
German Eagle

Belgium
2 franc, 1923
Allegorical Belgia
wounded but victorious

Poland
1 zloty, 1929
Polish eagle

Czechoslovakia
5 Crown, 1938
Head of Father Hlinka

Vatican State
2 lire, 1931
Good Shepherd carrying
a lamb

France
5 franc, 1934
Head of Liberty

India
1 rupee, 1947
Tiger

Typical Pure Nickel Coins

Switzerland
20 centime, 1881

Netherlands
10 cent, 1950
Head of Queen Juliana

Albania,
½ lek, 1926
Hercules wrestling with
lion

Iraq
10 fils, 1932
Head of King Faisal I

Italy
2 lire, 1923
Head of King
Victor Emanuel III

Japan
50 yen, 1956
Chrysanthemum

Greece
5 drachma, 1930
Phoenix emerging
from flames

Danzig
10 gulden, 1935
Danzig city hall and star

Turkey
25 piastre, 1925
Oak spray

Typical Pure Nickel Coins

tute because specifications for metals, used in other metalworking industries, were not suitable for chemical machining to the precise tolerances desired in finished parts.

The specification covers items such as surface, camber, crown tolerances, grain size, width, and thickness as well as alloy description, amounts, packing and delivery requirements. The following table shows the thickness tolerances for stainless steel with a 2B finish.

Specified Thickness (Inches)	Width, Inches			
	To 6	6-12	12-18	18-24
.0005 to .0010	±5%			
.0010 to .0100	.0001	.0001	.0002	.0003
.0100 to .0250	.0002	.0002	.0010	.0015
.0250 to .0400	.0003	.0003	.0010	.0015
.0400 to .0600	.0005	.0005	.003	.003

71-19 Fabrication of the pressurizer and primary circuit pipework for the Beznau station

H. Straub
Combustion, Vol. 41, No. 12, June 1970, pp. 42-50

In this article the author discusses the problems which arise in connection with the fabrication of a nuclear power plant and points out the cooperation that is necessary between fabricating and testing personnel to insure high quality.

Shown below are the materials and their properties and the technical data which were used in designing the pressurizer.

Technical Data

General

Design pressure	175 bar
Design temperature	360°C
Normal operating pressure	157 bar
Normal operating temperature	345°C
Test pressure	219 bar
Total volume	20 m³
Normal water volume	10 m³
Minimum water volume	3.5 m³
Electrical heating capacity	700 kW
Maximum pressure surge influx	440 l/s
Continuous water injection rate	2.8 l/min
Maximum temperature difference at inlet branch	70°C
Maximum temperature difference in injection pipe	170°C
Heating and cooling rate	56°C/h
Number of thermal cycles	200
Weights: Empty pressurizer	40 Mp
Full pressurizer	60 Mp

Material:

Pressure vessel A302Gr.B, corresponding to 19 MnMo 54
Branches and forgings A336 modif., corresponding to 20NiMoCr36

Mechanical properties of the material:

Tensile strength	56–70 kp/mm'
Yield strength	35 kp/mm'min.
Yield strength at 360°C	29 kp/mm'min.
Charpy V notch toughness at −12°C	5.2 mkp/cm'min.
Minimum individual value	40 mkp/cm'

Stainless material:

Nozzle ends and instrumentation:
AISI Type 316, corresponding to X5CrNiMo 18/10

Cladding and internals:

AISI Type 304, corresponding to X5CrNiNb 19/9

To insure the quality of the pressurizer approximately 17 tests were carried out, and for each usage a specification was necessary. In addition, the testing schedule had to be integrated into the work schedule so that quality could be assured as the fabrication progressed.

The primary cooling circuit pipework involved the following technical data and materials:

Design pressure	175 bar
Design temperature	344°C
Normal operating pressure	157 bar
Test pressure (cold)	264 bar

Austenitic material:

Straight tubes, forged seamless from ASTM A376, Type 316, supplied by Cameron.
Bends and tapers cast in ASTM A351, Grade CF8M, solution heat-treated, corresponding to modified Sulzer 209 alloy.
Branches and penetrations in ASTM A376, Type 316, contour-machined.
Executed and calculated to ASA Code B31.1 and Code Case N-10.

During erection the final welds employed the use of consumable insert rings, and in order to hold stresses to a minimum the connecting pieces had to be tailor-made when the exact sizes had been determined.

71-20 Corrosion of nickel alloys in quiet and low velocity sea water

R. G. Niederburger, R. J. Ferrara, and F. A. Plummer
Materials Protection and Performance, Vol. 9, No. 8, August 1970, pp. 18-22

The authors report the results of tests made in quiet and in slow moving (1 to 2 fps) seawater involving 22 commercial high nickel alloys. All tests were conducted for two years, except the nickel-beryllium (97-2) alloy which was removed after 171 days because of perforations. The tests were conducted at the Francis L. LaQue Corrosion Laboratory, Wrightsville Beach, N. C.

A summary of the corrosion damage to these alloys is shown in Table 2. The corrosion ratings are shown in Table 3.

Table 2 — Summary of Corrosion Damage of Nickel Alloys

Alloy	Major Alloy Content	Quiet Sea Water Weight Loss (grams)	Quiet Sea Water Range of Pit Depth (mils) Panel	Quiet Sea Water Range of Pit Depth (mils) Crevice Area	Quiet Sea Water Range of Pit Depth (mils) Coupon	Flowing Sea Water Weight Loss (grams)	Flowing Sea Water Range of Pit Depth (mils) Panel	Flowing Sea Water Range of Pit Depth (mils) Crevice Area	Flowing Sea Water Range of Pit Depth (mils) Coupon	Corrosion Rate (mpy) Based On Weight Loss	Corrosion Rate (mpy) Based on Maximum Pit Depth
					Nickel-Beryllium						
A	97Ni-2Be	11.10	130P	130P	130P	34.35	130P	130P	130P	3.9	>200
					Nickel-Copper						
B	65Ni-35Cu	20.40	0-20	30-32	17-29	21.10	10-15	24-27	27-31	0.9	16
C	60Ni-40Cu	23.80	18-19	10-13	15-18	30.10	14-20	15-30	21-28	1.2	15
D	45Ni-55Cu	25.10	7-9	8-9	6-13	42.30	14-25	6-9	4-10	1.5	12
E	65Ni-30Cu-3Al	19.50	22-26	22-23	15-19	24.40	32-40	20-28	21-34	1.0	20
					Nickel-Chromium						
F	77Ni-16Cr-7Fe	11.85	130P	130P	27-81	12.55	130P	29-130P	16-130P	0.6	>65
G	63Ni-35Cr-2Fe	9.32	120P	6-28	24-69	7.62	120P	15-65	120P	0.4	>60
H	60Ni-19Cr-17Co	7.50	135P	135P	30-125	9.30	135P	106-123	135P	0.4	>65
I	76Ni-20Cr-3Fe	12.80	160-135P	13-20	11-36	26.92	135P	20-35	12-135P	0.9	>65
J	73Ni-15Cr-7Fe	5.80	20-29	94-133	21-94	15.50	140P	140P	140P	0.5	>70
K	30Ni-20Cr-47Fe	4.60	100-140	20-60	60-150	18.10	Nil	105-160P	65-160P	0.5	>80
L	32Ni-20Cr-47Fe	15.72	145P	145P	18-128	24.50	145P	145P	56-145P	1.0	>70
					Nickel-Molybdenum						
M	66Ni-27Mo	42.80	20-21	13-14	7-14	54.80	10-13	8-16	7-12	2.1	10
					Nickel-Chromium-Molybdenum						
N	54Ni-19Cr-10Mo-11Co	0.80	Nil	Nil	Nil	0.30	Nil	Nil	Nil	0.03	Nil
O	47Ni-22Cr-9Mo-18Fe	0.10	Nil	Nil	5-26	0.60	Nil	Nil	0-4	0.01	13
P	69Ni-7Cr-16Mo-4Fe	0.50	Nil	0-2	5-15	1.45	Nil	3-4	24-40	0.04	20
Q	42Ni-21Cr-3Mo-30Fe	0.25	0-1	0-9	29-51	0.20	3-6	1-26	4-29	0.01	25
R	62Ni-22Cr-9Mo-2Fe	Nil	Nil	Nil	Nil	0.25	Nil	Nil	Nil	Nil	Nil
S	66Ni-20Cr-5Mo-6Fe	0.20	Nil	14-25	13-33	0.15	0-2	Nil	23-24	Nil	12
T	56Ni-16Cr-16Mo-4W	Nil	Nil	Nil	Nil	0.10	Nil	Nil	Nil	Nil	Nil
U	53Ni-18Cr-3Mo-18Fe	2.70	Nil	37-165P	46-165P	5.15	Nil	40-165P	51-165P	0.2	>80
V	42Ni-12Cr-6Mo-35Fe	1.48	0-11	3-136	17-76	1.00	Nil	28-97	20-110	0.05	55

Table 3 — Corrosion Rating of Nickel Alloys

Rating Group	Corrosion Behavior	Alloy	Major Alloy Content
		No General Corrosion	
1 A	No attack	N	54Ni-19Cr-10Mo-11Co
		R	62Ni-22Cr-9Mo-2Fe
		T	56Ni-16Cr-16Mo-6Fe-4W
1 B	Little or no pitting on boldly exposed areas, minor attack in crevices	O	47Ni-22Cr-9Mo-18Fe
		P	69Ni-7Cr-16Mo-4Fe
		Q	42Ni-21Cr-3Mo-30Fe
		S	66Ni-20Cr-5Mo-6Fe
1 C	Little or no pitting on boldly exposed surfaces, moderate to severe attack in crevices	U	53Ni-18Cr-3Mo-18Fe
		V	42Ni-12Cr-6Mo-35Fe
1 D	Moderate to severe attack in boldly exposed surfaces and in crevices	G	63Ni-35Cr-2Fe
		I	76Ni-20Cr-3Fe
		J	73Ni-15Cr-7Fe
		K	30Ni-20Cr-47Fe
1 E	Consistently severe attack by pitting and crevice corrosion (Figure 1)	F	77Ni-16Cr-7Fe
		H	60Ni-19Cr-17Co
		L	32Ni-20Cr-47Fe
		A	97Ni-2Be
		General Corrosion	
1 I	General corrosion plus moderate localized attack (Figure 4)	M	65Ni-27Mo
		B	65Ni-35Cu
		C	60Ni-40Cu
		D	45Ni-55Cu
		E	65Ni-30Cu-3Al

Table 2

% Fe	Before Galvanostatic Polarization	After Galvanostatic Polerization	Economy et al[4] 1N H_2SO_4 + .5N K_2SO_4 (pH = 0.56)	Morioka et al[3] 1M H_2SO_4
100	−517 ±5	−511 ±5	−542	−470
80	−404 ±3	−414 ±13	−422	−370
60	−365 ±10	−364 ±20	−362	−320
40	−329 ±10	−334 ±11	−342	−290
20	−325 ±3	−327 ±10	−302	−285
0	−323 ±10	−326 ±4	−282	−270

Table 3

The corrosion rates are shown here

% Fe	Weight Loss (gm/cm²-sec)	Chemical Analysis (gm/cm²-sec)	Weight Loss (A/cm²)	Chemical Analysis (A/cm²)	Polarization (A/cm²)
100	3.21×10^{-7}	2.87×10^{-7}	11.1×10^{-4}	9.89×10^{-4}	4.6×10^{-4}
80	2.73×10^{-8}	1.23×10^{-7}	0.94×10^{-4}	4.20×10^{-4}	0.66×10^{-5}
60	8.83×10^{-10}	7.01×10^{-10}	2.99×10^{-6}	2.37×10^{-4}	7.8×10^{-6}
40	4.84×10^{-10}	4.96×10^{-10}	1.62×10^{-6}	1.66×10^{-6}	4.5×10^{-6}
20	6.06×10^{-10}	6.00×10^{-10}	2.01×10^{-6}	1.99×10^{-6}	2.5×10^{-6}
0	1.15×10^{-9}	1.15×10^{-9}	3.78×10^{-6}	3.77×10^{-6}	6.8×10^{-6}

used in these tests were AISI grades 1036, 10B24, 4340 and 4620. The corrodent used was a deaerated 5% sodium chloride solution saturated with carbon dioxide and containing 1,000 ppm of glacial acetic acid. Temperature was maintained at 30 C (86 F) throughout the tests. Tests were conducted on mill-scaled surfaces and machined surfaces.

The most resistant materials were 3225 and 4340. The authors attribute this to the tightly adhering corrosion products on their surfaces which reduced the attack by the corrodent.

70-32 Corrosion of metals in tropical environments: nickel and nickel-copper alloys

Charles R. Southwell and Allen L. Alexander
Materials Protection, Vol. 8, March 1969, No. 3, pp. 39-44

This paper is the eighth of a series describing the results of a long-term corrosion investigation of 52 metals in marine and inland environments of the Panama Canal Zone.

Specimens were exposed in fresh water, in seawater, at mean tide and in marine and inland atmospheres. Total exposure time was 16 years with specimens removed for examination after one, two, four, eight and 16 years.

The major emphasis of this report is on nickel, copper and several of their alloys with some data on bronze, aluminum, lead and zinc included for comparisons. The nickel, copper and their alloys are Nickel (99%), cold-rolled MONEL* alloy (67 Ni, 30 Cu, 1.8 Fe), hot-rolled MONEL* alloy (67 Ni, 30 Cu, 2.1 Fe) nickel-silver (18 Ni, 64 Cu, 12 Zn) and Copper (99.9%).

The authors point out that seawater nickel and nickel-copper (MONEL alloy) were most rapidly corroded in the tropics than in temperate climates, with the loss in Panama being about four times that at Kure Beach, N.C. At mean tide the corrosion losses are lower in the tropics; atmospheric corrosion was higher in Panama than for similar metals exposed at Key West, Florida and La Jolla, California.

The authors point out that although the corrosion rates in fresh water are extremely low, there is considerable variation in rate changes. The corrosion of both copper and copper-nickel shows a constantly decreasing rate. MONEL alloy sustained extremely low weight losses during the early part of the exposure period but had begun to accelerate after four years. Nickel was virtually unaffected during the entire 16-year exposure period. Nickel, copper and copper-nickel remained free of measurable pits throughout the 16-year period. MONEL alloy sustained some pitting, although it appeared to have reached its greatest depth after four to eight years.

