

FRENCH FRIGATE SHOALS
1980 EXPEDITION #4
RISK TRACKING AND TAGGING

6 JUNE - 10 JULY

G. H. BALAZS
(808) 395-6409

REHOTE - SAISING

BASKER TAGGING
P. 76

TAG RECOVERIES
P. 90

BALAZS

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KANEHOE, HAWAII 96744

"NO REEN"
clerk

OFFICE -
7-4:30 PM
Regular
Schedule
8:30 PM.

FWS KILAUEA - 828-1431

EMERGENCY - 828-1520 for FFS

PSD - ENTANGLED TURTLE - TRIG

Preexpedition notes Pages 1-30
Narrative . 6 JUNE - 1 JULY 1980 Pages 32-
BASKER TAGGINGS Pages 76-
BASKING TURTLE CENSUS Pages 82-
Turtle Tag RECOVERIES Pages 90-
CLIMATIC
TIDE CALENDARS Page 111
Juvenile Turtle taggings and recoveries . . . 35, Pages 106-109,
74-75
PIT COUNTS Page 100-101
TRANSMITTER LOG Page 87
East ISLAND Map Page 103
Whale-Skate Map Page 115
Number of females per night pages 104-105

COMPOSITION BOOK

9 3/4 IN. x 7 1/2 IN. (24.8 cm x 19 cm) 24-h continuous monitoring diving . . . P120

AVAILABLE AS:

- No. 09-9130 (1130) 60 SHEETS COLLEGE RULED & MARGIN
- No. 09-9132 (1130-P) 60 SHEETS COLLEGE RULED & MARGIN
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PHOTO LOG PAGE 118

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

Bob Justman - 523-1181

→ 88C 5H100 NMFS Green Turtle Account ¹

RADIO-TRACKING INVESTIGATIONS OF GREEN
TURTLES AT FRENCH FRIGATE SHOALS

INTERESTING BEHAVIOR OF GREEN TURTLES
AT FRENCH FRIGATE SHOALS

RADIO-TRACKING INVESTIGATIONS OF THE INTERESTING
BEHAVIOR OF GREEN TURTLES AT FRENCH FRIGATE SHOALS

RADIO-TRACKING INVESTIGATIONS OF GREEN TURTLES
AT THE BREEDING COLONY OF FRENCH FRIGATE SHOALS

RADIO-TRACKING INVESTIGATIONS OF THE
INTERESTING BEHAVIOR AND INITIAL OCEANIC
MIGRATIONS OF GREEN TURTLES AT
FRENCH FRIGATE SHOALS

* RADIO-TRACKING STUDIES OF THE INTERESTING
BEHAVIOR AND MIGRATORY DEPARTURE OF
GREEN TURTLES AT FRENCH FRIGATE SHOALS

("home" voyage)
"RETURN"

p123637 ¹Track(n) (3a) the course along which something moves;

²Track(vt) - (1a) to follow the tracks or traces of;
 (b) to observe or plot the moving path of (as a spacecraft or missile) instrumentally;

p953 radiotelemetry - n: telemetry; radiotelemetric - adj.

p1198 ¹telemeter(n) - 1: an instrument for measuring the distance of an object from an observer;
 2: an electrical apparatus for measuring a quantity (as pressure, speed, or temperature), transmitting the result esp. by radio to a distant station, and there indicating or recording the quantity measured.

²telemeter (vt) - to transmit (as the measurement of a quantity) by telemeter
 (vi) - to telemeter the measurement of a quantity.

p1247 triangulation - (n) (multiple bearing lines) the measurement of the elements necessary to determine the network ~~of~~ of triangles into which any part of the earth's surface is divided in surveying: broadly: any similar trigonometric operation for finding a position or location by means of bearings from two fixed points a known distance apart.

biotelemetry - "makes use of either radio waves or ultrasonic vibrations as carriers of information" - W.K. Legler 1979; transmission of physiological processes. "transmission of information"

transmitter serves as a beacon, - located by triangulation, or strength of signal. "beacon transmitter" temperature, heart rate, pH, electro-encephalogram, pressures and flow rates, magnetic heading, etc.

Biotelemetry studies of turtles ranging freely in their natural environment.

The strength of the signal is used as a cue. If the signal becomes stronger as the investigator moves, he is heading toward the animal. If the signal fades, the path needs correction. Use of this direction finder scheme can usually lead the investigator fairly directly to within a couple meters of the animal.

ultrasound - problems of vegetation, bottom topography and islands.

"... radiotelemetry system for tracking..."
tracking system

Summary of events relating to radio tracking of green turtles during the interesting interval (breeding season) (in the breeding habitat) at French Frigate Shoals -

- 16 JANUARY 1980 - Preliminary meeting with Shomura - NMFS Lab J - and Dizon
18 JANUARY 1980 - meeting with Helfrich & Shomura
21 JAN 1980 - FWS - FG - NMFS meeting - planning for fieldwork in NHI
16 Feb 1980 Meeting with Shomura (Saturday)

? date visited with Dizon, Jameson, Whittow at Kewalo lab - took adult female green carapace for trial transmitter attachment - saw "dummy" transmitter package.

5-6 March 1980 Trip to Tern Island, FFS with Dizon, Nitta and Johnsons. see FFS 1979, Book 2.

16 March 1980 ⁰⁸³⁰ Attached package to male tag NO. 2983 ^{at SEA LIFE PARK} 5 screws used. At 1830 transmitter had been pulled out - plastic still on by 3 screws on the left (p 48-49 daily log).
17 March 1980 0800. unscrewed plastic.

23 MARCH 1980 ⁰⁹⁰⁰ Reattached transmitter - now
 painted green - using #2 12mm wide
 thread surgical screws ^{in front, other style aft.}
 of Zimmer Company was present.
 1030 - look good.

24 March 1980 Monday - Cromwell departed Honolulu
 with some of our gear.

27 March 1980 - Still attached - turtle looks normal -
 but whip antennae is bent.
 Called Jameson AM & Dixon at home PM

1 April Talked to Jameson & Chris - transmitter on - OK
 2 April Talked to Dixon by phone - late afternoon -
 "buy supplies by petty cash"
 7 April (Monday) - visited SLP - unit OK

11 April (Friday) - meeting at Federal building FWS
 with V. Byrd, J. Ludwig - Bob Stallenberger
 left early for meeting with Coggeshall.
 Vernon wrote down dates from project -
 6-10 JUNE for 3 week - I can stay on for
 10-14 more days - list of personnel - take
 all food and gasoline - write short
 proposal to augment Triparty - (copy received)
 need - Cromwell Schedule.

18 APRIL
 FRIDAY

13-April Sunday - removed transmitter from turtle -
 plugged holes with bee's wax. screw shows no
 corrosion - front holes/screw are snug - off
 holes (shorter screws, different threads) slightly
 loose. Rust from rivets on plating - need to
 laminate with plastic; slight pink around exterior
 of front holes; Antenna is chewed - badly bent -
 Andy will check to see if it is shorted.

Will Whitlow do preliminary trials with temperature
 transmitters?

Need updated Cromwell schedule.

18 APRIL 1980 meeting with Andy and Bill Gilman's
 FRIDAY at NMFS lab -

Expenditures to date

- 1) Travel - \$40
- 2) Travel - \$1850.
- 3) Telonics \$6160
- 4) Honolulu Electronics \$197.
- 5) Surgical screws \$200

Projected - 1) Charters 2 x \$1700
 2) Food camping (#10 day) \$1600.
 3) Schulmeister \$50 - \$840-1000

Responsibilities -

- 1) Check w/FWS \$0.5 people (FWS)
- 2) Gear on Cromwell + 1-2 people
- 3) Gas - Gilman's
- 4) Beer - me
- 5) buy & pack - me
- 6) FWS proposal - me

21 April 1980 - Call from assistant of Al Katekarn (FG) about "permit" request for radio-tracking work. Asked where this would take place.

20 May
TUES.

20-22 May
Tues - Thurs

28 April 2 - #276 internal ^{body temperature} transmitters arrived, as per Andy Dixon.

23 May -

2 May "Section 7" meeting with Nitta, Naughton, Jamison, Dixon, Kramer, Whitlow. FWS caretakers are planning to count birds on all islands of FFS once every 8 days - Johnson study will not take place at FFS - "Research by Proxy." Parish group will fly out ~ 19 May and return 6 June on our plane - will pay 1/3 of charter. Nitta was concerned about what PDF and FG would say about granting research permit for work on islands - "why can't they do it too?" - ^{possible} answers: "Because ESA doesn't have provisions for such activities?" "Refuge is for research?" Receivers and scanner were demonstrated -

26 May mo

29 May /
Thursday

5 May 1980 Lunch with Whitlow and Dixon at Gateway cafeteria. Contact Mary Lynn about P.O. for food - other items
4 2 4 3x 2x 2i - Cromwell fry & freezer
To take on Justman's plane - 50 people (passengers) plus hand carry items.

20 May 1980 Transmitters arrived -
TUES.

Sears camping gear purchased -
Permit amendment arrived from Washington, D.C.

20-22 May 1980 Shopping at Sears, Safeway etc. for
Tues-Thu all food and camping gear -
expenditures as follows:

23 May - Load Cromwell: 59 cartons - 10 freezer, 4 refrigerator
 Yamashiro's 5/23 PO 115.15
 Gem 5/22 13.17
 Penney 41.58
 Safeway Kaneohe PO 918.78
 Woolworths 5/21 29.10
 Longs - Ala Moana 5/21 59.32
 Sears PO 139.91 (-20)
 " 88.44
 " 51.54
 " 104.18
 " 234.98

26 May Briefing Meeting at NMFS lab
MONDAY

29 May 1980 Trial with transmitters (2)
Thursday out receiver in Kaneohe Bay - set up
antennae by lighthouse or Coconut Is.
Directionality not that accurate -
trial up to 4.5-5 miles.

- NEEDS FOR INVESTIGATION -

- Wire for alternate means of attachment
- X New tents ^{Thermos?} (one for radio gear, one for sleeping)
- Marine epoxy or marine tex
- ? Portable depth sounder
- maps of FFS
- hand bearing compass ^{MINE?}
- X drill motor - bits - router point
- X binoculars
- X folding chairs - ~~hammocks~~ (Woodworths)
- Silastic or silicon seal (cover "stitch" of screws?)
- X depth gauges
- X electrical tie wraps
- freon or liquid nitrogen - anesthetic (Pizon's container)
- floating "boat" for transmitter
- X CB portables for back-up communication - ~~NICAD~~ Batteries
- X sleeping bags - air mattress (2 each)
- X cots (2), folding table (1)
- X Bug spray for chiggers
- X propane bottles
- X water containers
- Food for East Is. - C-rations? call Mrs. Godfrey
- X Canvas tarps
- Antiseptic salve for screws
- Leucite spray paint \$1.40 wholesale (2929 Koapaka)
- extra elements for antennae / or netting
- upright stand for antennae
- X black sack to slip over turtles head
- X flashlights and batteries (AA's & headlamps)

3 June - Departure of Cromwell

Transport of gear (?)

- x Food for Tern Island (?) Safeway
- Means of attachment to males (physically hold?)
- Measure 12mm (minus plastic?)
- Tattoo applicator and ink
- Benjamin air pistol and dye (McCully Bicycle)
- Tar to mask screw heads
- Zodiac and motor for backup
- x Turtle decoy
- x (AA) batteries - ALKALINE
- x CB antennae for my base station
- Boat equipment for (Tern Is due to BW accident?)
- x Alarm clock (Longs)
- x Small folding table
- x Water containers
- Canvas (canopy) Sears Catalog + Yamastikos
- Bright tape/packing tape
- Plastic bags (Safeway) Hopaco?
- Calipers
- C-rations
- Pliers
- Line - (McWayne?)
- Headlamp - McCully (Eveready); Charby's; Nanko
- Respray plastic buckets BALAZS
- x Single cell AA 'mouth hold' light
- Pots to boil water + other eating/cooking utensils
- Carry bag for toting gear

→ 80 - JJA - 00223

- Personal Gear -

- hat
- long sleeve shirt
- gloves
- PABA

NOTES -

Orientation - navigation

"telemeter magnetic heading and velocity"

"track-by telemetry of heading and velocity"

"track by triangulation"

Divers using snorkel and scuba gear -

Males, as well as females

green turtle - sooty tern relationship

Courtship, then mating, nest, then 10-15 day interval - see Baldys, Sept 1979. (during the interim)

"Gap in behavioral ecology of the green turtle"

∴ DETERMINE

- 1) where she goes feed, rest, etc.
- 2) what she does - feed, rest, etc.
- 3) character of short range guidance feats

Technique used to investigate:

- 1) optically (visually)
- 2) electronic (radio)
- 3) sonic

short-range tracking

Initial segment of the long-distance migration back to the resident foraging pasture.

post-nesting travel patterns - departure routes and courses

visual floats or balloons - light needed at night; long line to allow diving; tangle on coral; resistance - drag.

Sonic - must follow in boat (night problems) - lack of transmission when behind coral heads or islands. Problem of "chasing" turtle

FFS and surrounding waters as interesting habitat

Range 10-50 miles ::

Tracking during departure from shoals (post-feeding season) to determine:

- 1) exit routes from shoals;
- 2) time underwater while traveling
- 3) minimum speeds of travel
- 4) direction of feeding pasture, NW or SE
- 5) group travel
- 6) differences due to sex
- 7) daytime - nighttime incidence of travel
- 8) high seas (long distance migration) tracking for initial segment of voyage - provide information on mechanisms used for navigation
i.e. - heading
- 9) mortality

location - whereabouts & behavior
 "where and when"

attach in a nonrestrictive manner
 - does not adversely affect mortality rates
 - does not adversely affect reproductive success

Consider possible positive effect
 i.e. scare off sharks

physiological and behavioral aspects of
 animals in natural conditions.
 Behavior - what animal is doing.

Tortuguero - unobstructed by reefs and
 coral that can tangle float/boat lines

Meylan thesis - 5 points addressed in study

Knock off transmitters during nesting, or
 while under coral, or while copulating.

Attach as they lay, or while filling chamber

Meylan results -

- 1) hold course independent of current
- 2) maintain fixed positions off shore

possible insight into adult mortality

"reproductive ecology and behavior"

"^{define} boundaries of habitat"

"in copula"

Meylan period of contact: 26 tagged with float

<u>DAYS</u>	<u>NO. turtles</u>
1	9
2	5
3	4
4	1
5	1
6	1
8	1
9	1
10	1

By no means, were they tracked on consecutive days. Never tracked completely through the interesting interval.

heterogeneous behavior (some bask, some?) also, different behavior at different colonies would be expected.

Sea Grant Cruise schedule - Easy Rides

Canceled - 21 May for 21 days - FFS, Maro Reef

6 Sept for 24 days - Midway

1 Oct for 21 days - FFS, Maro

19 May 80 Arrive to FFS - justman's aircraft

6 June 80 Returned on our flight - will pay $\frac{1}{3}$ of charter
(Potenone?) on Cronwell

- OUTLINE -

A Proposal to conduct research in the Hawaiian
Islands National Wildlife Refuge
Submitted to the U.S. Fish & Wildlife Service

Balazs[†], Dizon, Whittow, Jemison
(Home-499-1212) (Affiliations) office-531-5613

Background and Justification

Specific objectives

Proposed Research (?)

Methods

Effects of Research Activities

Cost

Schedule

Reports - Publications (?)

References

Permits

(Need approval)

Sand samples for Mortimer -

"3 samples - from the surface, from one foot, and from three feet deep (or at whatever depth the eggs are incubated)... it would be best for the sample to comprise a mixture of several subsamples from different points on the beach. I would only need a total of about 400 - 500 grams for beach sample."

Need
Line

cabin tent
Kamr WAX seams

Sears) 677195 11 x 9' family tent
Hillary) X 77655 Canopy / tent fly 189.99
X 677194 8 x 10 #169.99

Canopy 12 x 12 cataly 677655 #65.

- X (4) 5gal collapsible jug 71416 5gal #4.99
- X (4) propane fuel 14.1oz 95491 #2.89
- X (1) Tent patch kit 678615 #4.99
- X (1) 20 quart compact cooler M71294 #16.99
- X (1) 12 quart " " M71296 13.99
- X (4) Travel Ice M1231 #2.99
- X (2) gallon jug M71284 #10.99
- X (1) small
- X (2) duffle shoulder bags

Sleeping bag 3 lbs
 X 33 x 75" Hollofil 808 \$39.99
 M70064 \$29.99 on sale

X (2) air mattress - \$15.99

X (10) 6 Volt Lantern M4634 \$3.39
 Heavy duty
 (spring top)

X (2) 6V screw M4705 \$6.39

DIEHARD

$\frac{10}{22} = 11$
 (35) 1.5V size AA (2) MY 4681 \$1.49

(19) X (6) 1.5V size C (2) MY 4683 \$1.79
 Safetyway

X (8) 1.5V size D (2) MY 4684 \$1.79

X (2) Sears lantern M4809 \$2.99

X (2) C-cell flashlights

X (2) replacement bulbs

Fluorescent lantern M4434 \$28.99

LONGS
 (2) Fluorescent
 #11.00

white buckets (takes 4 6V)

X Pacer
 64" Base Station Antenna 3847 \$39.95

Shovel

WD-40

X Velcro

PO# 80-JJA-00211

80-JJA-00210

80-JJA-00212

Honolulu Sporting
 Propane "Gasshopper stove"
 Freeze dried food
 Sears

Safeway

- Final Need List - Reimbursement money -

Cooking utensils

extra sun glasses -

hat

Leucite paint

Water containers

Stove for cooking

Canned tortillas

slippers

Paper - books - pens

Saimin

2 JUNE 1980 MONDAY

- final Briefing meeting - at NMFS lab

Disturbance - my permit

food for East

Rotation of personnel to East

Chart for each turtle

White Buckets

Kilauea Pt. - telephone No. 828-1431

EMERGENCY - 828-1520

FWS Justman charter - week of 23 June 1980

6 JUNE 1980

FRIDAY

~ 6:45 AM

Depart for FFS in Bob Justman's Beechcraft 18-
 personnel include Steve Kraemer, Al Jemison,
 G.C. Whitton, Andy Dixon - Chris J - copilot -
 Approximately 1140 lbs aboard -

Landed at Lihue for breakfast -
 departed Kauai ~ 9:15 AM - circled
 for a short time over Nihoa enroute.
 Noted blue tent - campsite of Shields
 Conant and associate - East Palm Valley (?) -
 a short up gulch away from the ocean.

Arrive at Tern ~ 11:30 AM - Jim Parrish and
 4 student helpers returned on aircraft -
 Sightings of turtles given to me
 from his log.

Beth has been studying sooty terns
 on Tern Island, + two other originally destined for W-S.
 Craig Harrison & Jerry Ludwig sailed on
East a few days ago when Cromwell
 arrived. Sue Schulmeister and Beth went
 to Disappearing to count seals (2 pups noted)
 - saw a basking turtle. Trips have
 been made to each island every
8 days to count seals for the
 Johnsons - birds are also counted
 (except at East where there are too many)
 and stomach samples collected.

6 June

FRIDAY

6 JUNE 1980
FRIDAY

NOTES: water in carburetor caused partial engine failure when justwan took off with Grigg-Naughton-Dollas.

John Ganning was on purse seines - saw green turtles caught in net and released alive - captured (made far out to sea). He believes that turtles were used for food when observers are not aboard. Large leatherback once caught, but released alive. TO his knowledge, turtles never drown in nets. During after noon, whitton and I unpacked all gear - other people put up tracking antennae with rotas.

The Behavior of Noddy and Sooty Terns
by John B. Watson (1908)
Papers from the Tortugas Laboratory
of the Carnegie Institution of Washington
Volume II - Washington, DC

The Biology of the Wideswallow or Sooty Tern
Sterna fuscata on Ascension Island
by N. P. Ashmole
The Ibis (Vol 103b, No 3, 1963)

7 JUNE 80

SATURDAY Awake ~ 6:45 AM - Packed some gear for Bob, Sue and John to drop off at East Island during their 8 day 0 seal-seabird survey. Assembled second receiver antenna and hoisted it on Tern beach. At ~ 1 PM we loaded 2nd Boston whaler with boxes of camping food, other gear and departed for East. Met Schulmeister by Round (mullet is mostly underwater). Arrive East ~ 1:45 AM - small grey reef sharks in area - island appears dry - very little vegetation - very little Tribulus. Along Sand Point, only observed two basking turtles. Anchored BW in regular site and transferred gear ashore. Noted large piece of trout(?) net at water's edge; very few tracks or disturbance to soil apparent. Sooty Terns almost totally absent. Albatross young are abundant. Andy started testing turtle transmitters in CB communication with Al at Tern. I proceeded to walk around island noting turtles, seals, pits, etc. Bulldozer is exposed quite a bit. Waves appear to have washed up along vegetation fringe of island during this past winter.

7 Jun
SATU

3135

3136

6/29/80
5/4
11 M
20

6/17

01 NOV 2002

7 June 1980

SATURDAY

Tag 1288 noted on Round Log. (but check for 1171 & 1172) (reported by Jim Koneif - see original data book)

At ~ 3 PM I noted a juvenile hauled out on the Sand Point - captured and found to have two tags - strong and vigorous during both captures

3135


CURVED LENGTH - 46.2 cm

3136

CURVED WIDTH - 41.6

Plastron - 36.5 (with tape)

Brown-gold color to carapace, with the following injuries -

in 3rd lateral left -  (hole partially healed)

scar

peeled away area

2-3rd lateral right

6/79 SL 44.1 cm

11 months

20 days

no change

Tags look fine - some algae (soft) growing on inside surfaces.

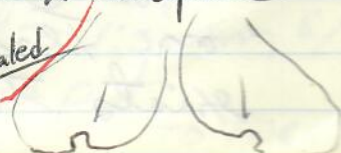
→ [ORIGINALLY tagged 6/17/79 - East Reef]

6/17/80 → came out to bask by BW mooring about 12 noon; at 12:20 I picked it up in view of approaching rain showers (that never hit). Measured with calipers

SL - 44.2 x 35.7

PL - 35.6

healed



NOTE - Tag 503 had circular injuries June 1979
Seal w/ pup on whale-skate

7 JUNE 1980

SATURDAY

note - Tug at Greek freighter site
was named "Mana" ^{According to Bob, dumping of clay started before program began suspended from/bnc.}
Returned to Tern ^{from East} 5 PM. ^{Left lone}
of the transmitters tied to ^{part} buried bulldozers. ^{- As a bearing calibration} Signal picked up fine at Tern, - particularly when Yagi antenna was rotated to horizontal position. Talked to Shieh Corant at 8:30 PM. Had tacos for dinner. Looked for turtles along north seawall - none observed. Counted pits along South beach - and watched Beth's bird observations. Chase patch with Fin.

8 Jun
Sunday

8 JUNE 1980

SUNDAY

Noted 3 new pits by water tanks on Tern.

Saw John M. Graving's print photo of 2 baskers on East taken in April. One turtle has two or more small pink tumors. Close-up photos. Bob indicated that basking turtles are more sensitive than seals. Sue described her 8 day seal counts for the Johnsons - mentioned that seal with molt was seen briefly on Tern, then departed. Possibility exists that molting seals move

Tagged
3510 ♂
361 ♂
450 ♀
on whale-sk

01 NOV 200

8 JUNE 1980

Sunday

between islet of FFS during the eight day period. Also, I saw ^{molting} SA hauled out at East 1/2 that was not there when Schulmeisters did their count a few hours earlier.

Andy and I departed for Trig-WS at ~5PM following "fork-chop" dinner. Motored to north shore of Trig - ~20 baskers noted; not many tracks ascending beach. Arrived at W-S ~5:45PM - Redwood fog is embedded in beach above tide - very little vegetation on island. Unload gear and walked to north & south ends of island counting basking turtles and pits noted at least two pairs of copulating turtles - mounted or had tag; ♀ had right front flipper 1/4 off and tattered. (BACKNOTE - Parrish orange buoy in the water to the SW of whale - skate).

Tagged

3510 ♂

361 ♂

450 ♀

on whale-skate

Tagging and tag recoveries were carried out on basking turtles - see log entries.

01 NOV 2002

Female hauled out for nesting at ~9:30 - dug at least 3 false pits - I tagged her (3569 RPE) at ~1:30 AM 6/9 - which slowly scratching 3rd pit.

TO PAGE 39

* → Strategy discussion 6/9/80 Monday
- 1 PM in "mess deck"

Objectives

- 1) position vs time tracking
- 2) surface intervals
(monitor for 24 or longer)
(one or more turtles)

6/9/
MondayTechnique/method
for objective 1)
Possibilities

- a) Monitor sequentially each turtle until triangulation position achieved (but with maximum time limits)
- AL b) Scan and eliminate frequently (turtle) as triangulation position achieved.
- c) Existing continuous scan (as now in progress)
- d) Two stations work independently - determine positions at later date
- e) Monitor sequentially for one hour each

Tagged
200 ♀
531 ♀
on TRIG

01 NOV 20

01 NOV

noted many ghost crabs on whole-skate³⁹
Both species, but primarily Levins, see Map.

6/9/80
Monday

At ~8 AM observed turtle
hauling out to back. A morning
inspection of ^{central} south Whole-Skate
indicated ~12 sets of wandering
tracks, but few if any pits or
"good" pits.

At ~9:30 AM departed for Tern
where we discussed tracking strategy.
Phone patch with mother and father at our home.

Departed from Tern for Trig (Andy &
Steve) about 4:15 PM -

Tagged
200 ♀
531 ♀
on TRIG

Selected basking female for transmitter
- at ~5:40 PM USFW 665^{0 FT}
3570, 3571 - Trans 6/192 PL-72.3cm
Block plosion - photos taken on roll two -
Turtle bit me on the forearm.

Proceeded to tag and read tags
on basking turtles along N shore of
Trig. Selected a female for transmitter
- 6/199¹⁴⁹⁽⁵³¹⁾ tagged her 3574, 3575 PL-67.3cm
released at 6:35 PM. Also turtle

01 NOV 2002

01 NOV 2002

3082, 3130 small female was turned
for measurements and released.
Counted pits (centered at north end)
and departed for W-S at 6:55 PM.