A large number of galvanic couples were included in this extensive program. The authors state that all the data obtained will be the subject of a separate report. However, data from a few of the couples involving the alloys in this report are presented.

70-33 Electrochemical deburring

R. F. Rosten and E. J. Manning
The Tool and Manufacturing Engineer, Vol. 62, No. 3, March 1969, pp. 14-16

The authors discuss experimental deburring of stainless steel straps, 4140 steel gears, and stainless steel turbine wheel vanes by an electrochemical process.

In deburring the Type 301 stainless steel straps, they determined that the most consistent and satisfactory results were produced by an electromotive force of 13 volts and a current of 140 amperes, applied for 15 to 20 seconds. The electrolyte for this work contained 2.5 pounds of sodium chlorate per gallon of electrolyte.

In deburring the teeth of the 4140 steel gears, the electrolyte was comprised of one pound of sodium

*International Nickel Trademark

University of Hawaii at Manoa

Hawaii Institute of Marine Biology
P.O.Box 1346 • Coconut Island • Kaneohe, Hawaii 96744
Cable Address: UNIHAW

November 3, 1975

Mr. J.H. Melchior
President
Fearing Manufacturing Company
490 Villaume Ave.
South St. Paul, MN 55075

Dear Mr. Milchior:

Thank you very much for your letter of Oct 30 regarding my inquiry about the use of Fearing tags for sea turtles. I would like to test the Tuff-Tex style in two projects. These are: 1) the release of a number of captive-held turtles from the Waikiki Aquarium facililty; and 2) tagging of turtles captured directly from the wild during an expedition to French Frigate Shoals. We have experienced considerable corrosion with monel and other alloys, therefore accounting for our interest in commercially available plastic tags. Your comments as to resistance to sunlight exposure seem encouraging.

The projects I have mentioned are scheduled to take place within the next two weeks. Of course we will not be depending entirely on the Tuff-Tex tags, but rather evaluating a number of brands along side one another. I would therefore like to obtain the following as soon as possible (air mail):

25 Tuff-Tex tags numbered 2001-2025 (charcoal or other dark color)
25 Tuff-Tex tags numbered 2026-2050 (black or other dark color)
1 installation pliers

Tags should be personalized with deep stamped letters (1/8") to read:

NOTIFYHIMB
UNIVHAWAII

I appreciate your offer of a series of samples for testing. However, if this is more than you had in mind, please bill me and I will cover all charges upon notification. The important thing now is to get the order in the mail to me so that the tags can be included in our projects.

Thank you very much for your continuing assistance in this matter.

Sincerely,

George H. Balazs
Jr. Marine Biologist

GHB:md

Unshaded blocks — Distributor's stock, immediate delivery or from factory in 3-5 working days.

Shaded blocks — Factory shipment in 7-10 working days.

PUSH-THRU TOOL

Cat. No.	Qty.
61100	

SAF-T-TAGGER Inst. Tool

Cat. No.	Qty.
61300	

MARKING PAINT FOR TUFF-FLEX OR TUFF-THANE

Cat. No.	Color	Qty.
62102	Yellow	
62103	White	
62104	Black	
62105	Red	

SUPER-MARK INK FOR TUFF-FLEX OR TUFF-THANE

Cat. No.	Color	Qty.
65104	Black	

TUFF-THANE NECK TAGS

BLANK

Distributor's stock or from factory in 3-5 working days.

Cat. No.	Color	Quantity
30001	Orange	
30002	Yellow	
30003	White	
30004	Black	
30005	Red	
30006	Blue	
30007	Green	

TUFF-THANE NECK TAGS

NUMBERED

Unshaded blocks — Distributor's stock, immediate delivery or from factory in 3-5 working days.

Shaded blocks — Factory shipment in 7-10 working days.

Cat. No.	Color	1-25 Qty.	26-50 Qty.	51-75 Qty.	76-100 Qty.	101-999 Broken Sets
31001	Orange					Factory delivery order on bottom of form.
31002	Yellow					
31003	White					
31004	Black					
31005	Red					
31006	Blue					
31007	Green					

NYLON CORD (White only)

Cat. No.	Qty.
63303	

"V" FASTENER

Cat. No.	Qty.
63400	

CHAIN

Cat. No.	Qty.
63100	

RING FASTENER

Cat. No.	Qty.
63200	

KING TUFF-TEX EAR TAGS

Cat. No.	Color	1-25 Qty.	26-50 Qty.	51-75 Qty.	76-100 Qty.	Other No's
40001	Orange					Sets of 25 only factory delivery order on bottom of form.
40002	Yellow					
40003	White					
40004	Black					
40005	Red					
40006	Blue					
40007	Green					

KTT EAR PUNCH

Cat. No.	Qty.
61400	

ADDITIONAL ITEMS:

CAT. NO.	DESCRIPTION	NUMBERS

Form No. 91105

ORDER FORM

ORDER DATE

FREIGHT PREPAID $100.00 or more $20.00 min. order

FEARING

SOLD TO: _____ SHIP TO: _____

SALESMAN _____ ROUTING _____

ORDERED BY _____ P.O. # _____

☐ Please note shaded delivery codes. If your order is for items in both shaded and unshaded categories, check the block at left if you want a split shipment. Otherwise, your order will be shipped when all items are ready. DO NOT ORDER SPECIAL IMPRINTS ON THIS FORM. USE FORM #90191, AVAILABLE ON REQUEST.

TUFF-FLEX EAR TAGS

LARGE BLANK

Distributor's stock or from factory in 3-5 working days.

Cat. No.	Color	Quantity
20001	Orange	
20002	Yellow	
20003	White	
20004	Black	
20005	Red	
20006	Blue	
20007	Green	

MEDIUM BLANK

Distributor's stock or from factory in 3-5 working days.

Cat No.	Color	Quantity
22001	Orange	
22002	Yellow	
22003	White	
22004	Black	
22005	Red	
22006	Blue	
22007	Green	

SMALL BLANK

Distributor's stock or from factory in 3-5 working days.

Cat. No.	Color	Quantity
24001	Orange	
24002	Yellow	
24003	White	
24004	Black	
24005	Red	
24006	Blue	
24007	Green	

LARGE NUMBERED

☐ Unshaded blocks – Distributor's stock, immediate delivery or from factory in 3-5 working days.

■ Shaded blocks – Factory shipment in 7-10 working days.

Cat. No.	Color	1-25 Qty.	26-50 Qty.	51-75 Qty.	76-100 Qty.	101-9,999
21001	Orange					Factory delivery order on bottom of reverse side.
21002	Yellow					
21003	White					
21004	Black					
21005	Red					
21006	Blue					
21007	Green					

MEDIUM NUMBERED

☐ Unshaded blocks – Distributor's stock, immediate delivery or from factory in 3-5 working days.

■ Shaded blocks – Factory shipment in 7-10 working days.

Cat No.	Color	1-25 Qty.	26-50 Qty.	51-75 Qty.	76-100 Qty.	101-999
23001	Orange					Factory delivery order on bottom of reverse side.
23002	Yellow					
23003	White					
23004	Black					
23005	Red					
23006	Blue					
23007	Green					

SMALL NUMBERED

☐ Unshaded blocks – Distributor's stock, immediate delivery or from factory in 3-5 working days.

■ Shaded blocks – Factory shipment in 7-10 working days.

Cat. No.	Color	1-25 Qty.	26-50 Qty.	51-75 Qty.	76-100 Qty.	101-999
25001	Orange					Factory delivery order on bottom of reverse side.
25002	Yellow					
25003	White					
25004	Black					
25005	Red					
25006	Blue					
25007	Green					

PREPAID FREIGHT: Freight is paid on shipments routed by us within the Continental U.S.A. totaling $100 or more. MINIMUM ORDER IS $20.00.

FEARING MANUFACTURING COMPANY, 490 E. VILLAUME AVENUE, SO. ST. PAUL, MN 55075

BARD COLLEGE
ANNANDALE - ON - HUDSON
NEW YORK 12504

DIVISION OF
NATURAL SCIENCES AND MATHEMATICS
914 — 758 - 6822

25-Oct 1975

George H Balazs
Hawaii Inst Marine Biology
P O Box 1346
Coconut Island
Kaneohe Hawaii 96744

Dear George:

Thanks for your interesting letter about turtle tags. Actually, I have not yet made a decision regarding tags as I am unsure to what extent I will do field work next year. I am currently analyzing data and writing a paper on snapping turtle ecology. The Petersen disk tags consist of two plastic disks 3/8 or 1/2 inch diam. with central holes, joined by a ~~monel~~ Nickel metal pin (as I used them, connected through a hole drilled in a posterior marginal scute). The disks have excellent lasting qualities, but the pins apparently shear when they become snagged (in traps, debris etc). Thus I have lost about ~~XXXXX~~ 10-15% of the tags per yr (this is not an exact figure - I haven't counted them all up yet). If I do much field work next year, I may either use a combination of a petersen tag (which is good for public return) on the shell and a monel ear tag on the interdigital web, or some kind of monel tag on the shell. The ~~monel~~ Nickel seems to hold up OK at least over a 2½-yr period (I work in fresh water). I was informed by Frank Schwartz (Inst. Marine Sciences, Univ. North Carolina, Morehead City NC 28557) that the ~~monel~~ Nickel tag pins last 10-15 yr.(on turtles?)in fresh or salt water. The Petersen tags may be ordered from: John Howitt, Howitt Plastics, Molalla OR97038. The price is reasonable and the company is very pleasant to deal with.

At one time I tried to find information on the effects of Monel or nickel metal on animals. I thought with snappers which can live for 25-50 yr, there might potentially be some chronic toxic effect. Monel is about 2/3 nickel. I could get no information on this - evidently no one has ever thought to check for this even though these metals are very widely used in tags on many species of animals! The toxicity of certain nickel compounds is well-known and nickel metal may cause a contact dermatitis in man.

Best,

Erik

Erik Kiviat
Director Field Station

THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

COLLEGE OF LIBERAL ARTS
DEPARTMENT OF ~~XXXXXXXXXXXXXX~~
Ecology and Evolutionary Biology

Oct. 23, 1975

Mr. George Balazs
Hawaii Institute of Marine Biology
P.O. Box 1346
Coconut Island
Kaneohe, Hawaii 96744

Dear George,

Thanks for your recent letter and reprint. I have been intending to write you since I heard from Mr. Haas.

This summer we did a serum sexing study on 120 animals. They were tagged on the rear flipper with the monel tags(see enclosed tag). The animals were kept in the large rectangular cement tanks which I am sure you will remember. Between five and six weeks about 55% of the tags just fell off. Prior to this the drop off rate had totaled about 5%. We retagged those that still were identifiable and salvaged a very important experiment. Many of those that were still tagged were just ready to loose theirs also (crosspiece gone and hanging by the curved point).

I haven't measured the electrical current in the tanks but will attempt to get this done through Jim Wood. A standard technique for measuring ocean currents utilizes the electrical current produced between two probes,thus I am sure that in a tank that turns over at least two or three times a day there is going to be a measureable electrical current.

My work is progressing very well thanks to a lot of help from the farm people. I hope to finish up this year. Good luck on your Inconel project and other work. It all sounds very useful.

Sincerely,

Dave

Dave Owens

agri-industries
P.O. BOX 6612 ST. PAUL, MINNESOTA 55106

October 10, 1975

Mr. George H. Balazs
Marine Biologist
Unibersity of Hawaii at Manoa
Hawaii Institute of Marine Biology
P.O. Box 1346
Coconut Island
Kaneohe, Hawaii 96744

Dear Mr. Balazs:

Thank you for your recent request for information on our line of plastic animal tags.

We are a mail order distributor for Fearing Manufacturing Company. We have handled their products for a number of years and have found them to be far superior to any tag on the market today.

Enclosed is a Sample Box with all the tags available.

Tuff-FLEX - 3 sizes, Small, Medium, Large
7 Colors
Blank, Numbered and Imprinting available

Tuff-TEX - 1 size, Numbering standard to 9999
Imprinting available

King Tuff-TEX - 1 size, Numbered standard to 999
Imprinting available

We suggest you write directly to the manufacturer and outline your proposed project to them. They could possibly assist you in this endeavor.

Write: Fearing Manufacturing Company, Inc.
490 East Villaume Avenue
South St. Paul, Minn. 55075

Sincerely,

Ellen
AGRI INDUSTRIES

/e

Form No. F-602 5M 2-74

FEARING

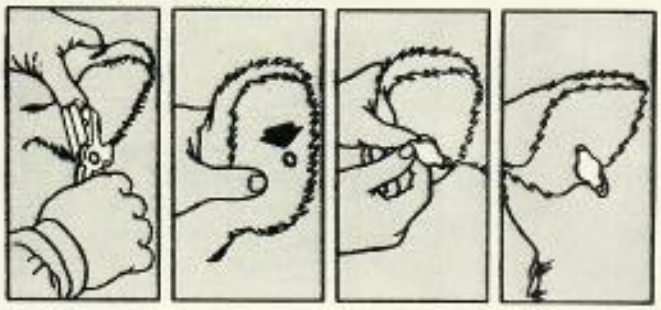
KING TUFF-TEX

THE PROVEN PLASTIC EAR TAG for . . . CATTLE, SHEEP and HOGS

"YOU'LL SELDOM REPLACE ONE!" Many stockmen have reported no Tuff-Tex tag losses in over three years. The open-end design permits fencing, etc. to release itself when snagged. Tags are made of a tough weather-resistant plastic that will last for many years. Colors are solid all the way through and will not fade. 12 colors are great for different tests within one herd. Colors can identify age. Names identify owner. Numbering identifies pedigree. Ear, left or right, identifies sex.

FREES ITSELF:

INSTALLS IN SECONDS:



NUMBERING TO 10,000 IN SETS OF 25

Sets No'd 1 to 25, 26 to 50, etc. NO SETS BROKEN.

PERSONALIZING:

Deep stamped letters; 2 lines, Ten ⅛" letters and spaces per line or 1 line, Four ¼" letters.

2¢ per tag

* Assortments

NO. 36 — KTT	NO. 72 — KTT
(Counter)	(Floor)
800 Tags & 6 Punches	1600 Tags & 12 Punches
Suggestion:	Suggestion:
200 Black	400 Black
200 Red	400 Red
200 Yellow	400 Yellow
200 White	400 White

®
FEARING MANUFACTURING CO.
SOUTH ST. PAUL, MINNESOTA 55075

Made in U.S.A.