6/9/80

Monday

Arrived at W-S 7:10 PM - Moved gear ashore. I proceeded along the shore to count, tag and select remaining 3 basking turtles for transmitters. 15 turtles in "favored" segment, including copulating pair, partially locked, on shore. (photos) Noted that monk seal with pup had abandoned pup we recorded yesterday. See tables for basker taggings.

Tagged

491 ♀

541 ♂

511 ♂

W-S

6/10/80

Tuesday

Returned to Tern AM.

Departed for East ~ 4:15 PM with Steve & Andy. Choppy sea - slight SW swell.

Set up tent and antenna - organized all gear. At 7 PM I walked to other end of island, and around, to count baskers.

Note - Turtles' nest easier with out nesting seabirds - Almost no sootys on East. Also, seals & seals with pups now crawl right into the center of the island. Intermittent disturbance of monk seals by birds, on a yearly basis (possible factor).

At ~ 10:15 I went around island to survey nesting turtle situation. Positions were not being determined due to absence of a calibration transmitter on Whale Skate. Such units on Tern and East are not useful due

6/11/80

Wednesday

to spill-over of frequency.

6/11/80 Wednesday Rain squall during the night - Andy moved into the tent. (UP ~ 7:15 AM) - Antenna was bent during the night, presumably by shearwaters - three cross sections bent. Departed for Whale-Skate about 8:45 AM ^{with Andy} - placed transmitter 551 frequency on log at 9:15 AM. Steve stayed at East site.

Arrived at Tern ~ 10 AM. Worked on outboard motor plugs and filtration; Bob loaned us his Midland (Sears) CB unit. Fashioned "tiller" for East Island antennae.

Depart from Tern for East ~ 2 PM - looked for turtles with transmitters to the west of Whale-Skate - none seen. At East, Steve and I took down the antennae to straighten cross pieces and tie on streamers. Processor of Telonics does not appear to be properly working.

Notes on radio tracking:

- 1) Transmitters are staying on turtles
- 2) Antennae are coming out of the water long enough to get positions (behavior)
- 3) Surface intervals have be documented (but not time spent at surface.)
- 4) Turtles are still in the area

11 JUNE 1980

Wednesday of French Frigate Shoals (island of attachment)

After attaching transmitters - Afternoon of 6/11 -
initiated "block" of 8 positions determined at 6 hour periods - 3 and 9

Questions: Comments:

- 1.) None of the turtles have returned to bask (day or night)
- 2.) None of the females have rested or hauled out to rest.
- 3.) None of the males have apparently been copulating (signal may be difficult to distinguish)
- 4.) Changes in behavior - movement as moon becomes fuller ^{moon} & tides differ?
- 5.) Do not continuously remain at the surface.

12 June 1980

Thursday during AM hours - Monitoring of positions, once every 6 hours (3 and 6 o'clock) is underway. Shifts at Tern are 4 hours on, 12 hours off. Gusty, strong trades are up. At ~ 8 AM, 1-2 basking turtles came out on Sand Point - As of 1:36 PM, 1-4 have been there.

Example - At 4:50 AM, Causey and I positioned frequency 361 at 87° and 352° .

At ~ 11:04 AM Frequency 200 started "coming out" for several minutes (up to ~ 7 minutes)
At ~ 11:30 it was positioned on Whale Skate ~ 84° and 342° and temperature went up to ~ 29°C .

12 June
Thursday

12 June 1980

Thursday Afternoon discussion with Andy concerning
 "ability of electronics" and enactment of
 "10 minute check and recording of turtles
 on the surface and their period".
 Resistance to doing more than one position-
 block every 6 hours due to possibility
 of confusing key punch operators.
 could 10 minute check will provide:

- 1) spot check (sample) of presence at
 the surface
- 2) period-temperature (if there is time to beam?)
 as opposed to scanner that delivers
 "presence at surface" information every
 8 seconds (is it basking, resting or
 at surface for a short time).

Alternate data gathering procedures:

- 1.) Step up 6-hour "block positions"
 to 4 hours - or 5 hours
- 2.) "Modulate" block of positions so
 they don't always start at 3 & 6
they seem to
 average
- 3.) Use remainder of 6 hours, after
 achieving block of positions, to scan
 and continuously monitor a particular
 turtle (different turtles for different
 people)

Results - detailed surfacing record for
 individual turtles - coupled with
 positions for 6 hour block.

6/13/80 Tag remaining on side of Round Log - 1288.
One missing from each end.

13 June 1980

~ 1:30 AM See indicated that only ~ 4 turtles had been heard surfacing once in the last hour - using 10 minute checks - Scan showed only a few others.

Does 10 minute check show length of time at surface?

How much harder would it be to record all surface emergences - (signal transmissions) at night? day?

Slept till ~ 11 AM. Windy, choppy day.

another

Call made to Arizona at ~ noon; leads on antennae shortened

Question - Why don't seabirds, particularly boobies, injure each other's eyes with their bills?

Note - This radio-tracking gear is made for land animals where you have lots of time to take a fix. We are fortunate that antennae are, for the most part, comes above water enough for transmissions. On other population - geographical locations, it may not work - (although note that Baldwin got some readings).

AM St. Helen's erupted again.

13 June
Friday

14 June
Saturday

13 June 1980 Steve observed Gekko in the door of
 Emmett's poem. Sue also mentioned seeing
 Gekkos at this location. Many cockroach eggs
 noted.

14 June Calmer in the morning, but wind came up
 strong more from the NE during the afternoon.
 Got up at 9 AM to follow pattern of
 transmitter 491 which appears to have
 nested on W-S last night - out from ~ 10 PM
 until 5:50 AM. Followed until ~ 8 PM
 that evening. Hard short rain shortly
 after dark. Turtle male 511 was last
 heard from at ~ 10 AM.

→ Consider construction of apparatus to measure
 "thickness" of turtles from margins or
 ground up.

Have noted many times that seal w/pup
 intentionally goes some place to harass
 another seal, people, etc.

Need to write short article on erosion of
East beach since 1946 - photos before
 and after ^{include} exposure of wire,
 Emmett/Finch documentations, ramifications
 for birds at turtles (seals?).

— Seal survey for molts will continue every eight
 days until October (or?).

NOTE:

I know the turtles behavior from this extensive field experience —

Noted Frigates soaring at night - very thin ^{moon} ~~with~~ early in evening only. How much flying takes place at bright moon.

16 Jun
Monday

15 June 1980 Father's Day

Sunday 2PM Phone patch with Jim from East Island using CB and crystal control at Kilauea Pt and Tern Island.

Need to break up slab ^{on East} and haul off to increase area for nesting to take place. June is a cooler month - (better suited for nesting than the less windy, hot month of August and September. The best of August and September are well suited for the incubation of eggs.

At ~5:45 noted early-weaned (abandoned?) pup, thin with left eye milky and red - apparently no vision. Took down antennae to straighten a few cross elements. Put heavy tarp across back of tent.

check with
Bill
Cooke

How do the two species of barnacles remain alive out of water during nesting and basking?

Males ^{in the populations} serve as a source of larvae?
~~call beardley~~ consider possibility of rats - byss - flies ashore

Kaimi F/V arrived at FFS about 11 AM - delivered supplies and moored off the west end of Tern ^{James} - Cook.
Report that boat will stop at Nihoa to repair windshield.

Note discrepancy of Beth's Hawaii State seabird permit for FFS. I found 361.

Do ~~it~~ ever
get retrieved?

Deep body transmitters have been taken from ~~birds~~ and placed in albatross. 6/17 came out of 66 albatross

17 Jun
Tuesday

Possible growing
on

in posting. Booby transmitter stopped working - 5 attempts
with water flush did not result in retrieval. 47

16 June 1980 Monday Departed for Tern about 11:15 AM after turning down offer by Kaiimi to be picked up. Kaiimi is waiting for weather to calm down at Brooks Banks so it can proceed with the State FG \$15,000 fishery charter.

Collected intestines that were wrapped around anchor line - possibly monk seal pup. - however juvenile turtles have been seen in recent days feeding on East Reef. At Tern I had split pea and ham soup, washed clothes, recharged battery. Steve took a photo of the Kaiimi. Read my mail. Returned to East about 5:30 PM with Al Jemison. Tied off the turtle decay about 20' behind anchored Boston whales. Turtle 200 appears on Tern to nest ~ 9 PM. Slept from 6:30-9 & 9:30-10:30.

Many "castings" have appeared on East in recent days, apparently from black-footed albatross.

17 June 80 Tuesday Strong gusty wind - black-footed albatross are starting to fly out over the ocean - some leaving?

Noted dried *Turbinaria* along the NE beach of East Island. Also, that central portion of island is "dished" (lower) due to sand-bubble build-up along the shoreline. Toys have been found on nearly all islands - push to pop up rings etc. in liquid medium.

Frequency 200 came out again to nest on Tern Island - eggs were deposited in

Possible growing on intertidal reef near Area 9

about 15 minutes according to Beth & John (60-80 egg possibly). On the evening of 6/16 Monday 200 hauled out in front of quarters - dug at several sites along the Tern beach. On the morning of 6/17 Tuesday she was found in the middle of the runway - guided back to the water. Transmitter looks fine - star is still on screw heads according to Andy.

18 June 1980
Wednesday

18 June 80 ^{120z} leucite spray paint (Wrought Iron White ^{4T-37F-1175}) does not appear to be lasting as well as stock purchased 2-3 years ago (^{12340z} 4T-37A-0173). Note that seabird "footprints" are present all over the island.

N=10
Ranges =

~ 130PM Schulmeisters & Beth & John stopped at East on their way from Gins on to W-5 Trig & Shark (Seal survey). Departed after about 45 minutes - Kaimi had towed them to off of Gins - Kaimi then departed for Brooks Banks.

Note that turtle pits from Day 1 of this study visit are now "aged" prematurely - look older than they really are - apparently (due to the wind). Humus tossed on the surface blows away quickly, leaving only the whiter calcareous "ships" & shell fragments.

19 JUNE 80
Thursday

18 June 1980
Wednesday Measurements of relatively fresh albatross castings
observed on East - probably most from black-footed albatross.

1. 17.5 x 4.5 x 3 cm

2. 13 x 5 x 3.5

3. 18 4.5 4

4. 12 5 3

5. 14 5 4.5

6. 14.5 4 3

7. 15 5.5 4

8. 13.5 5 2.5

9. 15 4 3.5

10. 15.5 4 3.5

$N=10$ $\bar{X} = 14.8 \text{ cm}$ 4.65 cm 3.45 cm

Ranges = 12-18 cm 4-5.5 cm 2.5-4.5 cm

Causesy reports that Kaimi returned this afternoon - only caught one fish - now tied up again at the end of Tern Island - consider use of facilities & discharge of sewage.

Monk seal(s) use this end of the island. Weather may very well be the factor that keeps fishing boats out of this area - or keeps them visiting FFS for calmer water!

Causesy reports that turtle was nesting 6/18 AM in front of old FWS quarters. - Flash photo taken - may have helped scare it away.

19 JUNE 80

Thursday

Departed for Tern with Al about 10:30 AM
- Decoy was turned upside down - waves?

19 June 1980 Thursday At Tern I observed the tracks,
diggings and egg site (in front of loan
building) of 200. Track went out onto
runway in front of SP building to the east.
A large circle was made (orientation?)
on the beach I noted black and white
piece of boat bulwark with

HA 829(1) or (7) only number possible, according
to State Boating, was a
Zodiac

Phone patch with Jim ~ 12:30 PM.

Boarded Kaimi for a short visit - Lower
Brook Banks is only ~ 26 miles from FFS.

Due to strong winds, he is reluctant to
fish there under his state contract -
made calls to Swerdlow. Later in the
day Kaimi went out by Shark Island -
to fish (?). Reported seeing one seal
on Shark - ~ 2 - 24" turtles on the way
out. Returned to Tern anchorage after
a few hours.

Returned to East via Trig where John
and Bob were banding seabirds and collecting
stomach samples. ~~They~~ had found a turtle
~ 25 yards inland with ~~stair~~ net wrapped
around her neck - some scabbing and
depression on dorsal areas - but not severe.
Photo taken - turtle carried/dropped to the
water where it laid at water's edge
for a short period then slowly swam
off. Knife mark made in left lateral.
Estimate size - ~ 37-38"

* - 8/11/80 - Tom H. A. of NMFS reports that basically
there are only two types of nets - TRAWL & GILF -
He speculated that this is some sort of TRAWL NET.

Not tagged - forget tags

20 June
Friday

21 June
Saturday

20 June 1980

Friday

Slept until ~ 10:30 AM. Andy set up canvas as an awning in front of tent. During the evening I noted several pups in the water close to shore. Shearwater eggs have started to appear ~~at~~ on the surface - many birds present at night. Guardian.

21 June 80

Saturday

Returned to Tern ~ 11:30 AM after motoring to reef area off South Whale-Skate where males 351 & 361 have been positioned. Approached barrier reef - water very clear - surf on reef low. No turtles seen. Suggested possibility of constructing a tracking station on (tunnel over barge-ramp at Whale-Skate.

8 AM initiated mid-study continuous scan surfacing intervals for 24 hours.

Tried calling Fin bat 3P & 4:15 PM - no answer - left message with Christie w/ftel

Confusion exists due to not recording times of turtles out (transmitter up) if ~~long~~ shorter than 5 minutes. Initial 24 hour did not record times shorter than 2 minutes.

Returned to East ~ 5 PM with Bob Schulmeister. Brought back bolt cutters to sever cable

21 June 1980 loops in area 8 and at other locations on
 Saturday East.

- note - that Beth showed me regurgitations from Frigate birds that consisted of sooty tern young. Could hatchlings be digested and discarded in a similar manner?
 - Possibility that Craig Harrison samples shearwater stomach contents by direct take (10 per month quota?).

22 June At ~ 12 PM, Bob and I noted a turtle (adult?)
 Sunday with frayed, apparently recently amputated, front flipper in shallow water near boat.

From Tern Island, Al reported that turtles exhibited short dive intervals today, particularly females 531, 200 & male 541. Also during night and early ^{6/22} AM turtles appear to be surfacing more in comparison with other nights. (Effect of Moon Stage?)

24 hour continuous interval recording concluded at
 8 AM 6/22. Sue's watch - only record over 5 minutes; ^{- no one typed her different}
 Steve's watch - only record over 2 minutes; Causey's
 watch - only record over 2 minutes.

Noted "fringing" reef area around SEP basking zone on East Island. This appears to represent a "sheltered" area - except note that sharks are schooling slightly

22 June
 Sunday

23 June
 Monday

repeat

Report from Laysan this evening that they have seen an old FWS tag on a turtle - will try to read it when it nests. 53

22 June 80 to the west - Schooling sharks seem to
Sunday be grouped by size. Larger ones occur
by SEP - smaller ones by East
Reef.

Repeat
At about 10:30 PM, Bob and I noted
a small adult swimming slowly by
boat mooring - shined flashlight
and observed what appeared to be a
missing right front flipper - white end
with small trailing pieces of flesh.

23 June 80 Departed East at ~ 11 PM for seal survey
Monday at Gin Islands. Motored along SNEP and
reef projection. Arrived at little Gin and
walked around island with Bob Schulmeister.
Took photos of masked Boobie and young with
Ja Perouse in the background. Found note
with Japanese (?) writing in ~~the~~ Coke bottle on
Gin Island. Observed ~ 40 adult
boobies - ~ 15 large fuzzy young.

Gin Island appears to have been reduced
considerably since last year - landing
was made at SW tip where Dave
Olsen first showed me in 1973.

Departed from Gin and proceeded to
Ja Perouse Pinnacle where we saw
and photographed two juvenile seals in the
water and one hauled out on a rock
ledge. Also noted many Fairy Terns
in SW cliff (these birds are ^{relatively} scarce on

23 June 80

Monday

Tern Island this year. Also noted a Blue-Gray Noddy. Only saw a ~~few~~ ^{for 500} opihis (removals made by Ralston ^{and} Easy Riders in recent months). Noted Jimu Kohn and Turbinaria.

Proceeded to Tern where I made a phone patch to Fin.

Departed Tern ~ 5:30 PM by myself and proceeded to Trig to look for 2008 491 that were recently basking. Neither turtles were seen. Tagged (and ~~removed~~) a basking male. Motored by west whale-skate but did not see any foraging juveniles. Arrived at East ~ 6:30 PM.

According to Bob Schulmeister, the "coral head" or reef area where turtles were seen from airplane in April is located to the north of a ^{seasonal} small sand islet near Trig.

Frigate birds roosted periodically on the antenna during the night. Consider bright moonlight night for predation by frigatebirds on hatchlings (?). Also, predation by reef fish - Hawaiian collection of hatchlings on moonlight nights.

24 June 80

Tuesday

Bob, Sue, John, Steve, Andy and Beth motored to La Perouse today. How far does an Endangered Species or MMPA permit extend in authorizing other people to do work?

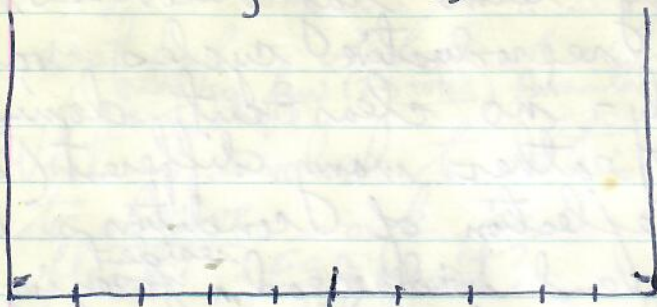
wind-up toy hatchling
for field trial

25 June
Wednesday

6/24 PM

*

Interesting intervals



Light winds during recent days prevent fledging albatrosses from flying and leaving island - heat induces stress - Overall effect should be lower survival rate.

Cycles of small grats and large "house" flies (But not green) have taken place on East - the larger flies have been seen on the wounds of monk seals.

Nesting Sooty Terns may constitute a disturbing factor to Monk seals with pups.

25 June 80 Read adult masked Boobie band -
Wednesday roosting on bronze machinery - A 8

568-71220 (Also, found used band -757-3678
see page 119 for Recovery Data Card 7)

6/24 PM 6/25 - 3/4 (three quarters) Moon present from sunset onward.

By 0355 6/25 it is low and yellow slightly to the right of La Perouse - significantly reduced illumination on East. Moon set ~0710-0715 AM.

* Increased activity (surfac^{RESPIRATION}) levels with bright moon? Decreased with setting moon?

George Huxley's
log's article

25 June 1980 ^{see} Wednesday Long-term tag recoveries ^{may} suggest that reproductive cycles vary greatly - no clear-cut dominant cycle, but rather many different (2 to?) as a reflection of conditions on the numerous land widespread ^{resident} foraging pastures of the Hawaiian Archipelago. Possibly different situation for males: Less energy required for reproductive event.

25 JUNE
Wednesday

Consider differences in swimming patterns - breathing behavior due possibly to large extended tail.

Copulation injuries - scabs seen on nearly, if not, all nesting turtles. However, this lesion is small - absolutely nothing like the abraded holes seen on females at Marmata Bay, Mexico (see photos).

See TC 2 record - note that second egg laying appeared to be far faster than the first observed event. Are fewer "false" pits dug on subsequent nestings?

→ Compile information sheet on remigrations that give - 1) nesters tagged on East recovered on W-S
2) nesters & baskers tagged on W-S recovered on East

est 25 June 80 Wednesday At 12:30pm I noted a juvenile turtle near East Reef - school of sharks in adjacent waters. ^{only a few (2-3 total) juveniles have been seen this season anywhere.}

(What is involved to obtain a MMPA permit to observe monk seals? Dye them with bleach? ESA permit?

Management Actions: 1.) Clean up debris and remove concrete slab 2.) Halt erosion of East 3.) reassess predation, and possibly control ghost crabs 4.) Remove "narrowed" roosting sites for Frigates on East

At SEP (12:30pm) I observed a mother with pup swimming along the outside of the fringing reef. Uya (seen close to shore - SEP + shells) on hot days, one would expect more up-down baskings. According to GCW assessment, turtles appear to bask in spite of heat.

At ~ 1:15 PM I proceeded to whale-skate. Towed turtle decoy for a short time, but no interest was displayed by gray reef sharks. At W-S I observed two pairs of copulating turtles - only two baskers but - no opportunities for tagging. No transmitter turtles observed. Returned to East for 3 PM positions. Noted lots of Masked Boobies with young at Skate end of W-S.

26 June 1980

Thursday

note - that nesting turtles seem to be far more subject to fight during periods of brighter moon - can see more easies.

26 June 8
Thursday

At 11:30 PM departed for W-S via Bare, to meet other Baton whales with Bob, Andy, Steve & John to attempt tracking with receiver and hand-held antennae. CB contact with Al at Tern was maintained. Turtle 200 (and 531 & 361) was received and indicated to be in the direction of Trig. Proceeded to Trig area, but after a number of attempts, visual contact was not established. Problems included 1) no directionality ($\pm 90^\circ$ + reception) 2) differentiating increasing signal strength due to antenna coming up and down out of water, and true signal strength direction. Several sharks (individuals) came to boat just about each time we stopped.

27 June 8
Friday

Bob and I motored to submerged area of small islet to the NW of Trig. The group of turtles observed from Justman's airplane were located on one of the coral head areas immediately to the East of islet.

Males will be motivated to stay in shoals as long as copulation is possible?

At Tern Island we ate Pizza and had a birthday cake for Steve in the shape of 200. Saw "least" Tern trying to feed young fairy tern.

26 June 80 on the return trip to East I stopped off
Thursday at Trig and tagged two basking turtles -
noted by west Whale-Skate.

27 June 80 (Full Moon night) Departed for Tern ~ 130PM -
Friday to call Jim as promised; also tent too hot;
Took along pop-tent plus some of other
unneeded camping gear in preparation for
scheduled departure on 1 July 1980. Anchored
off beach right near fuel tanks.

Departed Tern ~ 3:45PM for Trig -
in calm, almost glassy, water off the north
shore of Trig I saw two of the transmitter
turtles - (transmitter and antenna standing
high out of the water. Antennae had slight
curve but about the same as when placed
on the turtles. CB contact with Al identified
the turtles as 450♀ and 200♀. I
let the ^{boat} drift in area for about 30 minutes -
slight current moved me toward the north - outer
reef. Noted that Turbinaria ^{also some green supercilifera} covered
large areas of the reef flap. Also
saw ~ 5' gray reef shark swim around
boat - also saw one in shallow water
near shoreline of Trig. Encountered ^{adult} monk
seal - both seemed to exhibit flight.
Motor to west Whale-Skate where
I also found that Turbinaria covered

27 June 80 some of the coral heads. Also found
~~some~~ some thick patches of Laurencia.
 Friday Anchored toward the NW end of W-5
 (skate end) and went ashore to look
 for transmitter, turtles and baskets.
 Only one basket found - tagged 367ORFL
 she had several large tumors. Back
 side of W-5 is very calm - lots of
 debris floating near-shore. Seals have
 their heads in the water trying to keep cool.
 Returned to East - 6PM.

28 June
 Saturday

29 June
 Sunday

28 June 80

SATURDAY

Consider effects of hot, dry weather over
 the past 6 days on the incubation of
 turtle eggs.

At 6PM a male adult was found washing in the
 surf close to shore in area 12. Front
 right flipper severed and ragged, and cut present
 tail. This is presumably the same
 turtle seen by me and Bob on 22 June at 10:30
 near the boat anchorage.

Kaimi reported to have dropped off some fish
 for Tern Island during the afternoon hours.
 Another Gekko was seen in Emmett's box -

28 June 80 this totals 4-5 different animals.
Saturday

29 June 80 At ~ 10:30 AM I retrieved the dead male
Sunday in area 12 using the Boston whaler.
Transported the turtle to Tern where we
wrapped it in plastic bags and placed it
in the freezer. Estimated weight - 200 lbs.
Spent the day at Tern - fried chicken for
lunch. Also recorded the following
references:

Feare, C.J. ^{Got} Desertion and abnormal
development in a colony of Sooty
Terns infested by virus-infested
ticks. Ibis 118.

Wilson, Nixon. 1964. Isodes
Javanensis, a new species of
^{Got} tick from birds on Javan Island
J. Med. Ent. Vol 1, No 2, 165-168.
(1 July 1964)

Beth Flint
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29 JUNE 1980 Returned to East via Trig and
 Sunday Whale-Skate (see data tables).

30 JUNE Monday Made several last positions with Causey
 between 9 - 9:30 AM. - 10:15 AM Andy and

Steve arrived in other Boston whales to
 disassemble campsite. They departed
 with some gear at ~ 11 AM. I walked
 to SEP where I turned and tagged a
 male basker. Departed for Tern ~ 11:45 AM.

At Tern I cleared and packed/stored
 all camping gear. In late afternoon I
 motor to the north shore of Trig - then
 landed on W-S to count seals, tag
 baskers. Observed 351 basking on
 beach - noted bent antenna - photos.

Also photos of three pups with mother seal.
 During the evening we had steak
 dinner and rum punch. I listened
 to Omni and detected eight spill-overs
 from 200 - continuous transmissions.

Walked down Tern beach with Andy
 and hand-held antenna. Found
 200 digging on beach; returned with camera
 and screw drivers 15 minutes later -
 200 had moved a few meters and digging
 again - a few rain showers, but
 sand is dry and slipping -

Removed transmitter (lost one screw

FEARING
 2038

30 JUNE 80
 MONDAY

July 80
 TUESDAY

NOTE: STARTING JULY 1, 1980, SUB WILL
 "CHECK IN" Turtles ONCE DAILY BY TURNING THE RADIO
 ON FOR ONE HOUR - NOTE THAT DETECTION OF CONTINUOUS
 SIGNALS IS NOT POSSIBLE DURING OTHER TIMES.