KING SIZE No. KTT-511

12 . . . COLORS

Orange, Yellow, White, Black, Red, Blue, Green, Gold, Maroon, Chartreuse, Tan, Charcoal

Price: 18¢ each + imprint chg 2¢ ea

No. TT-512
INSTALLATION PUNCH $7.50 ea

* Assortment Display

SAF-T-TAGGER

FOR TUFF-FLEX EAR TAGS

FASTER SIMPLER SAFER

SURGICAL STAINLESS BLADE

LIST $2.50

QUALITY CONSTRUCTION

CYCOLAC T HANDLE

INSTRUCTIONS

1. Restrain animal's head securely.
2. Locate application area away from veins near center of ear.
3. Use a disinfectant on both the applicator and the ear.
   Note: Steps 2 and 3 will eliminate festering causing incision to enlarge and affecting permanency of installation.

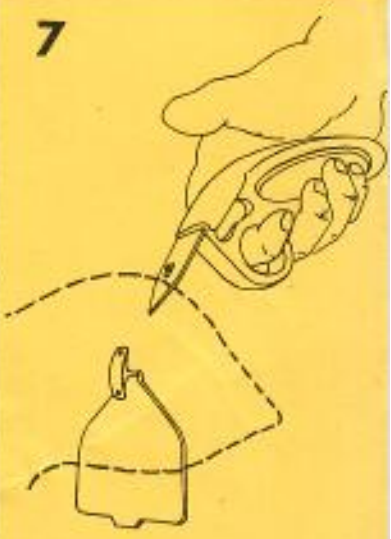
FEARING

4 Flip tag anchor so bottom hole can be hooked on blade.

5 Stretch tag over top of handle and hold firmly with thumb.

6 Push balde quickly through the ear as far as possible and retract immediately.

7



"Love those Fearing Tags"

REAR INSTALLATION
For milking parlors and stanchion barns. Numbered both sides.

Rubbery TUFF-FLEX

WITH EXCLUSIVE VERTICAL ANCHOR
Rubbery TUFF-FLEX tag won't stiffen or tear, even at 40° below zero.

proven best stay power by actual field use. For Beef Cattle, Dairy Cows, Hogs and Sheep.

THREE SIZES

Seven Colors

Orange, Yellow, Black, Red, White, Green and Blue

A vast variety of choices for all your livestock identification needs. Whatever your system. Big, easy to read numbers.

EASY TO INSTALL

Two Fearing Installation Systems

PUSH THROUGH TOOL

PUSH PULL TOOL

EASY TO NUMBER

You can number blank TUFF-FLEX Tags with Fearing Marking Paint. FOUR Permanent Colors:

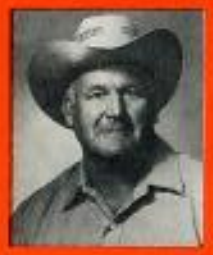
BLACK, WHITE, YELLOW and RED.

FACTORY NUMBERS

Vulcanized numbers or letters

LARGE Tags . . . . Nos. 1 to 9999
MEDIUM Tags . . Nos. 1 to 999
SMALL Tags . . . . Nos. 1 to 999

THESE STOCKMEN USE TUFF-FLEX



"I have used five other tags and I like this tag better than any I have ever used. Because of long distance legibility and ease of installation."

Mr. Wilbur C. Fugitt
Hunt County
Texas

"We like the TUFF-FLEX ear tag because it's so easy to put into the applicator and hugs the ear on the backside so there is no chance for it to snag."

Mr. Clifford Sannon
Wells County
North Dakota

"The thing we like most is the ease of putting the tags in the ears. We put them in sixteen two-year-old Angus bulls about six weeks ago. No problems, no cut hands or sore thumbs like we used to have when we used another type tag."

Mr. John Sandelin
Trego County
Kansas

80M-10-72 FORM TF 1025 PRINTED IN USA

Write or call for current prices from . . .

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DESIGNED AND MADE IN U.S.A. BY
FEARING MANUFACTURING CO. INC., ST. PAUL, MN.

FEARING

Rubbery TUFF-FLEX

For all Cattle, Calves, Hogs & Sheep

EXCLUSIVE VERTICAL ANCHOR

PROVEN BEST STAY POWER

World Patents Pending

MEMO-letter®

RHETT TALBERT

Belle W. Baruch Coastal Research Institute
University of South Carolina • Columbia, South Carolina 29208
Phone (803) 777-2692

To GEORGE H. BALAZS
P.O. BOX 1346 COCONUT IS.
KANEOHE, HAWAII 96744

Date OCTOBER 10, 1975

Subject

Dear George -

Forgive me for not including Kiviat's address with my letter, and for my handwriting - I wanted to respond before it slipped my mind.

PROF. ERIK KIVIAT
BARD COLLEGE
ANNANDALE-ON-HUDSON
NEW YORK 12504

This is the address as it appeared on his letterhead. Dr. Kiviat is Asst. Prof. of Natural History, and Director of the Field Station at this address.

Thank you for the articles; I hadn't seen any of them before, and feel enlightened from this result of our correspondence.

Kindest regards, Rhett

UNIVERSITY OF SOUTH CAROLINA

COLUMBIA, S. C. 29208

O. Rhett Talbert Jr.
BELLE W. BARUCH INSTITUTE FOR
MARINE BIOLOGY AND COASTAL RESEARCH

(803) 777-5288

George H. Balazs
Hawaii Inst. of Marine Biology
Univ. of Hawaii at Manoa
Kaneohe, Hawaii 96744

September 11, 1975

Dear Mr. Balazs,

Thank you for your letter of July 8concerning the new Inconel tags and their potential for sea turtles. Prof. Erik Kiviat wrote me about changing from Peterson disc tags to Monel for Chelydra, in New York. I passed on a copy of your letter encouraging him to consider using the new tag instead of or along with Monel, and directed him to Mr. Haas at Nat'l Band & Tag.

I must confess, however, to my continuing dissatisfaction with all presently available tags. You never mentioned your current involvement with turtles, but I would be interested to know more about the status of the nesting population(s) and rookery beaches. I have also begun to consider graduate studies at several schools, and would appreciate any information you might have on the University of Hawaii's program. If reprints of articles on sea turtle research conducted in your area , or especially through the University, are available, I would appreciate your directing me to the author(s). Any other ideas you may have for a marine turtle tag will be most welcome, and I will be sure to keep you informed of our progress in that area.

Kind regards,

Rhett

O. Rhett Talbert Jr.
Research Associate

send this
Reprints
Peterson Disc address

NATAL PARKS, GAME AND FISH PRESERVATION BOARD

TELEGRAPHIC ADDRESS } "FAUNA"
TELEGRAMADRES

RESERVATIONS ONLY } 53641
SLEGS BESPREKINGS

TELEPHONES } 51221/5
TELEFONE

RAAD VIR DIE BEWARING VAN NATALSE PARKE, WILD EN VIS

PIETERMARITZBURG

P.O. Box / Posbus 662

YOUR REFERENCE
U VERWYSINGSNOMMER

OUR REFERENCE 10/2
ONS VERWYSINGSNOMMER

8th September, 1975

George Balazs, Esq.,
Hawaii Institute of Marine Biology,
P.O. Box 1346,
Coconut Island,
KANEOHE,
Hawaii 96744.

Dear George,

Since my last letter our organisation's finances have weakened somewhat and I am not in a position to buy any tags this year although we are allowing for them next year. In any case the Company could not supply by the beginning of this season. I have, in fact, heard, a few minutes ago, that the first loggerhead has nested.

This situation has rather ruined this year's efforts I'm afraid so we shall have to wait until next season. I have no option at present as I do not control the finances here. By next season we should have plenty of takers so I hope Mr. Haas, to whom I am copying this letter, will be patient with us.

Hope your project is going along well. I shall be in touch again around the beginning of the year.

Yours sincerely,

for: DIRECTOR

GRH/LH

Copy to: Mr. J.R. Haas

George. Sorry!

AEROGRAM

PER LUGPOS
BY AIR MAIL
PAR AVION

AEROGRAMME

AAN
TO: GEORGE BALAZS, ESQ.,

Hawaii Inst. of Marine Biology,

P.O. Box 1346,

Coconut Island,

KANEOHE,

HAWAII 96744.

TWEEDE VOU—SECOND FOLD

NAAM EN ADRES VAN AFSENDER : SENDER'S NAME AND ADDRESS

NATAL PARKS, GAME AND FISH PRESERVATION BOARD

RAAD VIR DIE BEWARING VAN NATALSE PARKE, WILD EN VIS

P.O. BOX/POSBUS 662

PIETERMARITZBURG

Insluitings word nie toegelaat nie : Enclosures are not permitted

SEAL THE SIDE FLAPS FIRST, THEN THIS ONE
VERSEEL EERS DIE TWEE SYKLAPPE, DAN HIERDIE EEN

EERSTE VOU—FIRST FOLD

Fritz Trillmich
MAX-PLANCK-INSTITUT FÜR
VERHALTENSPHYSIOLOGIE
ETHOLOGISCHE ABTEILUNG
LEITER: DR. W. WICKLER

D-8131 SEEWIESEN
TEL. 08157/8121

Sept./11/75

Dr. George H. Balazs
University of Hawaii
Hawaii Institute of Marine Biology
Coconut Island
P.O.Box 1346
Kaneohe, Hawaii 96744
U.S.A.

Dear Dr. Balazs:

Many thanks for your letter of August 22. I am very sorry, but in order to meet my time limitations I ordered the normal Monel metal tags from National Band and Tag just a few days before I got your letter.

Sincerely,

Fritz Trillmich

Fritz Trillmich
MAX-PLANCK-INSTITUT FÜR
VERHALTENSPHYSIOLOGIE
ETHOLOGISCHE ABTEILUNG
LEITER: DR. W. WICKLER

D-8131 SEEWIESEN
TEL. 08157/8121

23. July - 1975

Mr.George H. Balazs, Jr.
University of Hawaii at Manoa
Hawaiian Institute of Marine Biology
P.O.Box 1346, Coconut Island
Kaneohøe, Hawaii 96744

Dear Mr. Balazs:

When I enquired about getting tags for sea lions and fur seals from the National Band and Tag Co. I heard from them that they had corresponded with you about using Inconel tags instead of the older Monel metal tags.

As far as I understand them they hoped to somehow 'pool' our orders to qualify for the nickel alloy company's minimum Inconel ordering requirements. I plan to order 1ØØØ bands. However I would have to have these tags before I leave for Galapagos, where I will do my research, in January 1976.

Do you know or could you guess whether enough people will have asked for Inconel tags before that date to allow the National Band and Tag Co. to order the material and print the tags?

It is possible that the Galapagos National Park would become interested in the tagging project and order more tags later on, but this is at present nothing to count on.

Sincerely,

Fritz Trillmich

copy:Dr. Craig MacFarland

Nat. Wildlife
Oct.-Nov. 83
Vol 21 No. 6

Tales Bird Bands Tell

Federal authorities receive thousands of tags in the mail every year; there's a story behind each of them

By Hank Burchard

GEORGE JONKEL is a genial master spy who spins his web worldwide. As chief of the Bird Banding Laboratory of the U.S. Fish & Wildlife Service, he seeks the secrets of where the birds fly, and how and when they die.

Jonkel issues virtually every bird band used in the United States, Canada, Mexico, and much of Latin America. He's also responsible for keeping tabs on where each recovered band is found. Every year another million bands are clipped onto the legs of everything from catbirds to condors; what becomes of 97 percent of those birds never is known, but the ones that do turn up tell us much of what we know not only about the lives of birds but about the health of our planet. It was largely the BBL's documentation of dwindling bird populations that spurred Rachel Carson to write *Silent Spring*, which helped shift the environmental movement into high gear.

But it's not just the satisfaction of serving birds, science and society that keeps Jonkel and his staff of 27 beavering away in their offices at Patuxent National Wildlife Refuge and Research Center in Laurel, Maryland. They come to work every morning in delicious anticipation of reading the mail. Among the hundreds of band-recovery reports that come in on a typical day are odd or sad or funny tales, mystery stories, cries of outrage, and confessions from people who think they've murdered one of Uncle Sam's pets:

I wish to inform you that I hunted a duck, wrote a Mexican peasant. *I am relating this to you with fear, as some of my friends have informed me that you blame our government, so that you may remove our arms. Actually, my gun is in very poor shape.*

Jonkel has a form letter reassuring

There are U.S. Fish and Wildlife Service bands for every size bird, and each year, another million of them are put into use.

finders that banded birds are not U.S. property, and that the BBL is grateful for any return—no matter how a bird was taken.

The lab has form letters for just about everything—it has to, in order to respond to more than 60,000 pieces of mail every year. There are touching pleas from desperately poor people who think they've won some sort of contest and can't understand why the money isn't pouring in. "Some of them will break your heart," says Jonkel. "But there's nothing we can do about it. There's no budget for reimbursing finders, much less rewarding them."

Everyone who reports a number gets a certificate of appreciation, suitable for framing, which tells who banded the bird, and when and where, along with the bird's sex and age at the time, if known. It's all done by computer, and the certificates go out in the appropriate language. Those who have written in English generally hear back fairly promptly. Nevertheless, the BBL gets scolded regularly by people like this Alabama lad:

I was just going to give you 4 days to answer me about the cedar waxwing, but my father told me to give you a month because the government is slower than most people.

I pay for my BBs and it isn't telling how many BBs it takes to kill a bird. If you don't answer this one, the next bird I kill with a band on its leg I'll throw it in the first mudhole I come to!

"We laughed over that one," recalls Jonkel, "but we worry constantly about delays, because it tends to discourage people from making returns, especially repeat returns, and they are the pivot point of our whole operation. We'd like to get replies out the same day, but the workload here is too high."