30 JUNE 80

MONDAY

in the sand). The next day I noted that two more sets of "up" tracks were made in this general area. Probably from 200. One set went right near previous nest of 200. Shields had ^{trouble getting} authorization to collect bugs and weeds from Nihoa.

1 July 80

TUESDAY

Justin's plane arrived ~ 11:30 AM with John Andre and Ruth Ittner aboard. ^{+ FWS gear} Departed Tern ~ 2:15 - some rain showers over Shoals - but we flew out to East where I took photos. Laid at fibue to offload John Graming where he will spend three weeks at Kilauea before returning to Tern (~ July 23rd).

Arrived (at) Honolulu ~ 6:25 PM. Randy of NMFS picked us up in van and dropped me off at Kewalo Basin. Al Jewison mentioned buying air conditioners on at Tern - Bob knew about it.

BACKNOTES: Lots of coral chunks packed up along areas 10-11-12 - tracks-emergences suggest that turtles ^(can't) won't crawl over this material. Also, noted once again that W-S has coarse chunks in substrate more difficult nesting than on other islands.

Frigates roost on stakes along intertidal of East Is. - area where hatchlings pass through.

NOTE: STARTING JULY 1, 1980, SHE WILL "CHECK IN" TURTLES ONCE DAILY BY TUNING THE RADIO ON FOR ONE HOUR - NOTE THAT DETECTION OF CONTINUOUS SIGNALS IS NOT POSSIBLE DURING OTHER TIMES.



15 JUNE 1980 SUNDAY
~2PM
Phone patch from "East Is. to Hawaii"

[Bahia de Lahuels - Mexico?
location?]

Question: As season progresses, do some of the turtles nesting on W-S move down to East, due possibly to "better" nesting substrate?

BACKNOTE: on use of Turtle Decoy trial -

For approximately 6 days and nights (or longer) during the second half of the expedition, I tethered the wooden decoy (black dorsal, yellow ventral) to the Boston Whaler at anchor by East Island. No interest by turtles was observed, however only one or two turtles were ever seen passing this area. Several were observed swimming by on a few occasions, but only mild, short term interest displayed. On two occasions I tried towing the decoy to elicit interest by turtles or shark. Decoy "fished-tailed" and "dove", but no response obtained.

11 July - 1980
Friday Telephone call from John Gorman (visiting Honolulu) indicating that the day after we left FFS a seal survey revealed a weaned pup at Round Is. tangled in netting - photos taken and cut loose. As of 15 days ago, the remaining ^{transmitters} turtles were still in Shoals.

17 JULY 1980 Telephone call to Bob and Sue ^{VIA KAWAI}
 Wednesday ^{Dave Boynton} revealed that turtles are being "checked
 in" every night between 9:30-10:30.

All 5 turtles are still being heard.
 Turtles 491, 450 & 531 are being
 to have been recorded nesting - pulse
 for temperatures are being taken - also
 transmitter on W-5. Turtle 531
 seem to have been out almost every
 other night. Turtles 351 & 541 (both
 males) sometimes have ^{alternating} weak and strong
 signals. No transmitter turtles
 have been seen during visits to other
 islands. ON 14 July turtle 3570, 3571
 nested on Tern between 9:30^{PM} - 12:30 AM -
 photos were taken - This is FREQ 200.
 Cromwell will arrive at FFS 20 July -
 Schulmeisters will depart 22 July on aircraft.
 Bob mentioned tidal wave alert - quake
 occurred in New Hebrides.

21 JULY 80 Call to Bob via John Grayning in Kawai -
 Monday All 5 turtles still being heard - on 14 July
 a special point was made to see "screw holes"
 in Freq. 200 - none seen. Photos were taken of
 head under groundwire. ^(NOW IN FILES - SLIDE MADE) Cromwell arrived
 yesterday, but will not load until 24 July.
 FG personnel working in shoals.
 No painted turtles or transmitters seen.
 Ruth will monitor after Bob & Sue depart for "leave".

-23
 22 July
 Tuesday
 Wednesday

5 AUGUST
 TUESDAY

6 AUGUST
 Wednesday

15 AUGUST
 FRIDAY

22⁻²³ July 80 Bob, Sue, Beth out from Tern to Kawai -
 Tuesday - next day on to Honolulu. Visited with
 Wednesday Dixon - Sue turned over data sheets
 (July - 21 July 80) now in my files.
 Four week contract arranged for Ruth Ittner
 SS 388-56-4937 @ #6 = \$168.⁰⁰

5 August 80 Talked to Noreen on Kawai - she
 TUESDAY reports that Ruth is still hearing all
 5 turtles (3510♂, 5410♂; 491♀, 531♀, 480♀)
 on 25 July 1980, 491♀ was seen basking
 on Whale-Skate - John Grawing confirmed this
 on receiver at Tern. (Photo taken by Ruth of
 491 went to tagged adult)

6 AUGUST 80 Talked to John Grawing (passed Gil Martin
 Wednesday message to Johnsons) and Ruth Ittner.
 Seal survey made 4 August - only one
 basker seen on East; 2 on W-S and
8 "in water". 5410♂ signal is weak.
 Grawing reports "2-3 times" the pits
 being dug on Tern now, as compared
 to June. He estimates seeing 6-8 "successful"
 based on his observation of Freg 200
 "good" pit.

Note - Could shift be taking place
 between islands? As turtles
 get ready to leave, they lay a
 clutch on Tern?

15 AUGUST 80 Talked to Dan M., Kawai FWS,
 FRIDAY he passed message on Noreen's

15 AUG 80
FRIDAY
(CONTINUED)

desk which read as follows:

on 8 August one dead hatchling was found on tennis court of Tern Is. -
on 10 August Survey, one small turtle seen in the water, at Trig - 1 recent pit; on Whale-Skate 12 large turtles seen in the water, 7 basking and 2 recent pits; on East, one large turtle seen in the water; on Little Bin, 2 small turtles seen in the water, 6 recent pits.

On 7 August 2140 hours was the last heard from Transmitter 491

On 10 August 2140h was the last heard from Transmitter 531.

Subsequent discussions with Ruth indicated she couldn't remember details of hearing "strong" signals.

2/AUG 80 Radio report indicates that ~~491~~ 351 ♂ and 450 ♀ are the only turtles still being heard. Since 8/15 ^{Report} 541 ♂ has dropped out. 541 ♂ last heard from on 13 AUGUST AT 2133h

2 Sept 80 Called Kawai - talked to Bob Schulmeister
Tuesday He will return on Sept 15th to Tern Is.
Talked to John & Ruth last night and they are still hearing 450 ♀ & 351 ♂

5-8 September TO FFS to collect
Friday - Monday hatchlings - reviewed data sheets from Ruth for monitoring

6 Oct 19

19 Nov 19

NO - DAY BEFORE WE LEFT
TERN - 30 JWE

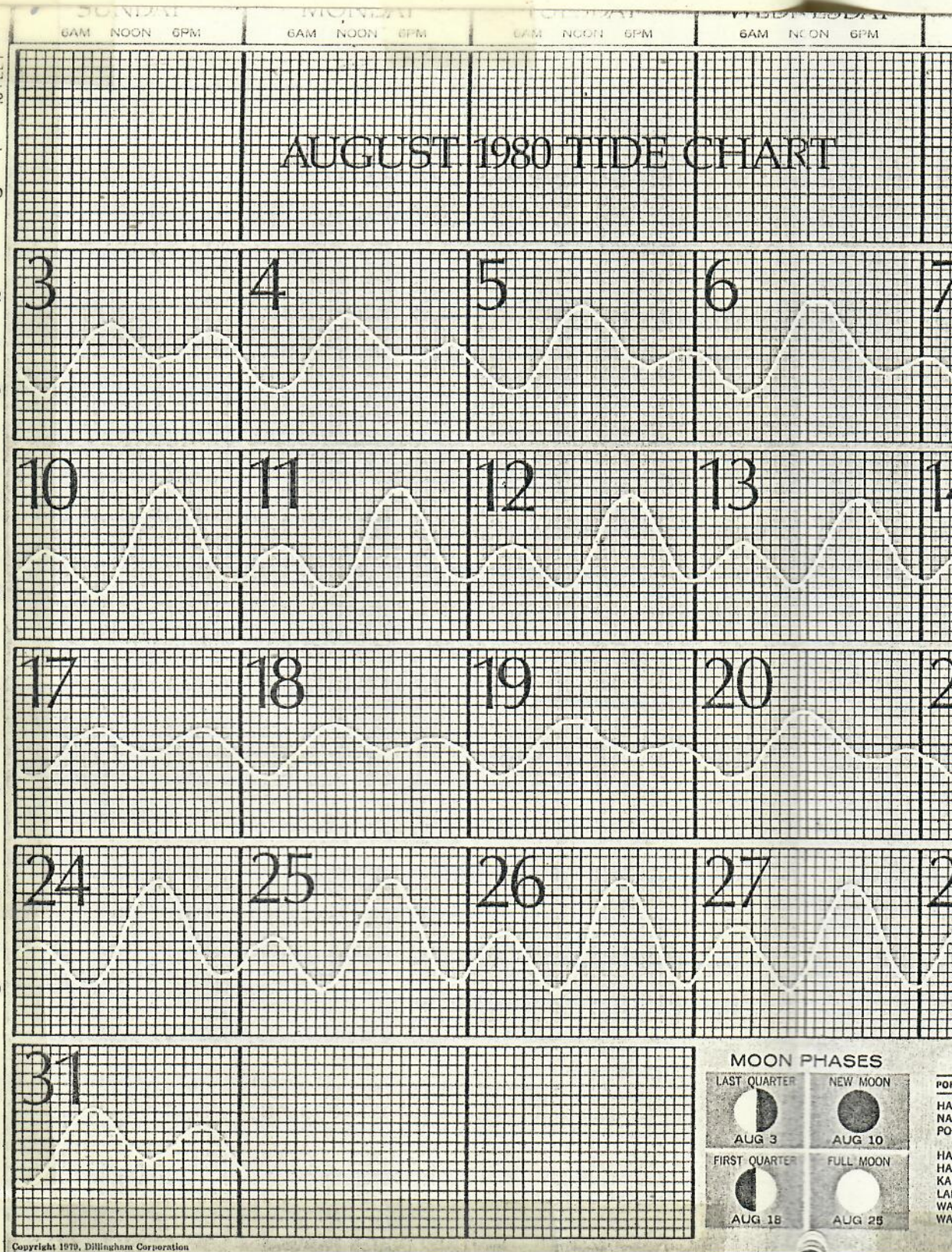
through 7 September. Beacon 551 was removed from W-S shortly before Bob and Sue left Tern. See other data book for narrative and data specifics.

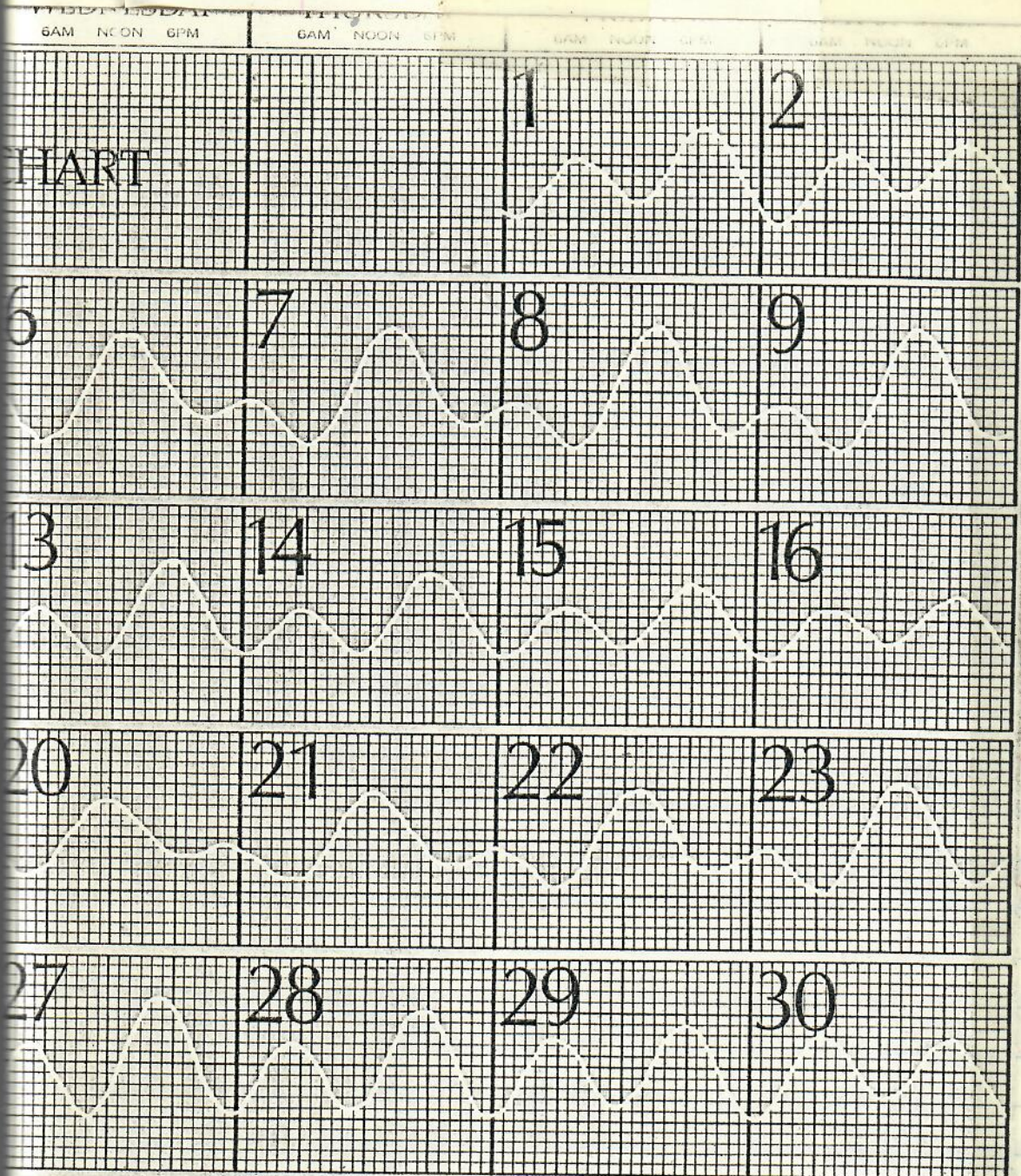
Turtle 351 ♂ last heard from at 1958h on 4 September.
- only Turtle now being heard is 450 ♀

John & Ruth departed Tern on 19 Sept -
Bob & Sue to Tern from Hawaii

6 Oct 1980 Talked to Ruth Ittner^(on Hawaii?) - reported that 450 ♀ is still being heard, however high-pitched noise also present. Also, static/squeak on 200, 351, 491 and 511

19 Nov 1980 Talked to Bob Schulmeister at Tern - November 13th was the last time 450 ♀ was heard. "Noise" still there, but not as evident. Crystals still "bleeding" bad in the scanner. I requested that electronics be sent in.