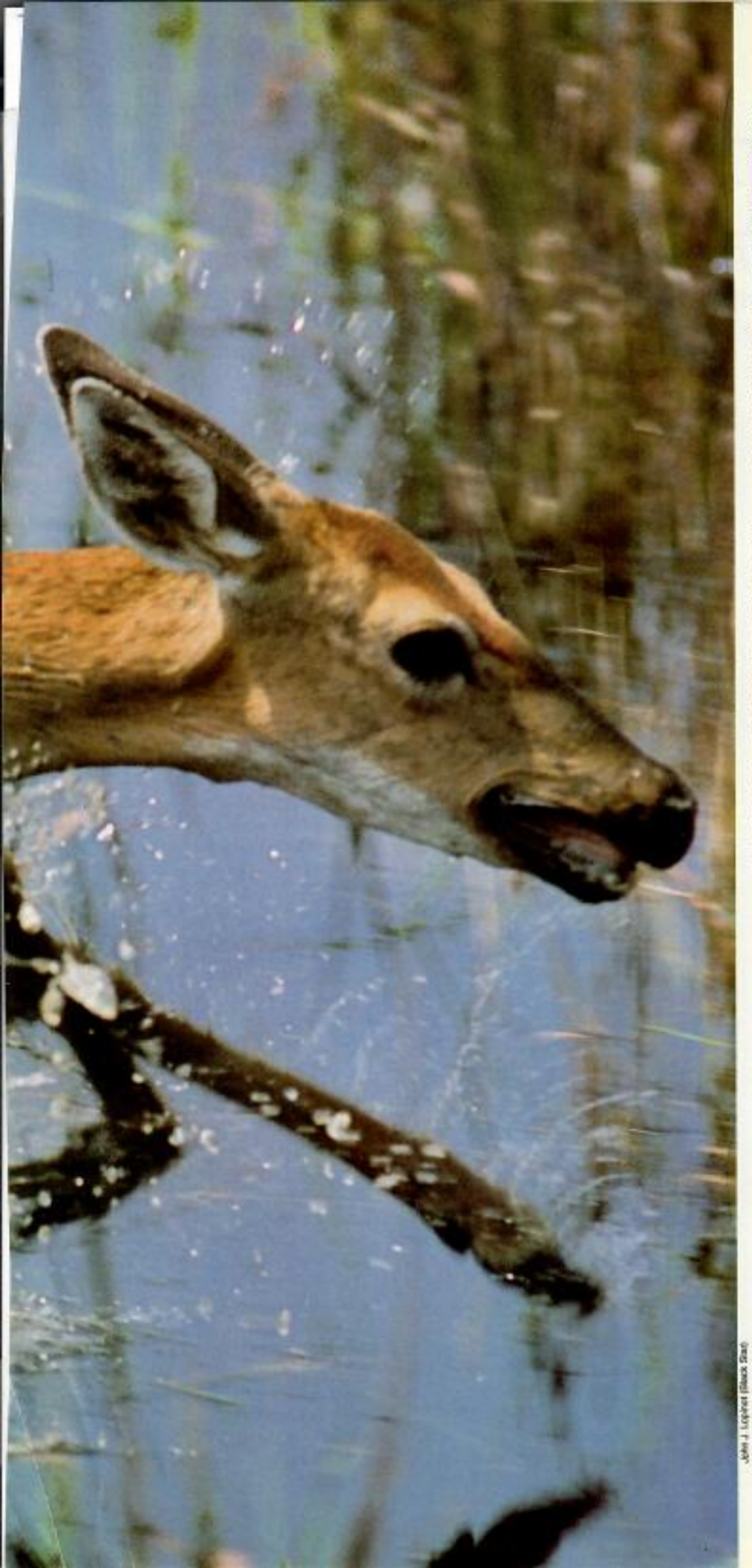
While such melancholy matters preoccupy him daily, Jonkel is continually refreshed by the letters he receives from people in faraway places. Last March, for instance, Cheng Jin-fa of the People's Republic of China wrote:

I feel very glad to write you today. I did not know you and you did not know me. Who introduced I to you? It is your pigeon. SHE FLEW TO CHINA. What a far way she flew! It is marvelous!

"The 'pigeon' was a pintail duck banded in Louisiana in 1978," says Jonkel. "Most of the reports we get have to be followed up. We have to know as precisely as possible when, where and under what circumstances a band was recovered. With only a two- to three-percent return rate for the average banding program—and some banders feel lucky to get back one in a thousand—even the slightest sloppiness can badly skew the statistics."

It couldn't be assumed, for example, that the duck band reported from China wasn't actually *on* a pigeon. "People do weird things," adds Jonkel. "They take bands off and put them on other birds, they alter the numbers or make counterfeits, and they make up stories about how they got hold of one. They'll report numbers that never were issued, or claim to have found a goose band on a sparrow."

A BBL verifier jumps on a suspicious return like a duck on a junebug. None



John J. Lopinot (Black Star)

his forthcoming work on the biology and management of white-tailed deer.

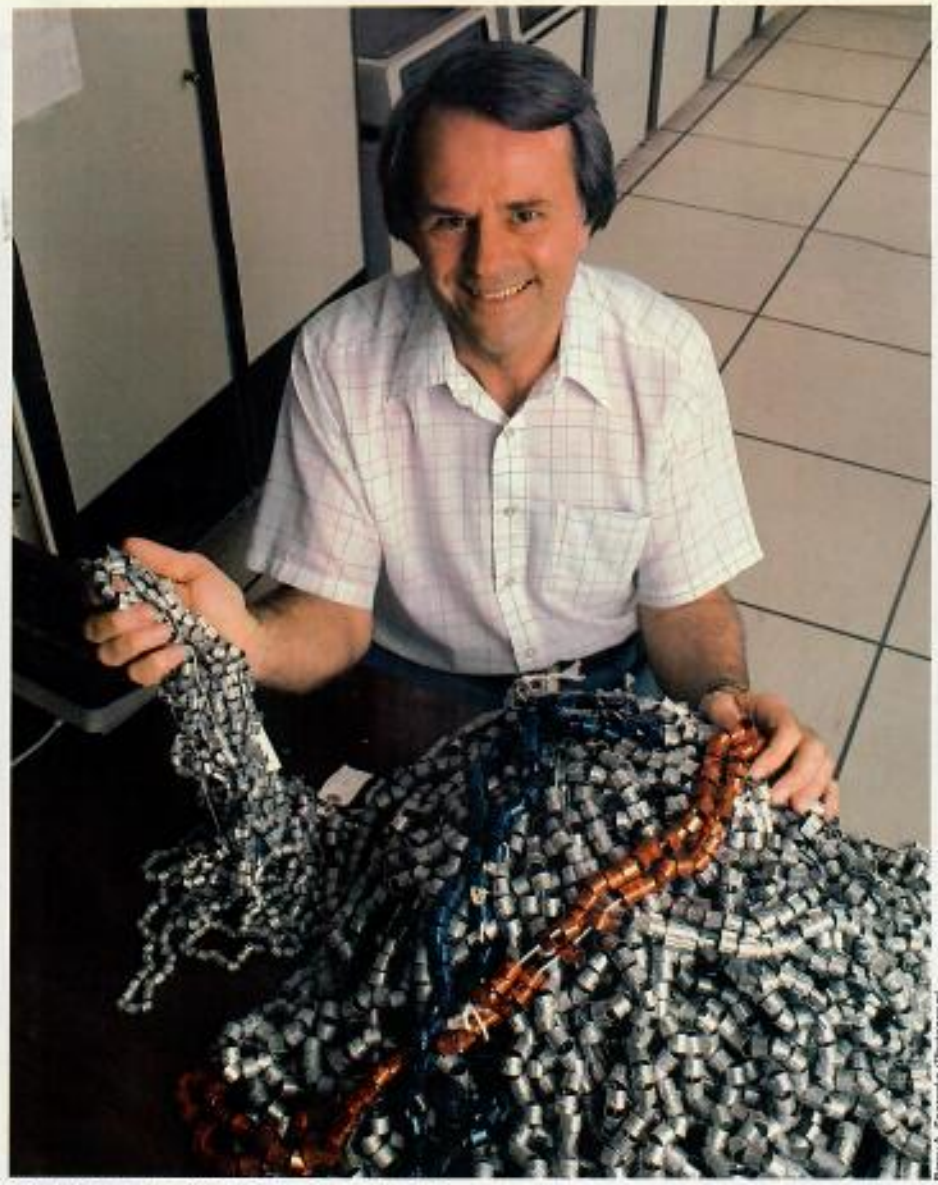
Moen's work constitutes perhaps the cutting edge of revolutionary new management techniques that will allow authorities to balance deer populations with available habitat and thus maintain healthy, stable herds. Key to his approach is the enormous data-handling capability of modern computers. His goal, he explains, "is to put this art of deer management on such a sophisticated, high level of understanding and analysis that it'll stand up in any court of law—in terms of recommendations of what should be done, and can be done."

After 20 years of research, Moen has developed complex ratios and formulas covering everything from a herd's sex/age structure and metabolic cycles to the amount of "metabolic forage energy" contained in its habitat. A deer manager will be able to feed readily obtainable information such as yearling buck antler beam diameters and range characteristics into the computer. And by "solving for the unknown," as Moen puts it, a wide variety of critical answers will emerge. The computer program will calculate the energy needs of a deer herd, the "forage" energy available in the habitat, how much forage the animals require, and how many deer the range will support.

With such technological tools, wildlife professionals will be able to manage whitetail populations more scientifically and effectively than ever before. But attitude surveys reveal that many sportsmen are not ready to give up their old beliefs. Indeed, notes Jay McAninch, "many hunters have never accepted the premise that the wildlife manager is a professional manager."

Hesselton concludes that "the wildlife profession is doing a superb job of producing technicians. But it still hasn't come to grips with the problem of communicating with people." In other words, he says, the trained professionals know very well how to handle deer herds, "but we don't know how to talk to legislators and other decision-makers. And that's what has to be done. We have to overcome that problem before we can really manage our wildlife." ■

Washington, D.C. journalist Sam Iker has written on a variety of subjects for National Wildlife, *including endangered species, wetlands protection and poaching.*



Operating out of the federal Bird Banding Laboratory in Maryland, George Jonkel issues virtually every bird tag used in North America. The computers located behind him hold 63 years of tagging data.

goes into the lab's sophisticated computer system until it's "clean" enough to satisfy Jonkel. "We phone, we write, we get help from wardens and wildlife agents, we chase each question as far as we can. Our verifiers are super people, and they develop a sixth sense about these things. The data are so sparse we hate to throw any report out, but if it won't come clean, out it goes."

"Sparse" seems a curious word for a data base that embraces every band issued in the past 63 years—40.5 million of them, plus the 2.3 million verified returns—until one remembers that it's nearly all that's known about many generations of many species, amounting to billions of birds.

The laboratory depends heavily upon bird lovers, both for the banding and the returns. More than half of the 4,500 field workers are volunteers who receive nothing but free bands and a sense of accomplishment in return for the delicate, tedious work of catching, banding and recording birds.

The BBL is world-famous, but often feels like the orphan of the Interior Department, which recently tried to sell off part of the Patuxent facility along with other "surplus" federal lands. That proposal was slapped down by Congress, which pointed out that such disposal was expressly forbidden by the legislation that created the national wildlife refuge system.

"We operate so close to the bone that we sometimes don't know from one year to the next whether we'll have to ask some researchers—people doing first-class, vital work—to pay for their own bands," notes Jonkel. "There's a growing bird-research movement in Central and South America, which we fervently support because so little is known about 'our' migratory species that winter there. It is generally agreed that the BBL should handle issuing bands and collating returns there, just as we do for Canada and Mexico, because it's the most efficient way to do it. Even governments with whom our relations are troubled make a distinction between politics and matters of science. The need for knowledge is so *vast*: there are more species in the Amazon Basin alone than in all of North America."

The legend on most bands is AVISE BIRD BAND/WRITE WASH., DC U.S.A., plus the number, which works best of all the combinations BBL has tried. ("Avise" is not a misspelling. In French, Spanish, Portuguese and the many Latin-rooted dialects it means "report," "tell" or "advise," with a suggestion of "send." The lab assumes English-speakers can puzzle it out, and most do.) Some people fail to flatten the bands before putting them in envelopes, which gives mail-sorting machinery indigestion. Occasionally, somebody mails in the whole bird.

The bulletin board outside Jonkel's office is covered with duplicates of letters that are just too good not to pass along to fellow workers. Probably the all-time favorite is this one:

Dear Sir,

I have a mother cat. Her name is Freckles. She really is a good cat, but I hate to tell you the bad news that she caught one of your birds with a number, 763-49449. We have been learning about coordination and now I think my Freckles is more coordinated than your bird was. She tore the bird up, and left some here and some there. My mother screamed at me to get the innards off the driveway, cause it looked icky.

So I did. My brother Mark learned in school that cats don't really mean to kill birds, but they like to catch things that move, so she really didn't mean to kill it. She is sorry and so am I. The parts I saw seemed like it was a pretty bird.

Love, Stephen. ■

Hank Burchard is a staff writer for The Washington Post.

Memorandum

File reference TAG FILE

KAREN -
FOR YOUR INFORMATION -
"TAG" & "NUTRITION"
OF INTEREST TO YOU.
Please return eventually
/ George

QUEENSLAND NATIONAL PARKS AND WILDLIFE SERVICE

From CJL

To George.

Band and Tag?

Titanium tag breakage.

Date 28·1·85

Notes (Australia Day)

The titanium tags I'm using in place of National Stock brands #49 are more prone to cracking when bent >90° then straightened. This applies particularly to the tip which gets bent on misapplication.

At present I have about 2% breakage which means the tags cannot be applied. None are breaking on the flat surface with numbers.

Most misapplication is by the volunteers in my program — they don't recognise occasional bent tags / thicker flippers or compensate for flipper movement when they are learning to tag.

The problem you describe would seem to be a result of the very thin tage metal you used. Can you increase thickness?

Before you go to far you need to trial small batches before launching into mass production - it's cheaper. John did this with me when we were developing my tag. — it is still underdevelopment by the way. I want a 1.2 mm thick metal not 1.00 mm but it needs double action applicators for the many of the women to close the tag. John is working on the idea of new applicators at present.

on The Size #1 Titanium Tags I had made for hatchlings

That's what we did, but John doesn't always tell the whole story when doing business with him!

Memorandum

File reference

QUEENSLAND NATIONAL PARKS AND WILDLIFE SERVICE

1-85

From: CJL

To: George.

Subject: Turtle Nesting.

Date

Notes

This has been an exceptional season for me. Our Greens decided they were Ridleys and gave us mass nesting for the entire summer. I finally got to Raine Island for my 'ego trip' and counted 11467 females ashore in one walk of the 1.7km island — and would you believe I didn't tag a turtle (but my hand kept twitching) — Nicholas wouldn have been proud

of me ~~not~~ gielding to the primaeval turtle tagging urge. Not to worry my staff tagged ~ 2500 for the 6 weeks work (= $2500 in tags — I couldn't tag anymore because I didn't have any tags left or money to buy more).

NOT DOUBLE TAGGING?

The loggerhead and flatback work went well — lots of remigrants including good old 2912 which I tagged 16 yrs before and which hasn't bred in 11yr (she has been under observation in our underwater study throughout those 11 yr) It was nice to hold her flipper for her while she laid — she was obviously glad to have me with her at Monkey Mia

On a more serious note. I would expect your nesting density to increase this coming season (if it hasn't done so in the last season) I'll be interested to hear if it does.

on one of our minor beaches about 3 weeks ago we had 5 greens, 1 flatback, 3 loggerheads and 1 Dermochelys ashore for the night. It was great for the team to be able to see so many species at once. I wish we could have it more often. I'm afraid I still get carried away with Dermochelys — we see them so infrequently — and I took yet another role of film of it — and I still find the photos exciting — almost as exciting as the mass nesting greens.

I've had 4 god-damns (all female) work as volunteers with me this summer — including one from your 'big island' and I suggested she ring you up some time ('In Australian that means "give you a call on the telephone"). The woman from Georgia spent ~6 weeks with us — she thinks I am a extreme male chauvenist but since I love turtles she concluded that I can't be all bad. She spent 3 weeks with John Parmenter's flatback work so she will go back with

broadened horizons after having been exposed to our turtle heresy – down under.

The reason for this lengthy letter of very little substance is that I am sitting in Gladstone airport between planes and I started thinking how much you would like to hear from your errant brother of the south seas. Sue just left Mon Repos after two months and I on route to Heron Island to begin a months underwater work – sexing etc for my population structure study. This is the 2nd yea of a 2 year study. This will be the 3rd year running we will have checked some females for breeding condition to assess the proportion of the residents that have bred for the season. – I even hope to be on the reef to welcome 2912 back home now that her nesting season has finished. In case you haven't guessed I am very fond of 2912.

Memorandum

File reference

1-85

QUEENSLAND NATIONAL PARKS AND WILDLIFE SERVICE

From

To

Subject (Page 3 Turtle Nesting) Date

Notes

If you read one page per week you will get the impression that I am a prolific letter writer.

On part performance of our greens I'm expecting nesting density to crash dramatically next season so I'm eager to check it in the feeding grounds now as next years breeders are preparing.

Bye the way our GBR greens at the end of 10 years of total tagging of the Heron Rookery, continue to give

as a 5 yr modal return between breeding seasons — we rarely record a 2 or 3 yr remigration. This may be linked to the slow growth rates of our turtles. As a start to this I'm having a new PhD student begin with my project this month. I want her to parallel Karens green diet/nutrition studies with a study of greens on a totally algal based diet. She's arriving from England this week so I'll introduce her to our turtles in the next month and we'll see how she likes them. Hopefully she'll accept the study.

Well must close. Why don't you come visit us some time. It will save writing letters.

Regards. Col

Wide range of tags made in Australia

AN advanced range of fish tags is now being produced in Australia.

The manufacturer is Hallprint Pty Ltd of Adelaide.

Hallprint's managing director, Mr Michael Hall, says several standard tag patterns have been improved in design and construction by the use of new processes invented and developed by the company.

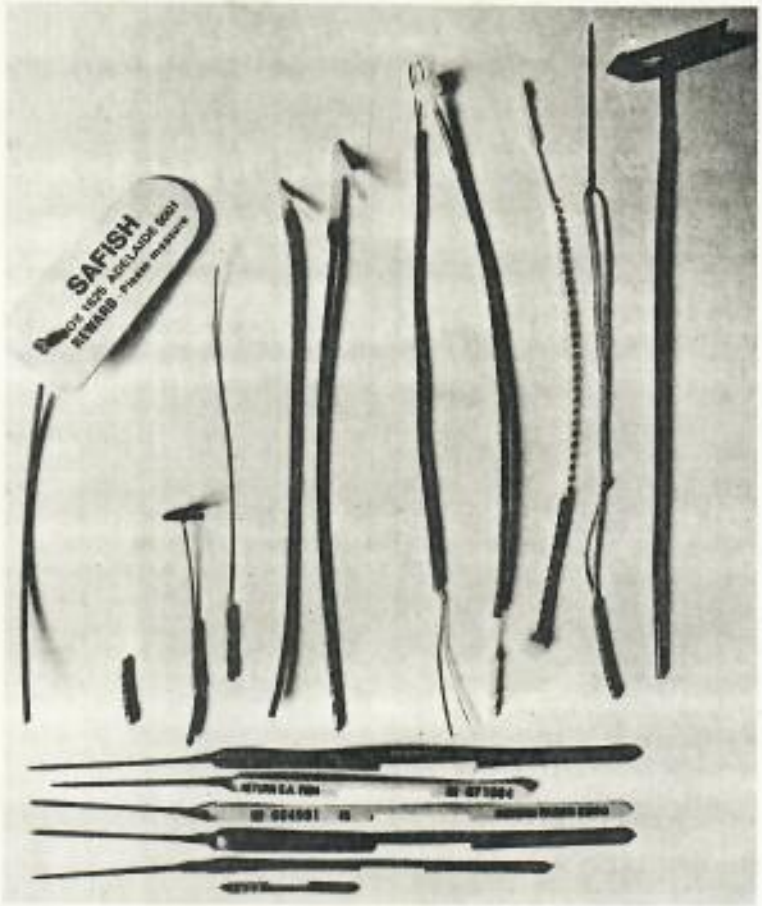
'All materials are carefully selected to give the best possible performance in use and strict quality controls are enforced at all stages of production, printing and packaging,' Mr Hall says.

Hallprint produced their first polyethylene streamer tags in 1983 and since then many thousands have been effectively used in large-scale prawn tagging studies around Australia. The streamlined method of application and development of a wide range of sizes and shapes have also enabled them to be used in evaluating their potential for tagging fish and crustaceans.

Many other types of tag are now being produced. These include plastic and metal dart, T-bar and loop tags in many variations. Special tags for particular needs have been developed in co-operation with biologists working in specialised fields.

'Just one example of this is the simple wire and moulded marker tag devised specially for marking scallops, which is performing well in the current Port Phillip Bay study to determine growth and mortality rates.'

Further afield, Hallprint's new version of the self-locking loop tag has been successfully used in the New Zealand Hauraki Gulf snapper-tagging program. (Copies of a professional 20-minute video and other materials related to this program can be obtained from Hallprint.)



Part of the Hallprint range of tags.

'Double-tagging has proven the Hallprint tags to be far superior in retention and durability to others,' Mr Hall claims. 'This results mainly from maintaining the central locking loop as a single piece, previously considered impossible. In the past this had to be cut and rejoined with glue so as to apply a marker of PVC spaghetti tubing.'

As with all their tubular form tags, the Hallprint process eliminates the need for glue in assembly and varnish to cover essential printed information so as to partly extend its life. This is achieved by printing on an inner core of coloured polyethylene, to which is permanently fused an outer tough clear layer of the same material.

These photos show two views of a prototype experimental tag being evaluated for possible use on crown-of-thorns starfish (Acanthaster planci) at the Australian Institute of Marine Science.

This marker is also moulded around any other tag components such as stainless steel wire, metal and plastic dart heads, monofilaments and threads.

All tags are available in a widening range of colours and sizes. They can be printed with special legends and reliably numbered with combinations of up to seven alpha-numeric characters. Packaging for each tag is designed to save time and effort in use.

Mr Hall, who founded the company in 1972, says he is grateful for the friendly encouragement and professional guidance of many biologists round the world in the past three years' efforts to improve the situation with fish tags, and it is good to see the results now becoming quite evident.

Samples and other information are available from Hallprint Pty Ltd, 27 Jacobsen Crescent, Holden Hill, SA 5088, Australia; tel. (08) 261 0312; telex: AA87037 HALTAG.

March 31, 1981 F/SWC2:GHB

Mr. Larry H. Ogren
Southeast Fisheries Center
Panama City Laboratory
National Marine Fisheries Service
3500 Delwood Beach Road
Panama City, Florida 32407

Dear Larry,

Thanks very much for your letter of March 25 containing all of the interesting and informative items. I really do appreciate being brought up to date on these various points.

The situation on the mass production of Inconel tags looks dismal. Based on my experiences in talking and writing to people, and participating in the Washington Conference "lunchtime" tag workshop, the greatest problem will be getting researchers to make a commitment to a tag order. Most people feel that they don't really have that much of a problem, or at least they don't want to admit to one. Also I have detected a considerable reluctance in most workers to pay any more than 10-15 cents for each tag. I find it hard to understand how people can be so cheap about something that is so absolutely essentially important to their research. I know that you agree with me. But how can we convince others of such an obvious point? I simply don't know, and at this stage I'm not sure if I want to spearhead another Inconel tag campaign. I have enough tags to work with in my own project, at least for the foreseeable future. As you know, the "foreseeable future" with respect to funding has been shortened considerably in recent months. One point that I will bring up that bothers me is the periodic mention in print that we need to develop better tags. Peter Pritchard did this recently in the "Introduction" to the nesting maps put out by the Center for Environmental Education. The superior tag already exists; all researchers have to do is make the financial commitment to obtain them.

The booklet report on the Sea Turtle Excluder Device really looks great, Larry. Thanks for sending me this copy—no one else has. As per the Washington Conference recommendations, we need to get many more of these printed (and translated into other languages) and distributed to all the key people. If this isn't already underway, I would be willing to help stimulate such needed action. Let me know.

I'm not aware of the Western Atlantic Survey and Census Symposium that you mentioned. When and where will it be held, and who all will be attending.

I hope that the SE Recovery Team does send out drafts of the Recovery Plan for review by us "Consultants." It seems like the title should be earned somewhere along the line. What I mean is, no one has ever formally asked me to do any consulting. A "non-consulted consultant," as one of our close friends recently described it to me!

I've enclosed 5 x 7 Xeroxes of my final selections for the postcard project. I would appreciate your frank opinion. Remember the two objectives I set up: 1) pretty pictures to inspire people (conservation-education; and 2) pictures to serve as a supplement for species identification.

Best personal regards,

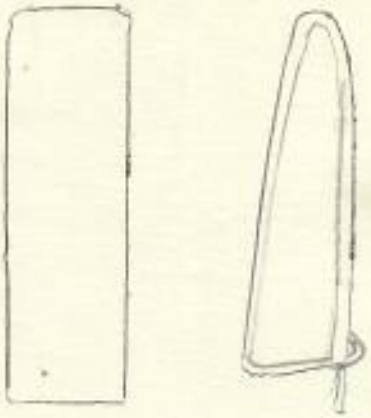
George H. Balazs
Fishery Biologist

Enclosure

bc: Balazs
GH.

GHB:iht

LAYSAN IS.



FIRST RECORD OF A SEA TURTLE BEING TAGGED

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WILLIAMS, E. E., ALBERT G. C. GRANDISON and [illegible]

15106 & 15107 locked
15108 & 15109 unlocked Sent 7/7

STOCKBRANDS CO. PTY. LTD

53 Edward Street, Osborne Park, W.A. Telephone 444 4877 All correspondence to P.O. BOX 60, MT. HAWTHORN, WESTERN AUSTRALIA 6016

May 30, 1986.

Mr. G.H. Balazs
National Marine Fisheries Service,
South West Fisheries Centre,
Honolulu Laboratory,
P.O. Box 3830,
Honolulu,
Hawaii 96812

Dear Mr. Balazs,

We are most concerned to learn of your problem with the Turtle Tags.

We are not sure if it is the fault of the tag or the applicator, and we enclose samples of correct tags for you to try in your applicators, and let us know.

Please return us a sample of your unused tags for us to inspect.

Yours faithfully,

JOHN FOREHAN.

July 7, 1986 F/SWC2

Mr. John Forehan
Stockbrands Co. Pty. Ltd.
P. O. Box 80
Mt. Hawthorn
Western Australia 6016

Dear Mr. Forehan:

Thank you for your letter of May 30, 1986 which I just received last week upon my return from four weeks of field work at a remote location.

I have tested the two titanium "Greenpeace" tags that you sent, -- one in each of our two applicators (A and B). In addition, two of our own titanium tags have been tested in the same manner. All four of these locked tags have been enclosed for your inspection.

In my opinion none of these tags worked properly, if the purpose of the hole is to have the piercing tip fold into it as a safeguard against snagging on a foreign object. None of the tips entered the hole, including the sample tag you sent as representive of a correctly locked tag. The only difference that I could find between our tags and the tags made for Greenpeace was that the tips on the latter were manufactured with more of an inward curve or bend. Our tags have an almost straight tip, with little or no curvature. Two of our unused tags have been enclosed for comparison.

As I indicated in my earlier letter, our tags are usable, but do not function in the manner for which they were designed. We plan to continue using the tags on sea turtles under select circumstances, but only in combination with tags obtained from other sources.

We look forward to having your professional analysis of this problem. Thank you for your assisteance.

Sincerely,

George H. Balazs
Zoologist

cc: Colin Limpus
Larry Ogren
Karen Bjorndal

STOCKBRANDS CO. PTY. LTD

53 Edward Street, Osborne Park, W.A.

All correspondence to P.O. BOX 80, MT. HAWTHORN, WESTERN AUSTRALIA 6016
Telephone: 444 4877 Public Telex No. AA92881 Fax 61 09 4440619

December 15, 1986.

Mr. G. Balazs
National Marine Fisheries Service,
Southwest Fisheries Centre,
Honolulu Laboratory,
2570 Dole Street,
Honolulu,
Hawaii 96822-2396

Dear George,

Kindly reference your F/SWC2 of July 7 1986.

I apologise for not writing before now, but I have held off until we could offer you some definite answers to your several queries.

We have had some real problems with this tag, mainly due to the fact that the design, and moulds were originally intended for aluminium and stainless steel tags, which behave much more docilely than the titanium. We find that the rapid deterioration of our tools allows dimension changes to creep in, and unless everything is quite right the tags do not behave well. As well as that, the aggressive nature of the titanium has necessitated us replacing worn, and broken parts and stamps so often that the whole exercise has been an economic disaster.

Nevertheless, we have perservered with the various problems, and appreciate the loyal, and patient support we have had from our customers.

We have altered the design slightly, (sample enclosed), and we feel now that the tag behaves as well as it is intended or likely to.

We note that you are using tags of another manufacture, and we would be interested to have samples of these if you feel that they offer advantages over ours.

Yours faithfully,

JOHN FOREHAN.