MOON PHASES

For tide time at following places, add or subtract from Honolulu time.

 LAST QUARTER AUG 3	 NEW MOON AUG 10
 FIRST QUARTER AUG 18	 FULL MOON AUG 25

PORTS	Hrs.	Mins.	PORTS	Hrs.	Mins.
HANALEI BAY, KAUAI	-1	40	KAUNAKAKAI, MOLOKAI	-0	09
NAWILIWILI BAY, KAUAI	-0	32	KAHULUI, MAUI	-1	48
PORT ALLEN, KAUAI	-0	32	KIHEI, MAALAEA BAY, MAUI	-0	14
HALEIWA, OAHU	-1	36	HILO, HAWAII	-0	59
HANAUMA BAY, OAHU	-0	55	HONUAPO, HAWAII	-0	24
KANEOHE BAY, OAHU	-1	35	MAHUKONA, HAWAII	-0	24
LAIE, OAHU	-1	48	KEALAKEKUA BAY, HAWAII	-0	16
WAIANA, OAHU	+0	16			
WAIMANALO, OAHU	-1	15			



Dillingham

04 NOV 2002

BASKER TAGGINGS

DATE/TIME	TAG NOS.	SEX	LOCATION/REMARKS	DATE/TIME
6/7/80 ^{TC 38}	3552 RFL	F	East-NEP-BASK	6/9/80 Monday
6/8	3553	M	W-S - Bask	6/9
6/8	3557 RFL	small F	W-S Bask	6/9
6/8	3561 , 3562 RFL	Male	W-S Bask TRANS 194 gcm (PRINTED) PL-75.0cm Bitten front flipper	6/9
6/8	3563 RFL	Male	W-S 9:20 BASK RFL 1/2 healed	6/9
6/8	3564 , 3565 LFL	Male	W-S 11:30 PM bask	6/9
6/8	3566 LFL	Male	W-S 11:30 PM bask	6/9
6/8-6/9	3569 RFL	Female	nesting shale-west W-S end tagged while digging 3rd pit	6/9
6/9	3574 , 3575	Female	6:35 PM TRIG BASK TRANS 199 PL-67.3cm 149.531	6/9
6/9	3572	Female	TRIG BASK	6/10/80 Tuesday
6/9	3573	Female	TRIG - BASK	6/10/80 Tuesday


Recovered
6/25/84
LAYSAN BASK by KRAM

ENT. NO. 321

ENT. # 382 + 11/4/85
B-LAYSAN

DATE/TIME	TAG NOS	SEX	LOCATION/REMARKS
6/9/80 Monday	3751 RFL	MALE (small)	W-S-bask
6/9	3752, 3753	Female	W-S bask
6/9	3754 -	Female (not entered in)	W-S Bask
6/9	3755	Female	W-S bask
			6/20/83 W-S BASK by SRK
6/9	3756	Female	W-S bask
			ENT. NO. 447
6/9	3757	Male	W-S bask
6/9	3758	Male	W-S bask
			ENTERED NO. 83
6/9	3763 LFL 3764	Male	W-S bask PL-71.2
			TRANS 198 149.511
			carapace & pleon collected barnacles scabs on flippers - pieces missing from trailing distal edges of front flippers. Half pieces missing from RH flipper.
6/9	3766 RFL 3767 LFL	Female	Nesting - wandering W-S in sand south end
6/9	3768 LFL	Female	Nesting - just coming W-S out 1120
6/10/80 Tuesday	3770 3771	Female TC 184/15	East 10:30 PM bask with a ♀ 2.07-SEP

BASKET TAGGINGS (CONTINUED)

DATE/TIME	TAG NOS.	SEX	LOCATION/REMARKS	DATE/TIME
6/11/80 11:30	3775 RFL 3578 LFL	Male	East SEP BASK	6/23/80 Monday
6/13/80 5:45 PM	3588 LFL	Male	East SEP - BASK no scars	6/26/80 Thursday
6/13/80 10:30 FRIDAY	3589	Female	East area (out to west)	6/26/80 Thursday
6/15/80 5:45 PM Sunday	3598	small Female	East A9-10 - BASK	6/27/80 Friday
6/17/80 3 PM Tuesday	3610	Female	East NEP	6/29/80 Sunday
6/19/80 5:45 AM	3618 3617	MALE	BASK-EAST SEP by test	6/30/80 Monday
6/19/80 6 PM Thursday	3620 3621	Female	EAST - NEP BASK	
			indented deformed healed → 	
6/22/80 Sunday	3636 LFL	Female	EAST - NEP BASK Recent split in right flap	
6/22/80	3637	East MALE	basket (?) on lost (?)	
6/22/80	3638 LFL	Male	East - SNEP BASK	
6/22/80	3639 3640	Male	East SNEP BASK (observed 6/26 ~ 7 PM BASK SEP)	

must have flipped it over

ENTERED NO. 71

Recovered 6/15/81 ENT. # 759

2038 BINCK + 3673 RFL
L-3rd Scale

TC 29

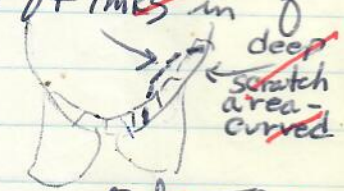
ENT. # 759

NO. 105
(P214)
3/81

BASKER TAGGINGS (continued)

04 NOV 2002

<u>DATE/TIME</u>	<u>TAG NOS.</u>	<u>SEX</u>	<u>LOCATION</u>	<u>REMARKS</u>
6/23/80 11:20 AM Monday	3646 RFL	Female	LGIN	Small - ~ 75cm
6/26/80 6 PM Thursday	3667	Male	TRIG	Back scabs at base of tail
6/26/80 6 PM Thursday	3668	Female	TRIG	Back
	Rec. Summer 1991 Nesting Tern	Nesting Tern		
6/27/80 5 PM Friday	3670 RFL	Female	W-S	Back
		TMR on ventral surface at end of right front flipper + TMRs in flap areas.		
6/29/80 Sunday	3674 RFL	Female	ENTERED NO. 82 (as a male)	Back-TRIG
	3675 LFL (may be close to edge)			
6/30/80 Monday	3677	Female	Back-W/S	several large erect barnacles on left laterals



BASKING TURTLE CENSUS

DATES/TIMES	MALE	FEMALE	I	Total	OFFSHORE			LOCATION	DAYS/TIME
					M	F	I		
6/7/80 2-3PM SAT	1	1	23 ^{SEP}	25	-	-	5	EAST	6/16-11
6/8 ~5:30PM SUNDAY			~20	~20				TRIG	6/20/80
6/8 6:00PM	3	3	25	31	2 cop obs	4+	WS		6/20 6
6/10 7PM	1	1	20 ^{5SP} 15SEP	22				EAST	6/22/80 SUNDAY
6/11 6PM		2 TC, 2	18 ^{10SEP}	22	1A 1SP	0	0	East	
6/12 1PM		2 TC 2, 2?	21	23 ^{5SEP} 15P			17SEP	EAST	6/23 Monday
6/13 5:45PM	1	4 ^{35SEP} 1-A11	TC 1, 9, 2	27 ^{1SP}				East	6/23/80 Monday
6/14 3:15PM	-	6 ^{1-A12} 3-SEP	TC 1, 3, 9	25	2SP			4 East	
6/15 5:45PM	-	6 ^{4TC-TC8,1} 4.5SEP	14 2A9-90	20				EAST	6/23 12 Monday
6/17 Tuesday 3PM	1	8 ^{TC 11-A11} TC 1, 18, 3, 8	14	23				EAST	6/23 6PM Monday
6/18 Wed 7PM		Schulmeisters - none on GIN	(but rain showers passing)	2	NO PAINT			L. GIN	
6/18 5PM	2 "looked young"	10 ^{SEP} TC 6, 8, 10, 18, 20	6 NEP 3, 17	18				EAST	6/23 6:45 Monday
6/19 5PM	2	3 ^{1 w/cargo} net	0	5	Bob & John w/ee tagging birds.			TRIG	
6/19 6AM	2	14 TC-6, 8, 10, 9, 23, 18, 20, 11	8	24				EAST	6/24 7PM Tuesday

STATION	DATES/TIMES	MALE	FEMALE	I	Total	OFFSHORE			LOCATION
						M	F	I	
ST	6/16 ~ 1130 AM	Monday		2	2				MULLET
G	6/20/80 2PM	3	TC 24, 28, 20 12	14	29			lots of off-shore several	EAST
S	6/21 6PM	2	(6, 27, 17, 8, 25, 30) 8	TC 8, 10, 23, 25, 24, 27	10	20		lots of phunks several	EAST
T	6/22/80 5PM	3	13	3	19				EAST
		SUNDAY							
ST	6/23 11 AM	Monday		SEP TC 27 4	1	5		1-TC (left only)	EAST
				NEP TC 29, 8, 13					
	6/23 1130 AM	Monday	0	1	-	1	0		GIN
	6/23 12 noon	Monday	-	-	-	1	1		GIN
	6/23 6 PM	Monday	1	HMB 1204	1	2	4	2	TRIG
	6/23 645 AM	Monday	0	9	NEP TC 29, 36, 36, HMB 859 3, 13	1	10		EAST
				SEP TC 6, 23, 11 27, 38, TC?					
(Males are noticeably absent on EAST)									
	6/24 7 PM	Tuesday	0	14	1	15			EAST
				Note, SEP TC 1, 6, 17, 23, 25, 27, 38, 39 + 5 other					
				NEP TC 30				TC w/ readable	

BASKING TURTLE CENSUS (CONTINUED)

DATES/TIMES	MALE	FEMALE	I	Total	OFFSHORE			LOCATION	DATES/TIME
					M	F	I		
6/25 12:30pm Wednesday	1	11	2	13		~4	EAST	6/28/80 Saturday	
		NEP - TC 29, 32, 36 + 2 NO TC + 1 unreadable SEP - TC 2, 8, 10, 23, 27, 38 + 1 "							
6/25 2pm		11	2				12 W-S	6/28/80 Saturday	
	Two copulations noted close to shore - photos roll 8								
6/26/80 6:30am	1 tag on right	12	TC 2, 23, 25, 38	13				6/28/80 Saturday	
6/26/80 11:45am Thursday	0	1	0	1		0	BARE	6/29/80 Sunday	
6/26/80 6pm	2	2	0	4			TRIG	6/29/80 Sunday	
6/26/80 7pm	1	6	0	7			EAST	6/29/80 Sunday	
6/27/80 1pm	0	6	1	6		~5 1 with scum on carapace	EAST	6/29/80 Sunday 5:00	
		TC 5, 23, 27 NEP TC 1, 31, 46 SEP							
6/27/80 6:45pm	-	5	1	6		-	EAST	6/30/80 Monday	
		11 NEP - NO TC TC 9, 20, 25, 6?, unreadable							
6/27 Friday	-	-	1	1	~2:30pm by Schulmeisters		SHARK + lots of shark	6/30/80 Monday	
6/27/80 Friday 4pm				0			TRIG	6/30/80 Monday	
6/27 Friday 5pm	0	1	0	1			W-S		

DATE/TIME	MALE	FEMALE	I	Total	OFFSHORE			LOCATION
					M	F	I	
6/28/80 2:30AM Saturday	2 ↑ (dead in area 12 at 6AM?)	6 1-NO TC SEPT TC 1, 4, 18, 25? NEP TC 3		8				EAST
6/28/80 6AM	(+3620-5)	7 TC 25, 8+ unreadable	I	8				EAST
6/29/80 Sunday 7PM		3 2 TC SEP 1 TC NEP unreadable		3	1	0	0	(off area 10-12) EAST
6/29/80 6PM Sunday	<u>NO</u>	<u>BASKERS</u>						(107 seen offshore) W-S
6/29 Sunday 5:30AM	0	I	-	1				(tag 3674-3675) TRIG
6/30 11:15AM Monday	I ³⁵⁸⁸⁺	I ^{TC 27}						EAST
6/30 6:15PM Monday	<u>NO</u>	<u>BASKERS</u>						TRIG
6/30 7PM Monday	2 FREQ 531 957	2 3557 3677	0	4				W-S

- MALES

Whale-Skate ^{old tag (Recovery)} 351 ; ^{old tag (Recovery)} 361 ; 541 ; 511

- FEMALES

Whale-Skate ^{old tag (Recovery)} 450 ; ^{old tag (Recovery)} 491

Trig ^{old tag (Recovery)} 200 ; 581

5 of the 8 transmitter-equipped turtles are recoveries (previous tag history) - 2 of the 4 males and 3 of the 4 females.