NATAL PARKS, GAME AND FISH PRESERVATION BOARD
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T.A. "FAUNA"
(0331)
51221
(8 Lines)
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RESERVATIONS ONLY
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6-43481

RAAD VIR DIE BEWARING VAN NATALSE PARKE, WILD EN VIS
POSBUS 662, PIETERMARITZBURG 3200

INQUIRIES
NAVRAE Dr GR Hughes

OUR REFERENCE
ONS VERWYSING E. 6/1

Please address all communications to the Director
Geliewe alle briefwisseling aan die Direkteur te rig

10 July 1986

Dr Karen Bjorndal
Department of Zoology
University of Florida
GAINESVILLE 32611
Florida
United States

Dear Karen

Thank you for your circular letter and incidentally, support for my plea for more information, that was greatly appreciated. In reply to your questions:-

(i) Tags for Nuitja - This suggestion is supported. Incidentally I have been using Australian Titanium tags recently. They are four times the price of Monel and so far after two years of use (not enough I know) there is no indication of any improvement in recovery figures. Until we have more proof I suggest that you buy Monel tags.

(ii) Our telex number is at the head of this letter so that gives you mine. Thanks for yours.

(iii) As far as the weather balloons are concerned, I think you should write for the group to the main suppliers. Attached please find a schedule of names of the suppliers for our balloons in South Africa.

George

Regards to Archie and others.

Yours sincerely

George.

ASSISTANT DIRECTOR CONSERVATION

GRH/blj

FRENCH FRIGATE SHOALS, 1984: GREEN TURTLE HATCHLING MARKING

This work was conducted by Gail Peiterson, Robin Westlake, and Susan White and was performed from 26 July to 8 August 1984, under Special Use Permit HWN-8-84.

A total of 2,542 green turtle hatchings were collected from East, Whale-Skate, and Trig Islands. All of these were single foreflipper tagged with titanium tags. Tagged hatchlings were released at East, Whale-Skate, and Tern Islands.

Approximately 450 hatchlings were dug out of previously erupted nests. All but 200 of these were released <u>untagged</u> because they appeared to be very weak animals that would probably not survive. The other 200 were retained for captive tag retention and autograft studies.

Autografts and double flipper tags were applied to this group of 200 hatchlings on Tern Island before departure to Honolulu. Approximately 30 hatchlings died the night before departure, more died in the morning prior to flight time. By the time the plane reached Honolulu and the turtles were delivered to the Aquarium most had died and all but 12 died in the next few days. We suspect these were initially weak individuals having never emerged from their nests and that the handling, shipping, and temperature stresses were more than they could handle.

Before attempting to perform this tagging study again we have decided to wait and see what the Pacific sea turtle recovery team may recommend in this regard.

Many of the titanium tags misfired or broke when applied, so further work needs to be done on the hatchling tag itself.

National Park nature trail, visits to the Caño Palma Canadian Research Field Station, boat rides through the canals for wildlife observation, fishing trips, and in some occasions badminton or volleyball games held at the Mawamba Lodge. Activities were posted in the dining room after lunch on the bulletin board.

The Volunteer Coordinators were also responsible for handling particular requests, in order to ensure a pleasant stay at the CCC compound.

ILLEGAL HARVEST

Costa Rican Wildlife Conservation Law prohibits the capture of sea turtles and their products, within 12 miles of the coastline from Boca Matina to the Nicaraguan border. During the course of this program, all illegal activities were monitored by the RAs and reported to the Tortuguero National Park Office at Cuatro Esquinas. During a total of 58 days, from 7 July through 2 September 1995, 34 vessels with what appeared to be turtle fishermen carrying harpoons were recorded on 28 different days. These data was gathered along the northern most five miles of Tortuguero beach. National Park Service Personnel conducted eight boat patrols along the Tortuguero National Park boundaries during the above dates (Alan Marín, Encargado de Programa de Uso Público del Area de Conservación de Llanuras de Tortuguero, pers. com, 1995.). These patrols resulted in the capture of five vessels and the release of approximately 60 harpooned turtles. During the same period, four persons were captured inside the Park boundaries while flipping over nesting turtles. A total of seven nesting turtles were found and released either by CCC personnel, the Park Guards or by the policemen prior to their slaughter in front of the Tortuguero village. Unfortunately, fourteen nesting turtles were slaughtered at or near the village. Similarly, 4 out of 5 turtles that came to nest on the beach strip between Parismina and Pacuare on the night of 12 August were slaughtered.

A generalized discontent by local Tortuguerans is perceived because the Costa Rican Fishing and Aquaculture Institute (INCOPESCA) issues turtle fishing permits in Puerto Limón, for a 1,800 turtle quota from 1 June through 31 August 1995.

OBSERVATIONS AND RECOMMENDATIONS

Research

Principle activities during green turtle nesting season's yearly research and conservation programs at Tortuguero relate to the tagging process. A sufficient amount of tags should be previously stocked and comprise one numerical series.

Tags made from different metals, and tagging application procedures should be systematized.

Daily track counts should be recorded during early morning, leaving the nocturnal beach patrols solely for tagging and measuring purposes. Daily track counts through the entire 18 mile coastline can be easily and more accurately surveyed using an ATC. With this vehicle, mile markers could be easily maintained and communication between CCC compounds and camps at miles 8, 12, and 15 would be enhanced.

A permanent camp established at or near mile 12 would enhance beach surveillance, thus increasing turtle detection and tagging.

A Sea Turtle Management Plan for Tortuguero and its surroundings should be drafted with the input of the National Park Service, Guide Association, CCC, Local Tortuguerans and other organized entities in the locality.

The laboratory room at CCC's compound should be adequately equipped, further enhancing future research.

Cement mile markers should be permanently set at one-half mile intervals, with reflectors placed on each one.

Research Assistants

Research assistants play a vital role in the execution of the research activities. Clear terms of reference should be followed to select future personnel. Some of these terms include:

1. Commitment to stay the entire duration of the season.

2. Involvement in turtle research and conservation, or closely related field.

3. Have attained a Bachelor's degree in Biology or related field.

4. Be able to multiply and transmit their acquired knowledge.

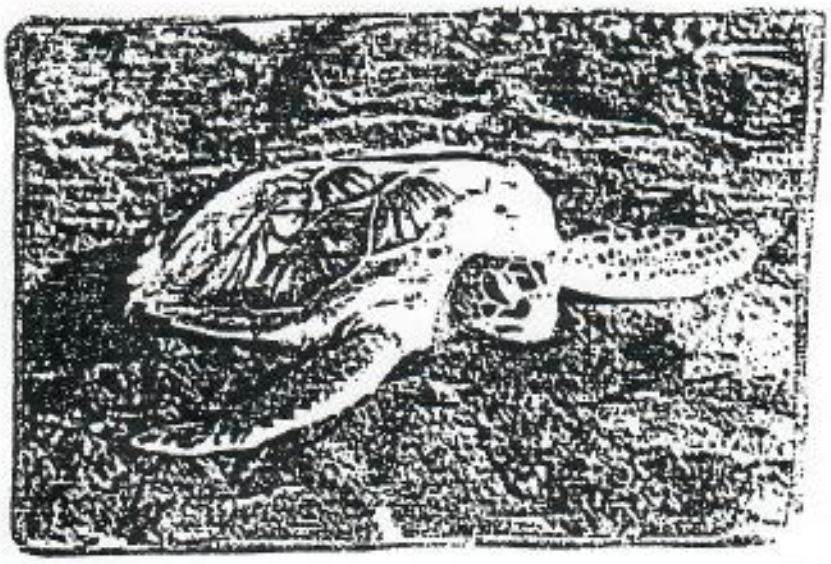
One research assistant should be responsible for organizing a computerized data base system for the season.

Research Participants

The checklist of necessary items to bring to Tortuguero should be updated as complete as possible.

Due to the significant amount of responsibility required to coordinate volunteer activities, a full time volunteer coordinator should be contracted.

GREEN TURTLE, Chelonia mydas, RESEARCH AND CONSERVATION PROGRAM AT TORTUGUERO, COSTA RICA DURING THE 1995 NESTING SEASON



Technical Report Submitted To:
Caribbean Conservation Corporation (CCC)

Prepared By:
Carlos Roberto Hasbún*, Suejin Hwang, Tracy Leavy, Lori Oliver,
Zachary Stroker, and Jordy Urstadt

Review and Revision by CCC Scientific Advisory Committee and Staff

*Research Coordinator
7a Calle Pnt. #5150
San Salvador, El Salvador

Date: Mon, 2 Sep 1996 13:43:36 -0700
From: "Wallace J. Nichols" <jnichols@CCIT.ARIZONA.EDU>
Reply to: Sea Turtle Biology and Conservation <CTURTLE@nervm.nerdc.ufl.edu>
To: Multiple recipients of list CTURTLE <CTURTLE@nervm.nerdc.ufl.edu>
Subject: incidental capture of sea turtles

I've just returned from a summer field season of research in the Gulf of California. The focus of the research has been on the movement and feeding behavior of the East Pacific Green, or Black sea turtle (Chelonia mydas=agassizii). For five years turtles have been tagged and released at their feeding areas in the Gulf, particularly in Bahia de Los Angeles.

It was not until mid-season this year that we learned that the plastic "cow-ear" tags that we use may be contributing to turtle by-catch in gill nets of all mesh sizes. Through interviews with local fishermen, direct observations of turtles in fishing nets, and in-tank observations we have determined that tagged turtles may have a significantly higher probability of being captured in gill nets set for mullet, rays, flounder, shark, etc. We immediately ceased our tagging activities and have begun a tag removal program with recaptured turtles.

We are concerned that other turtle conservation programs that use a similar type of tag may be unknowingly contributing to the turtles' incidental capture, particularly in areas where gill nets are common.

We are interested in using an alternative tag design, one that has been shown to be "tangle free".

We have communicated this information to J. Alvarado and A. Figueroa in Michoacan, who use a similar tagging system on black turtles nesting on the beaches at Colola and Maruata.

Our questions are:

Which other nesting beach programs use plastic tags?

Do the typical monel tags contribute to entanglement?

Are there any studies on incidental capture of tagged vs. non-tagged turtles?

What are the other options for tag designs that are currently in use?

Any information on these topics would be appreciated.

Wallace J. Nichols
Jeffrey A. Seminoff
Antonio Resendiz
Bety Resendiz

~~~~~~

Wallace J. Nichols
School of Renewable Natural Resources-Wildlife Ecology
Biological Science East
The University of Arizona
Tucson, Arizona 85721 USA

jnichols@ccit.arizona.edu
~~~~~~

Date: Mon, 2 Sep 1996 23:05:58 -0700
From: jnichols@ccit.arizona.edu
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
Subject: Re: incidental capture of sea turtles

You wrote:

> Keep in mind that
> tagging sea turtles is as much art and skill and common sense as it is
> science...

Indeed, and in retrospect I feel as if I lacked all of the above--and have gained a bit of each in the process. Unfortunately, it may have been at the expense of some turtles. This thought makes me feel quite ill. The initial decision to use the plastic tags was primarily one of historical inertia (and ignorance on my part), a donation of "free" tags some years ago, and some literature on monel vs. plastic tag retention in the ETP. I will do what I can to see that these plastic tags are replaced wherever they are being used. Are your observations of the problems with plastic tags published? MTNL?

Thanks for your insight and quick response. I'd like to chat with you about some other issues later (satellite tags, morphometrics).

Hasta luego,

J.

~~~~~~

Wallace J. Nichols
School of Renewable Natural Resources-Wildlife Ecology
Biological Science East
The University of Arizona
Tucson, Arizona 85721 USA

jnichols@ccit.arizona.edu
~~~~~~

Date: Mon, 16 Dec 1996 07:34:11 -0500
From: NATLBAND@aol.com
To: gbalazs@honlab.nmfs.hawaii.edu
Subject: 681 inconel tags

George,
Thanks for your last E-mail regarding the application of the inconel tags. We have been reviewing your comments and have some conclusions we would like to share with you.

We analyzed our production samples of all inconel tags including the tags sent to you back to 1992 and have concluded that each batch of inconel has it's own unique set of characteristics. Sets of tags made from differnet coils (about 10,000 tags) will come out somewhat different.

>From what we can tell, the technique you suggested does work on most of our tags. We found some tags actually worked better using your method but some tags worked better using the method suggested on the box. Obviously we are not in the environment you are in but we feel this conclusion may be worth considering.

Our conclusion (and hopefully yours as well) would be to make up a supplemental instruction sheet showing the three methods for inserting the tag in the applicator. Along with these instructions, we will supply a set of tags to be used to "test" the applicators or determine which method would be best for each batch of tags - perhaps 25 tags.

Since the beginning we have made minor improvements in the tooling each time we run an order. This has resulted in more consistent tags but there still is room for improvement (no guarentee two lots will be the same). Also, we have made great strides in improving the applicator. The applicators we are producing now are much more "forgiving" than the first ones produced. In closing, unfortunately, I don't think we can etch in stone there is any one correct or better way to insert the tag in the applicator. But if we show several suggested ways and supply some samples with each order and even mark the way we think will have the best results with that particular lot of tags may result in better success rates.

Thanks again for your continued interest and suggestions. The very best to you, your team and your family this holiday Season.

Looking forward to your reply.

Fred and Kevin.

Date: Tue, 3 Dec 1996 07:26:21 -1000 (HST)
From: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
To: NATLBAND@aol.com
Subject: Re: Message for Kevin Haas.

Dear Kevin: Thanks for writing and please extend to your father my very best regards. I'm glad he saw the video, taken right off of Waikiki Beach a few years ago. I wonder if he looked hard and noticed NBT Inconel tags on the little turtle I was holding? They were faithfully there, on all four flippers!

I suspect you've filling your dad's place in the company now and that he is taking much well-earned vacation time and maybe retirement. I ought to be doing that also, but a kid going soon to college financially stop me in my circumstance. If my assumion about your dad is correct, then I will direct the question I have to you. The question comes from the fact that I am currently writing a short chapter for a sea turtle research techniques manual. My part deals with tagging methods and tips. This has been good for me as it has forced me to look closely and place into words what I have to some extent been intuitively doing for years. So here goes..

As you know, I use the size 681 "conservation tag" (I think that's what you still officially call it) made of Inconel alloy 625. The tags come (have always come) packed in the 25 per strip box (100 total). I'm sure this box with directions on the side was originally made for the more comonly produced Monel tags. The directions say "Make sure the bottom plane of the tag is flat against the bottom jaw and the "bubble" is seated in the hole." I have just come to the realization that this isn't best for the Inconel tags. Maybe the difference in alloy toughness makes this direction good for Monel. But not normally for Inconel. I've tried this multiple times in practice in my office now ("tagging" a piece of cardboard). I find that malfunction is high if the directions are followed (bottom plane of tag is flat against bottom jaw). In contrast, if the tag is pullled up so bottom plane is at an angle (so that the leading edge "lip" by the "bubble" is situated more inside the jaw) that malfunction happens far far less. What I am saying, then, is that by my experience the bottom plane of the tag should not lie flat, but rather end up being at an angle, such as shown in the smaller picture on the carton where the tag is just being pulled by the person into the jaws.

I'd really appreciate your remarks on what I've said above. I've been doing this for years (loading the tag contrary to what the instructions say on the carton). But only realize that now (so much for "reading the instructions!). My concern of course is that other researchers may indeed be following the directions. And coming up unhappy with the malfunction rate.

I'm looking forward to hearing from you when your time permits. Aloha,
George

George H. Balazs
National Marine Fisheries Service
Marine Turtle Research Program
Honolulu Laboratory
2570 Dole Street
Honolulu, HI 96822-2396
Tel:(808) 943-1240
Fax:(808) 943-1290

Email: gbalazs@honlab.nmfs.hawaii.edu
****

On Mon, 2 Dec 1996 NATLBAND@aol.com wrote:

> George,
>
> Fred said he saw you on TV the other day. Congratulations!!
> I gave him your E-Mail (I think it was his first ever!!!)
>
> Anyway, I'll type his response later today or in the morning. Thanks for
> contacting us. Please let us know if there is anything we can do.
>
> Take care.
>
> Kevin (Fred's son)
>

Identification Designers and Manufacturers

STOCKBRANDS CO. PTY. LTD

53 Edward Street, Osborne Park, W.A. Telephone 444 4877

All correspondence to P.O. BOX 80, MT. HAWTHORN, WESTERN AUSTRALIA 6016

August 15, 1983.

Mr. G.H. Balarz
Wildlife Biologist,
National Marine Fisheries Service,
Honolulu Laboratory,
P.O. Box 3830,
Honolulu,
HAWAII 96812

Dear Mr. Balarz,

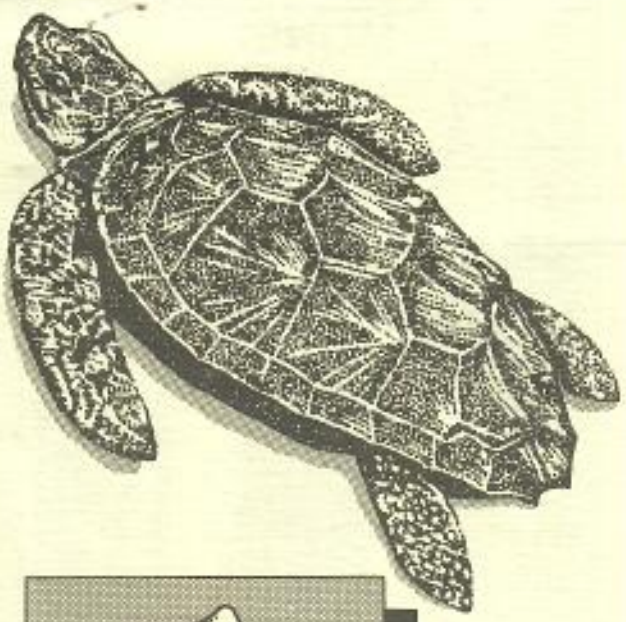
We would produce the hatchling tag to your specifications, and for a quantity of 10,000 we would estimate a cost to you of approximately Aust $120.00 per 1000.

At this stage you might like to advise us if the size might perhaps be varied from the sample, particularly to permit more message.

We would like to work with you in this regard.

Yours faithfully,

JOHN FOREHAN.

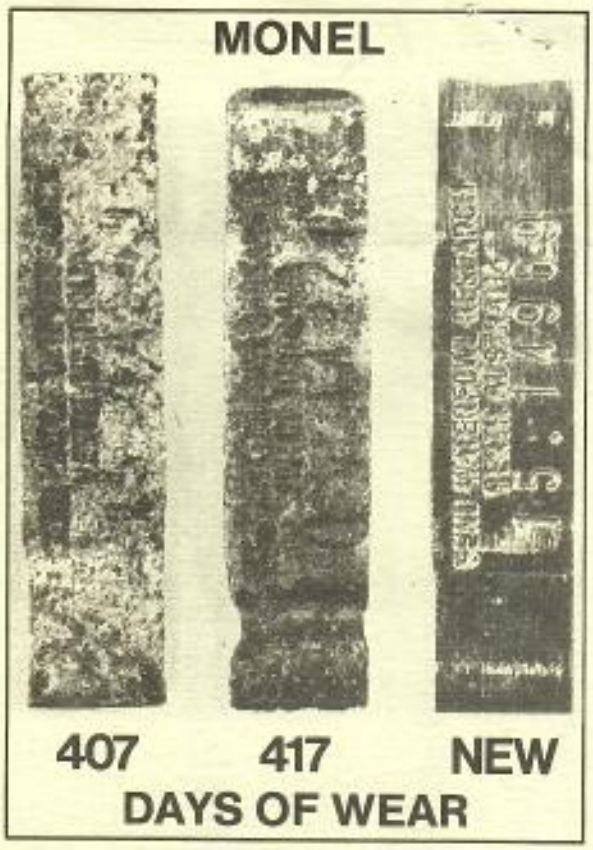


Turtle Tags

(mfg commercially, pure TITANIUM)

For samples and assistance with all your tagging programmes (Bird Bands, Fish Tags etc.)
Write:

STOCKBRANDS CO.
P.O. BOX 80, MT. HAWTHORN 6016,
WESTERN AUSTRALIA



The West Australian Fisheries and Wildlife Department commenced banding water fowl in 1967 using Monel bands, which showed considerable deterioration to the point of loss or illegibility within 417 days. (see photo)

Titanium bands were used starting 1967 for banding Wild Duck on Rottnest Island under lake conditions ranging in salinity from 5% to 22% (sea water 3.5%). These bands evidenced no deterioration over the 10 year period to 1977.

(Ref: RIGGERT Dr. T. The Biology of the Mountain Duck on Rottnest Island.)

COMPARATIVE TAG RETENTION RATES FOR TWO STYLES OF FLIPPER TAGS

Jonathan C. Gorham, Michael J. Bresette, Bruce D. Peery
Quantum Resources Inc., P.O. Box 30008, Palm Beach Gardens, FL 30008, USA

3/97

INTRODUCTION

Poor retention of tags is a widely recognized problem in sea turtle research (Balazs 1982; Henwood 1986). Despite the emergence of Passive Integrated transponder (PIT) tags, flipper tags in various designs and materials remain the mainstay of most tagging programs. Numerous studies have examined the problem of tag loss (Balazs 1982; Henwood 1986; Bjorndal et al. 1996), and the search for the ideal tag design and material has proven elusive. Self locking Monel and Inconel metal tags, such as those supplied by National Band and Tag Company (USA), have been widely used, and plastic two piece Roto-tags manufactured by Dalton (UK) have been in use for several years. Studies comparing the two tag styles (metal and plastic) have not achieved a consensus on the superiority of one style over the other. Green (1979) found plastic tags clearly superior to Monel metal tags on green turtles in the Galapagos Islands, as did Alvarado et al. (1988) for east Pacific black turtles. Eckert and Eckert (1989) however, found very poor retention of plastic tags on leatherback turtles. It is likely that the relative performance of different tag styles varies with the species of turtle under consideration, the size class of turtles within a species, and the various environments the tags are exposed. This study examines rates of tag losses for Inconel metal size 681 tags and plastic Roto-tags on green and loggerhead turtles captured at the Florida Power and Light Company St. Lucie Power plant on the Florida East Coast between November 1990 and March 1996.

MATERIALS AND METHODS

Turtles were captured and tagged at the Florida Power and Light Company St. Lucie Nuclear Power Plant located in St. Lucie County on the Florida East Coast. The plant draws cooling water from the Atlantic ocean via intakes 365 meters off the beach. The water travels through three intake pipes under the beach to an enclosed canal system. Sea turtles entrained with the cooling water became entrapped in the intake canal, and were captured by tangle nets or divers. After tagging, turtles were released from the beach about 1 km north of the intake.

Tags used in this study were supplied by the National Marine Fisheries Service (NMFS). The metal tags used were Inconel size 681 self piercing tags manufactured by National Band and Tag Company (USA) and plastic tags used were blue jumbo Roto-tags from Dalton Supplies (UK). Tags were applied to the trailing edge of the front flippers, generally through the second or third scale from the body. Metal tags were sometimes applied through the webbing between the scales when the scales were too thick to accommodate the tag locking mechanism. During the period from November 1990 to March 1996 when both types of tags were being supplied by NMFS, turtles were tagged with one tag of each type. A total of 791 loggerheads and 786 green turtles were tagged in this manner. Tagged turtles for both species were dominated by juveniles and subadults.

Tag loss probabilities were calculated from a total of 327 recapture events, with recapture intervals ranging from 1 to 1545 days. Calculations of probabilities of tag loss

were performed using the equations of Mrosovsky and Shettleworth (1982) where:

$$P_a = \frac{N_{1b}}{N_2 + N_{1b}} \quad \text{And:} \quad P_b = \frac{N_{1a}}{N_2 + N_{1a}} \quad \text{Where:}$$

P_a = probability of type a tag loss
P_b = probability of type b tag loss
N_{1a} = number of recaptures with only type a tag remaining
N_{1b} = number of recaptures with only type b tag remaining
N_2 = number of recaptures with both tag types remaining

These equations provide the probability that a tag will be lost in a selected time interval. We performed calculations for 100 day time intervals from 0-500 days and for 500+ days, analyzing results separately for green turtles and loggerheads. We also performed a simple probability analysis on the 47 turtles recaptured with just one of the two tag types missing to determine if the missing tags were equitably distributed between the two tag types (Z test) (Sokal and Rohlf 1981).

RESULTS

For recapture intervals from 0-300 days, the Inconel metal tags showed slightly lower probabilities of loss in green turtles (figure 1) but in the 400-500 day and 500+ day recapture interval classes, Inconel tags began to show higher probabilities of loss, although sample sizes were small for the longer recapture intervals. Tag loss probabilities for both types of tags were at or exceeding 50% after 400 days.

Loggerheads showed considerably lower probabilities of inconel metal tag losses compared to Roto-tags for recapture intervals from 0-200 days (figure 2). Data were insufficient for comparisons over longer recapture intervals for loggerheads. Tag loss probabilities in general were lower for loggerheads with either tag type at all recapture intervals than for green turtles.

Examination of the 47 turtles of both species combined that were recaptured with only one tag remaining revealed that the Inconel metal tag was lost in 12 cases and the plastic Roto-tag was lost in 35 cases. Statistical testing against the null hypothesis that both types of tags were equally likely to be lost showed the Inconel metal tag was significantly less likely to be lost ($Z=3.355$, $p>.001$).

DISCUSSION

The results of this study confirm the general conclusion that flipper tags are not a reliable method for the long term identification of sea turtles. Tag loss rates exceeding 50% within 2 years can provide only limited information on long lived species. Tag loss probabilities in our study are similar to results in other studies for the Inconel tags (Bjorndal et al. 1996; Henwood 1986). Tag loss probabilities for the plastic Roto-tags in our study were much higher than those reported by Alvarado et al. (1988) for black turtles and Green (1979) for green turtles. A likely explanation for this difference is that the above referenced studies involved adult turtles on nesting beaches while our tagged turtles were primarily juveniles. In the case of the green turtles, most tagged turtles were under 35cm carapace length. Small turtles do not offer as secure an

anchor, particularly for the more massive plastic Roto-tag, and the more rapid growth of this size class of turtle may also present problems. The generally lower tag loss probabilities for loggerheads in this study may be due primarily to their larger average size in our capture population than to any real difference between species.

Examination of recaptured tags and tag scars can give some indication of likely modes of tag failure. In many cases, the piercing section of the size 681 metal tag was too short to allow application through a flipper scale, particularly on larger individuals. Tags applied to the webbing between the scales are relatively easy to tear out. Possibly, larger tag sizes or a redesign of the size 681 tag would reduce tag loss rates.

We did not see any instances of significant corrosion on our Inconel metal tags, so the noncorrosive nature of the plastic tag was not a significant advantage in this case. The most significant problem experienced with the Roto-tags was the enlargement of the attachment hole and subsequent tearing of the flipper or slippage of the tag body through the enlarged hole. In many cases this problem was exacerbated by very heavy barnacle fouling of the Roto-tag, which adds to the force exerted by the tag on the attachment hole during swimming motion. The decision by NMFS to dicontinue suppling the Roto-tag was based in part on heavy barnacle fouling encountered in many applications (A. Woodhead, personal communication).

If there is no clear generally superior tag style for all applications (which we feel is the case), examination of tag loss rates becomes a crucial tool for all turtle tagging researchers in order to fine tune tag choice and tagging protocols for their particular situation.

ACKNOWLEDGMENTS

We would like to thank Robert Ernest and R. Erik Martin of Ecological Associates Inc., who founded and managed the sea turtle conservation program at the St. Lucie Plant from 1976 to 1994, and Florida Power and Light Company for their continuing support of the program.