DATE

~~6/8/80~~
Sunday

~~6/8/80~~
Sunday

~~6/8/80~~
Sunday

~~6/9/80~~
Monday

~~6/9/80~~
Monday

~~6/9/80~~
Monday

~~6/9/80~~
Monday

~~6/9/80~~
Monday

TRANSMITTER LOG

87

04 NOV 2002

DATE	NO.	Freq.	Location	SEX	OTHER
6/8/80 Sunday	193 ^(149.551)		W-S	Male	Tags 2400, 2401 1160 (Recovery) PL-65.6
6/8/80 Sunday	194 ^(Paint) 149.361		W-S	Male	Tags 3561, 3562 Bitten front flippers <u>450</u> PL-75.0
6/8/80 Sunday	195 ^(Paint) 149.450		W-S	Female	USFW 376 off (Recovery) new 3567, 3568 PL-68.4 Light shell

(6/197
East (Bulldozers) East 149.500

(6/201
Tern - East end - 6/11 to log on
Trig bears 328° from East; whale skate 149.551
from East bearing 342°

6/9/80 Monday	192 149.200		TRIG	Female	USFW 665 off (Recovery) 3570, 3571 PL-72.3
6/9/80 Monday	199 149.531		Trig	Female	3574, 3575 PL-67.3
6/9/80 Monday	196 149.491		W-S	Female	3164, 3760 (Recovery) PL-74.0
6/9/80 Monday	200 149.541		W-S	Male	3081, 3762 (Recovery) PL-66.6m transmitter slightly off center
6/9/80 Monday	198 149.511		W-S	Male	3763, 3764 PL-71.2 Bitten flippers scabs

04 NOV 2002

TURTLE TAG RECOVERIES

DATE	TAG NO.	SEX	LOCATION/REMARKS	DATE
6/7/80	(2599 RFL 335 LFL (new))	Male	Area 9 - East IS BASKING	6/8/80
6/8/80	43(2) US Wildlife Honor new tags - 3554 , 3555	OFF Female	ENTERED NO. 159 W-S - bask (poss. 3555-3556) LFFL 1/2 off Healed	6/8/80
6/8/80	3075 LF new 3556 RFL	Male	W-S bask	6/9/80
6/8/80	1160 ^{FL} ; 2400 RFL; 2401 LFL 6/30 observed & photographed bask on whale shark ~ 6:30am	Male 149.351	W-S bask TRANS 193 LHF 1/2 off	6/9/80
6/8/80	3041 new 3558 LFL	Male	SL 88.4cm W-S bask until at least 1 AM	6/9/80
6/8/80	3215 new 3559 (?)	Male	RFL all healed RHF	6/9/80
6/8/80	956, 957, 958 6/30 NW tip W-S' bask scabs at base of tail	Male	NW tip bask W-S - dug deep hole - lots of sand flipping - at least until 11:30 PM	6/9/80

04 NOV 2002

DATE	TAG NO.	SEX	LOCATION/REMARKS
6/8/80	2716, 2717	Female	W-S Bask - 1130pm
6/8/80	3069RF	Male	W-S 1135 BASK LFL MISS. - heal.
6/9/80	370 ⁴⁵⁰ US Wildlife Honor (OFF) New 3567RFL, 3568RFL 149.450	Female	W-S ~ midnight PL - 68.4cm Light colored shell painted TRANS 195 green
6/9/80 Monday	665 US Wildlife Honor (OFF) New 3570RFL, 3571LFL	Female	TRIG 5:40 pm PL - 72.3cm Black plastion - photo left front flipper short but healed - sunken pelvic area; knob on ventral surface of left hind flipper Bit bare 149.200 TRANS 192
6/9/80	943 ⁹⁴²	Female	TRIG - Bask (in contact with 945)
6/9/80	945	Female (?) longer tail	TRIG - Bask
6/9/80	1247	Female	TRIG - Bask
6/9	3047	Male	W-S bask

TURTLE TAG RECOVERIES (CONTINUED)


DATE	TAG NOS.	SEX	LOCATION/REMARKS	DATE
6/9/80 Monday	3082; 3130 6/17/79 TR 19 Growth measurement: SL-29'4" x 23" = 74.3cm x 58.4cm PL-24" = 61cm	Female	TR - Back Turn	6/9/80 Monday
6/9	2663	Male	W-S Hooked tail - lots of TMRS - tag embedded in TMRS on R flipper	6/10/80
6/9	2594 RFL (2594 applied to left flap of male boater (with furina) at East 6/4/78.)	Female	W-S Swells bad - lots of TMRS - tag embedded in TMRS on flap -	6/10/80
6/9	2712	Male	W-S Back	6/10/80 Tuesday
6/9	3164 LFL 3760 new(?)	Female	W-S ^{8:45} - Back PL 74.0cm TRANS 196	6/11/80 11:30 6/12/80 10:30 Thursday
6/9	(3215) see p. 90 1/8 original recovery	Male	W-S ^{8:16} back	6/12/80 10:30
6/9	3031 RFL 3762 LFL new(?)	Male	W-S ^{9:35} back TRANS 200 PL-66cm Hatched LFL Black-speckled with olive scabs on flippers.	6/14/80 3:30 Saturday

04 NOV 2002

DATE	TAG NOS.	SEX	Location/Remarks
6/9/80 Monday	3234 3765 LFL new	Male	W-S - Bask 11 AM scabs - missing pieces trailing off front flippers.
6/10/80	3058 RFL 3769 new	Male	East - Bask 7 PM Eye TMRS
6/10/80	2576	Male	East 10:30 PM Bad bites on all flippers.
6/10/80 Tuesday	2219 LFL + tag on the right	Female (TC 6)	East Area 7 10:20 PM coming up 30 TO West
6/11/80 11:30 AM HMB	749 LFL TC 40	Female	East sep Bask
6/12 Thursday 10:30 AM	2576 LFL same as turtle 3582 RFL new	Male	East sep Bask Bad bites - pieces missing from front flippers - scabs - bites at tail base.
6/12 10:30 AM	2589 2590 TC 48 6/29/80	Female	East - sep Bask tags are shiny & - foaling growth not apparent
6/12 Saturday 3:30 PM	859 LFL HMB 3591 new 3007 423 Basking sep	Female	East - sep Bask

~~no TC assigned -~~
~~never seen nesting~~

04 NOV 2002 TURTLE TAG RECOVERIES (CONTINUED)

DATE	TAG NOS.	SEX	LOCATION/REMARKS	DATE
6/19/80	HMB 1058 3619 RFL new	TC Female	EAST-SEP BASK Left flipper piece missing from flap	
6/19/80	2233 LFL + 2234	TC Female	EAST-SEP BASK	
6/19 Thurs	 cut in lateral right	Female	EAST-Areas BASK	
6/20 FRIDAY 1:30pm	3274 LFL 3629 RFL (new)	Male	EAST-SEP BASK possibly missed tag scabs on front flippers	
6/20/80	Appeared to be a single sprayed TC number - deep healed cuts in scapulae. (6/25 AM - TC 7 - 3579, 3580 (embedded))	Female	East-SEP basking along side of above tag LHL partly missing but healed	
6/23/80 Monday 6pm	HMB 1204 OFF HMB 1749 OFF new - 3647 RFL, 3648 LFL	Male	BASK-TRIG scabs on trailing edges of front flippers	
6/24 Tuesday 4:30pm	Size 681 tag in ? - 3rd or 4th scale left	Female	BASK-SP East TMS on flap area right front flipper - possibly also left.	
6/30/80 Monday 7pm	HMB 986 115 FWS Honolulu 3678 LFL (new)	Female	W/S BASK SE TIP	

PIT COUNTS

DATE
6/7/80
FRIDAYLOCATION
EASTArea 1 - 9 ; Area 3 - 5 ; Area 4 - 5
Area 5 - 9 ; Area 7 - 2 ; Area 8 - 1 ;
Area 12 - 2 ; Areas 14-15 - 3 ; Area 16 - 2.

Total - (38)

Number of "good" probably doesn't exceed 10

6/7/80 TERN - South Beach: East end to Quarters - 7
By dead Messersmidti - 4 + 2 -Date: 6/4/80 (4 on one night - 2 the next. Parrish people reported finding a "turtle egg" on beach.
Total - (13)

6/8/80 3 new pits by water tanks on Tern

6/8/80 Whale-Skate - ~ 18 at ^{fine} Sandy "Whale" end-west shore; ~ 12 + ~ 16 in central areas; ~ 5+ more toward "Skate" end - but none at northern tip.

~ Total ~ (39)

Three (3) false dug by nester at Skate end
6/8 - 6/9 tag 35 (GRFL).

DATE LOCATION

6/9/80

TRIG

~ 14 concentrated at the elevated NW corner. 45 at east end (not on extended sand bar)
Total - (29)

6/16
Monday
NIGHT

Tern

John & Beth saw an unmarked turtle haulout on Tern Beach - returned w/o laying eggs
Also - 200 by quarters starting at 9PM - Lay 6/17-6/18

6/18 wed. night

Tern (PM)

Causey reports nesting turtle in front of old FWS quarters - I observed 3-4 sets of fresh tracks on 6/18 day visits

6/23 Monday

Little GIN

~ 18 pits, along rim of this dish-shaped island

6/23 Monday

GIN

only noted 1 pit - no turtle tracks

6/25 Wednesday

Whale-Skate

Several (4-8) "good" nestings observed from the log to sandy area of whale.