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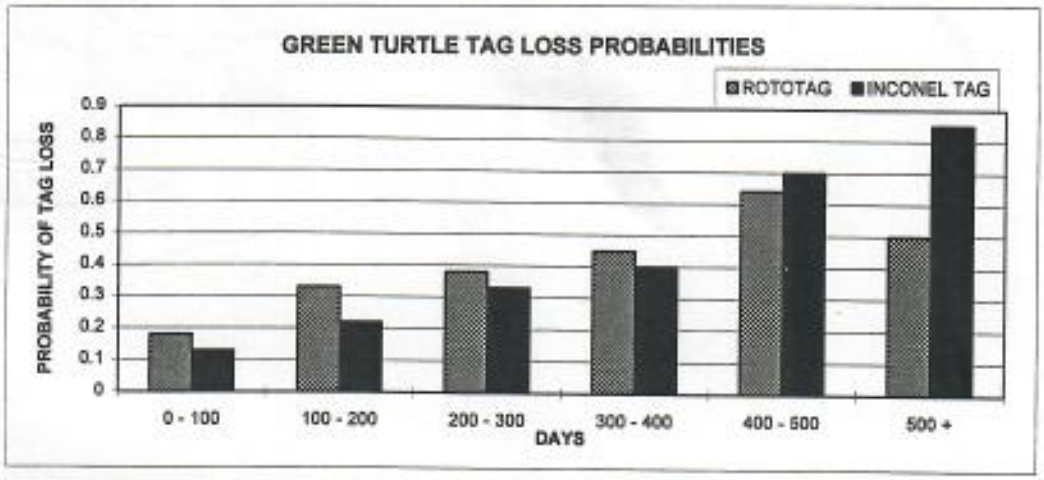


Figure 1. Comparison of probability of tag loss for green turtles tagged at the St. Lucie Power Plant from 1990 - 1996. (N = 786)

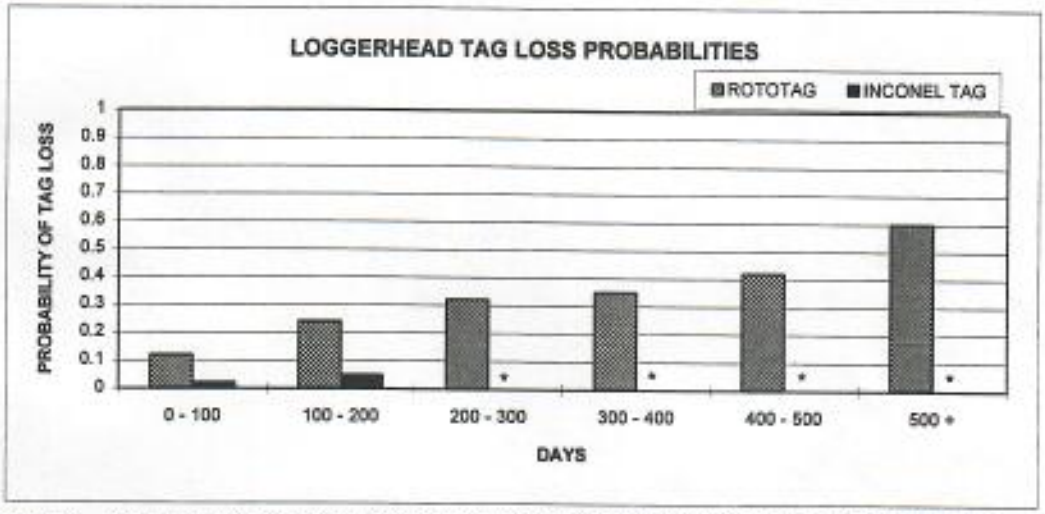


Figure 2. Comparison of probabilities of tag loss for loggerhead turtles tagged at the St. Lucie Power Plant 1990 - 1996 (N = 791)

* - insufficient data for analysis.

FAX

NATIONAL BAND and TAG CO.
721 York Street, P.O. Box 430
Newport, KY 41072-0430
(606) 261-2035
Fax (800) 261-TAGS (8247)

To: George Balazs Date: 3/12/97
Time:
From: Kevin Haas Page 1 of 1

George,

Sorry for the delay. Enclosed are the proposed instruction. Please Edit & Return for updating.

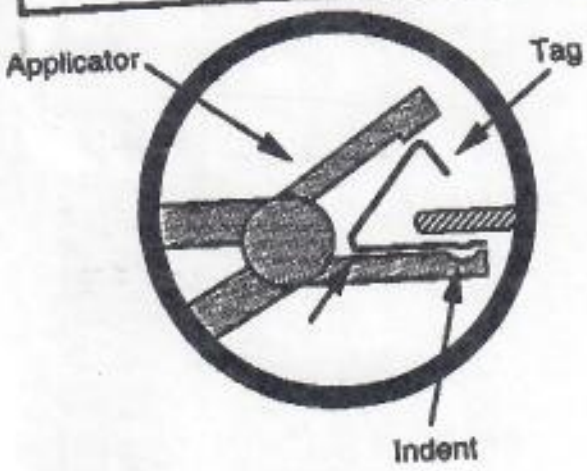
Also enclosed is the info on our 56 & 624 round post Self Piercing Tags.

Take care

Kevin

National Band & Tag Company
721 York St, P O Box 430, Newport, KY 41072-0430
Phone (606) 261-2035 Fax (800) 261-TAGS (8247)

Applicator Instructions - INCONEL



Standard Tagging Method

- Insert Tag into proper applicator. Make sure "bubble" side of tag is flat against the bottom jaw of the applicator, with the "bubble" located in the jaw indent.
- Place lower jaw of applicator parallel to tagging surface (ear, wing, flipper, etc.).

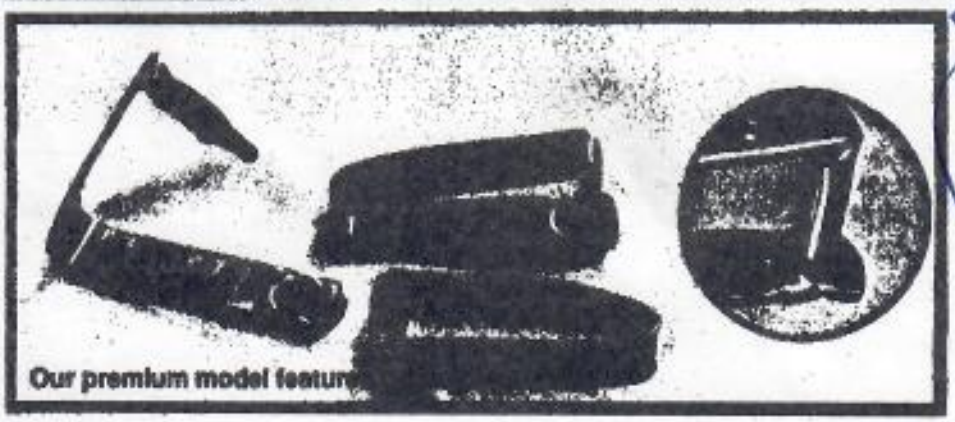
Alternate Tagging Method

- Insert Tag into applicator centering the end of the tag in the applicator as shown above.

Once tag is in place in applicator, squeeze handles enough to slightly close the tag to just before touching the skin. If the piercing spot is correct and the animal is is a non-moving state, then squeeze to pierce the point through the skin. After the skin has been pierced, continue with intense pressure to fully seal the tag.

National Band & Tag Company
721 York St, P O Box 430, Newport, KY 41072-0430
Phone (606) 261-2035 Fax (606) 261-TAGS (8247)

Specifications: Style 621 Bright Metal Ear Tag



We can use Monel

GENERAL - Tag must be applied in one operation with an applicator and must be in a one piece self-contained tag -- the point self-aligning and self-piercing. The inside tag dimensions must assure adequate space for ear growth and to permit proper healing of the incision. The inside area of the tag, when properly sealed, should be approximately 1/2" high at the point, 1-1/8" inside length, 5/16" at the elbow.

MATERIAL - The ear tag shall be made of an electro-plated nickle zinc alloy coated steel of sufficient thickness so the coating shall not not break or crack upon closure and provide a durable surface for long term protection. The width of the tag shall be approximately 3/8" and overall thickness of .042" minimum.

TAG EDGES - The edges shall not have excessive burr so as to prevent the cutting or chafing of fingers when placing tag in applicator and to prevent irritation in the ear.

STAMPING - Tags will be stamped with an alpha-numeric serial number. Characters must be 3/16" minimum in height and imprinted through the coating into the steel base.

TAG POINT AND POST - Arrow head style rounded/flattened post design. 3/16" at widest point, 9/16" to 5/8" from tip of point to top of post thereby assuring penetration of the animal's ear and proper locking.

SEALING UNIT - Must be a fully closed housing formed as an integral part of the tag, not a separate unit. It must have a strong bridge bar centered in the housing for proper seal.

PACKAGING - 25 tags packaged on carriers designed to assure holding tags in consecutive series during use and while in transit. Four carriers (100 tags) to a box; 10 boxes (1000 tags) to a shipping carton adequately marked as to contents.

APPLICATION - Tags are to be suitable for application with National's standard 56S applicator or 56CS compound applicator or equivalent.

What makes National's Livestock Tags the *SAME*?

- **National Band & Tag Company** is the *original inventor and manufacturer* of the Metal Livestock Tag styles 49, 56, 62, & 681.
- These styles have been the standard of the market for decades and *can be applied using any of the existing working applicators* in the field.
- These tags meet or exceed all Federal and State Specifications.

What makes National's Livestock Tags *DIFFERENT*?

CONSISTENT QUALITY & SERVICE

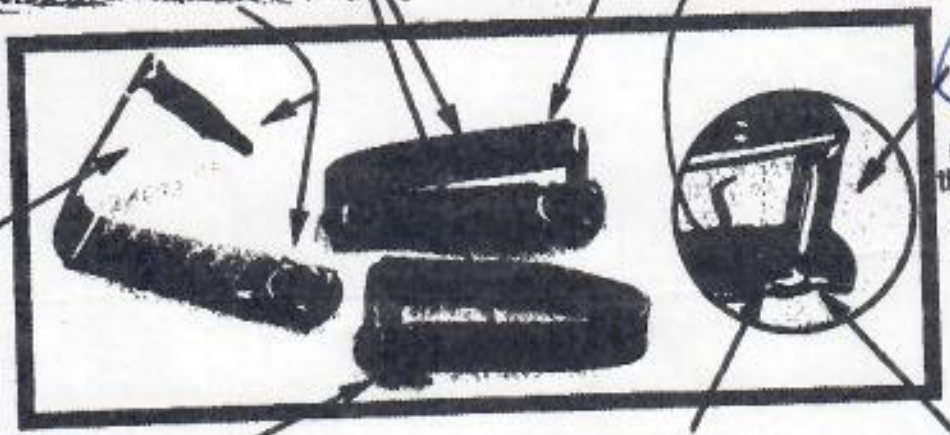
NEW! Smaller style 621 for calves, swine, sheep, etc.

Deep stamping & numbering are centered & highly visible even after years of abuse.

We use only the finest steel and coatings for long lasting color identification and corrosion resistance.

Consistent piercing points are accurately centered for a secure seal.

Adequate space for ear growth and healing.



Precision engineered angles hit their target every time.

A round post design provides higher retention rates as it allows the incision to heal properly without further irritation.

Closed bubble virtually eliminates malfunctioning tags.

Tips do not over-curl, which can cause irritation. (when sealed with proper applicator)

Strong bridge bar for a secure lock.

A-0198

TAGGING FOLDER

Return: 20 ANCUN = 15
RD, HAIZHU, GUANG = 15
ZHOU. THE P.R.C. = 16
Reserve Importante

Contact:
George H. Balazs
NMFS, Southwest Fisheries Science Center
Honolulu Laboratory
2570 Dole Street
Honolulu, Hawaii 96822-2396, USA
gbalazs@honlab.nmfs.hawaii.edu

Address
PRC609@HOTMAIL.COM
email

Address on tag:
Write HIMB
University
Hawaii 96744

Manufacturer: NBT (National Band and Tag Company)

Style & Material: 681 Inconel

Ocean Basin: Pacific

Tag Series:

2000 - 12000	U1 - U999	3A00 - 3A99
A1 - A999 N=24	V1 - V999	4A00 - 4A99
B1 - B999	W1 - W999	5A00 - 5A99
C1 - C999	X1 - X999	6A00 - 6A99
D1 - D999	Y1 - Y999	7A00 - 7A99
E1 - E999	Z1 - Z999	8A00 - 8A99
F1 - F999	1A - 999A	9A00 - 9A99
G1 - G999	1C - 999C	1B00 - 1B99
H1 - H999	1D - 999D	2B00 - 2B99
I1 - I999	1E - 999E	3B00 - 3B99
J1 - J999	1H - 999H	4B00 - 4B99
K1 - K999	1M - 999M	5B00 - 5B99
L1 - L999	1N - 999N	6B00 - 6B99
M1 - M999	1S - 999S	7B00 - 7B99
N1 - N999	1T - 999T	8B00 - 8B99
O		
P1 - P999	1X - 999X	9B00 - 9B99
Q1 - Q999	1Z - 999Z	1C00 - 1C99
R1 - R999	1A00 - 1A99	2C00 - 2C99
S1 - S999	2A00 - 2A99	

T-

3C00-3C99

4C00-4C99

5C00-5C99

6C00-6C99

7C00-7C99

8C00-8C99

9C00-9C99

1D00-1D99

2D00-2D99

3D00-3D99

4D00-4D99

5D00-5D99

6D00-6D99

7D00-7D99

8D00-8D99

9D00-9D99

1E00-1E99

2E00-2E99

3E00-3E99

4E00-4E99

SIZE 1 TAG LIST

Inscription on tag:
NOAA

Manufacturer: NBT (National Band and Tag Company)

Style & Material: 100S-1 Monel

Ocean Basin: Pacific

Tag Series:

WA01 - WA99	XT01 - XT99	ZS01 - ZS99
WB01 - WB99	YK01 - YK99	ZT01 - ZT99
WC01 - WC99	YL01 - YL99	WK01 - WK99
WD01 - WD99	YM01 - YM99	WL01 - WL99
WE01 - WE99	YN01 - YN99	WM01 - WM99
WF01 - WF99	YO01-YO99	WN01 - WN99
WG01 - WG99	YP01 - YP99	XU01 - XU99
WH01 - WH99	YQ01 -YQ99	XV01 - XV99
WI01 - WI99	YR01 -YR99	XW01 - XW99
WJ01 - WJ99	YS01 - YS99	XX01 - XX99
XK01 - XK99	YT01 -YT99	XY01 - XY99
XL01 - XL99	ZK01 - ZK99	XZ01 - XZ99
XM01 - XM99	ZL01 - ZL99	YU01 - YU99
XN01 - XN99	ZM01 - ZM99	YV01 - YV99
XO01 - XO99	ZN01 - ZN99	YW01 - YW99
XP01 - XP99	ZO01 - ZO99	YX01 - YX99
XQ01 - XQ99	ZP01 - ZP99	YY01 - YY99
XR01 - XR99	ZQ01 - ZQ99	YZ01 - YZ99
XS01 - XS99	ZR01 - ZR99	ZU01 - ZU99

ZV01 - ZV99

ZW01 - ZW99

ZX01 - ZX99

ZY01 - ZY99

ZZ01 - ZZ99