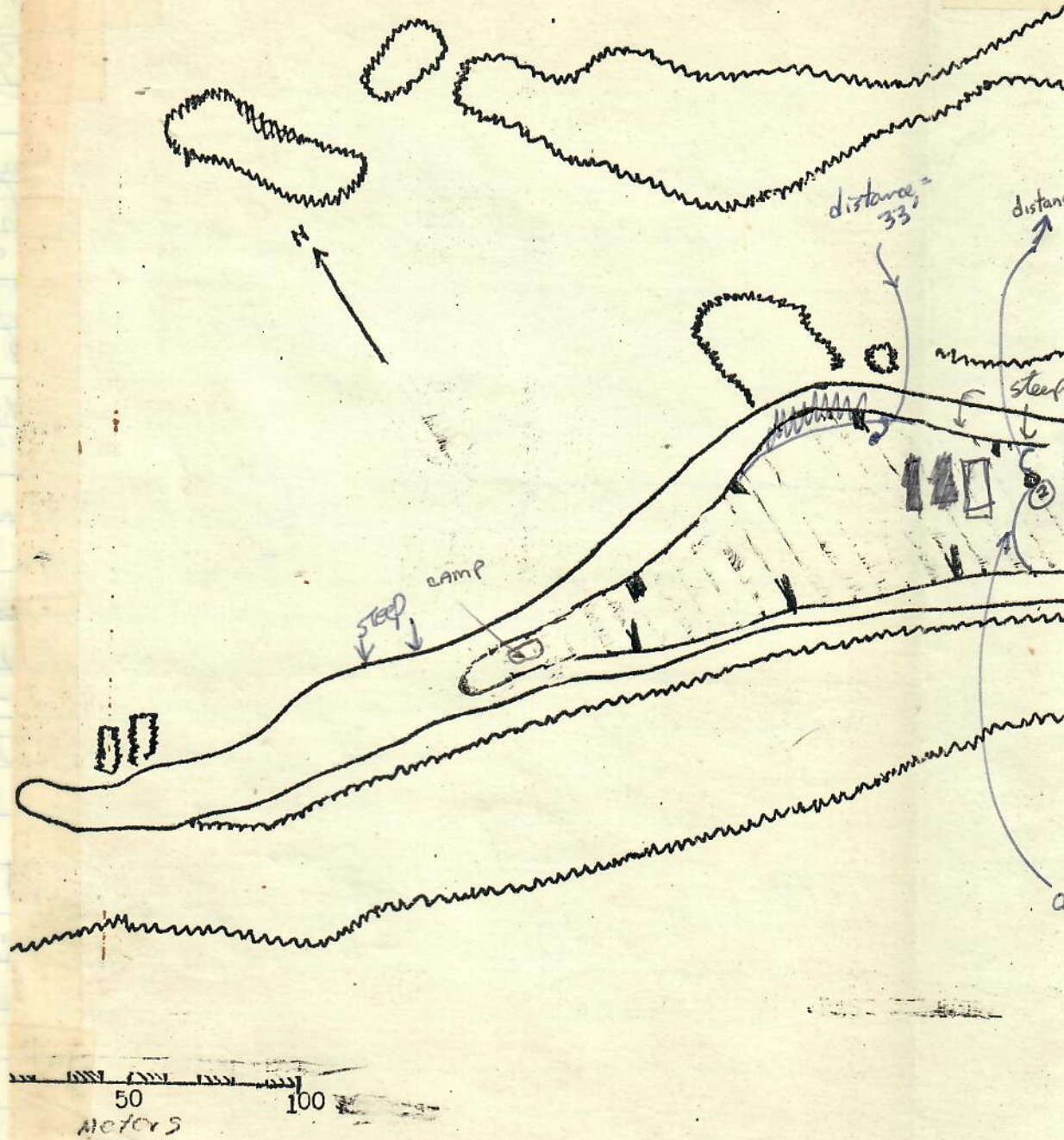
8/6/80

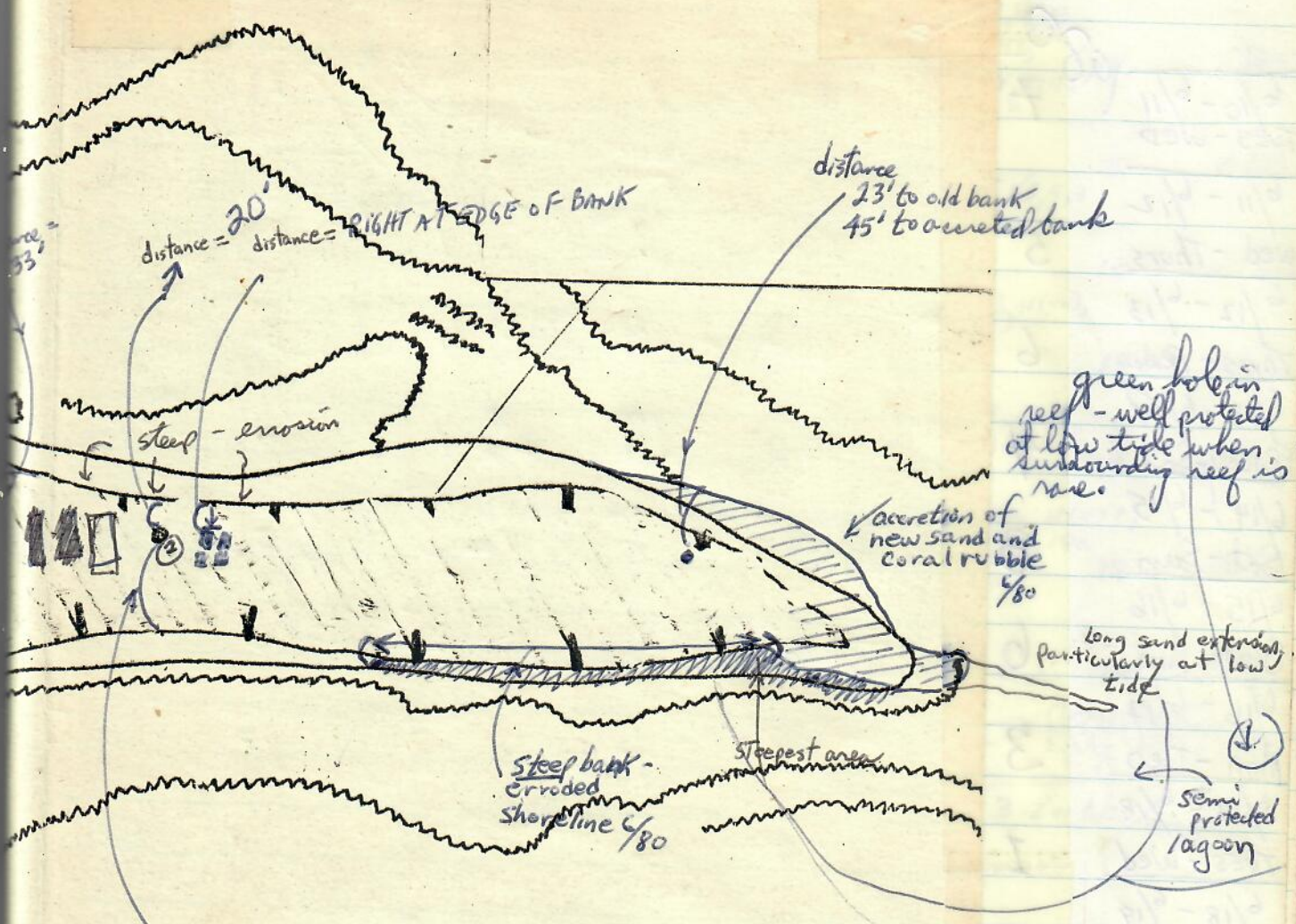
John Graham reports 0-2-3" times the number of pits now on Tern compared with June. Estimates seeing 6-8 successful on Tern.

8/10/80

Trig -

1 recent pit; W-S - 2 recent pits;
Little GIN - 6 recent pits [seen during seal surveys]





distance = 120'
(80' to start of washed-up rubble)

measurements
 3 August 1975: Mast 2 to N shore = 44'
 " " " S shore = 161'

NUMBER OF FEMALES PER NIGHT

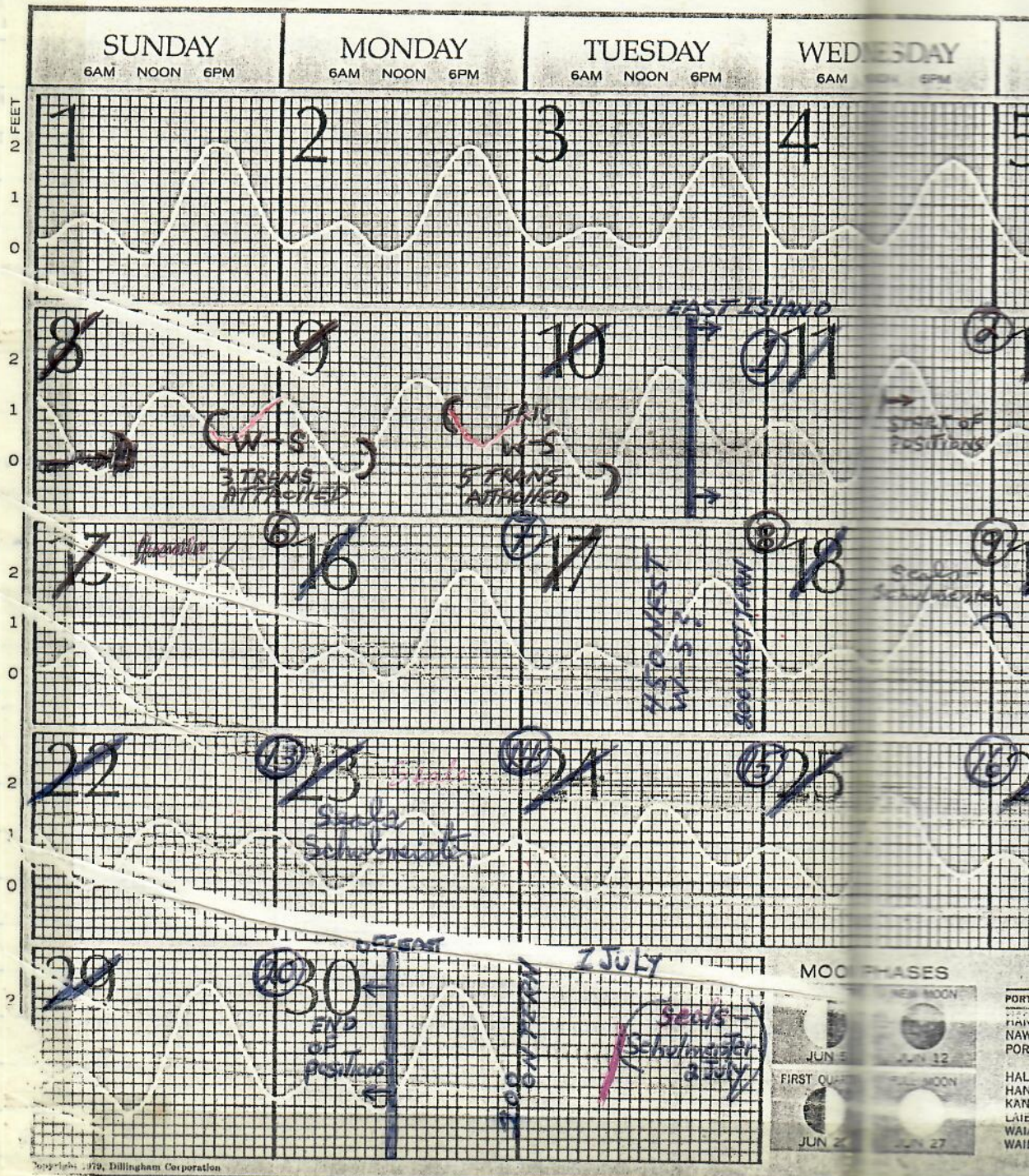
NIGHT PM to AM

DATE	NO. OBSERVED	% successful $\bar{x} = 61.25$ $N = 20$ RANGE 0-100	NEW OBSERVED	OF THOSE, NO. SUCCESSFUL	DAY	% turtles NEW OBSERVED ↓ ISLAND	DATE
6/10-6/11 TUES-WED	7	57.1%	7 TC 1-7	4 TC 1, 2, 3, 5	1	EAST	6/23-6/24 Monday-Tuesday
6/11-6/12 Wed-Thursday	5	20.0	2 TC 8 NOTC	1 TC 7	2	EAST	6/25-6/26 Tuesday-Wednesday
6/12-6/13 Thursday-Friday	6	66.7	4 TC 9, 10, 11, 12	4 TC 8, 10, 11, 12	3	EAST	6/26-6/27 Wednesday-Thursday
6/13-6/14 Friday-Saturday	4	25.0	1 TC 13	1 TC 13	4	EAST	6/27-6/28 Thursday-Friday
6/14-6/15 Sat-Sun	8	37.5	6 TC 14, 16, 17, 18, 19	3 TC 15, 17, 19	5	EAST	6/28-6/29 Friday-Saturday
6/15-6/16 SUN-Mon	6	83.3	3 TC 19a, 20, 24	5 TC 19, 19a, 18, 24, 20	6	EAST	6/29-6/30 Saturday-Sunday
6/16-6/17 Mon-Tues	3	100	0	3 TC 9, 14, 23	7	EAST	6/30-7/1 Sunday-Monday
6/17-6/18 TUES-Wed	1	0	1 TC 25	0	8	EAST	7/1-7/2 Monday-Tuesday
6/18-6/19 Wed-Thursday	2	100	2 TC 26, 27	2	9	EAST	7/2-7/3 Tuesday-Wednesday
6/19-6/20 Thursday-Friday	4	100	3 TC 28, 29, 30	4 TC 30, 25, 29, 28	10	EAST	7/3-7/4 Wednesday-Thursday
6/20-6/21 Friday-Sat.	3	66.7	3 TC 31, 32, 33	2 TC 32, 33	11	EAST	7/4-7/5 Thursday-Friday
6/21-6/22 Sat.-Sun.	7	28.6	6 TC 34, 35, 36, 37, 38, 39	2 TC 34, 35	12	EAST	7/5-7/6 Friday-Saturday
6/22-6/23 Sun-Monday	6	50.0	2 TC 40, 41, 42	3 TC 41, 41, 40	13	EAST	7/6-7/7 Saturday-Sunday

DATE	NO. OBSERVED	% Successful	NEW OBSERVED	of Those NO. Successful	DAY	ISLAND
6/23-6/24	TC 34, 39, 1, 3, 4, 42, 43					
Monday-Tues	7	57.19%	2	4	14	EAST
6/24-6/25	TC 44, 7, 34, 8, 5, 9, 4, 10, 2					
TUES - Wed	9	55.6	1 TC44	5	15	EAST
6/25-6/26	TC 45, 9, 5, 7,					
wed - Thurs	4	75.0	1 TC45	3	16	EAST
6/26-6/27	TC 9, 13, 11(46),					
Thurs - Friday	3	100	0	3	17	EAST
6/27-6/28	TC 12, 17, 18					
Friday - Sat	3	66.7	0	2	18	EAST
6/28-6/29	TC 48, 19, 18(47), 23, 20, 24, 19a					
SAT - SUN	7	85.8	1 TC48	6	19	EAST
6/29-6/30	TC 15, unreadable					
SUN - Mon	2	50.0	0	0 or 1	20	EAST

45 Total = 20 nights
 42 Total = 14 nights
 20 Recaptures
 3 turtles/night

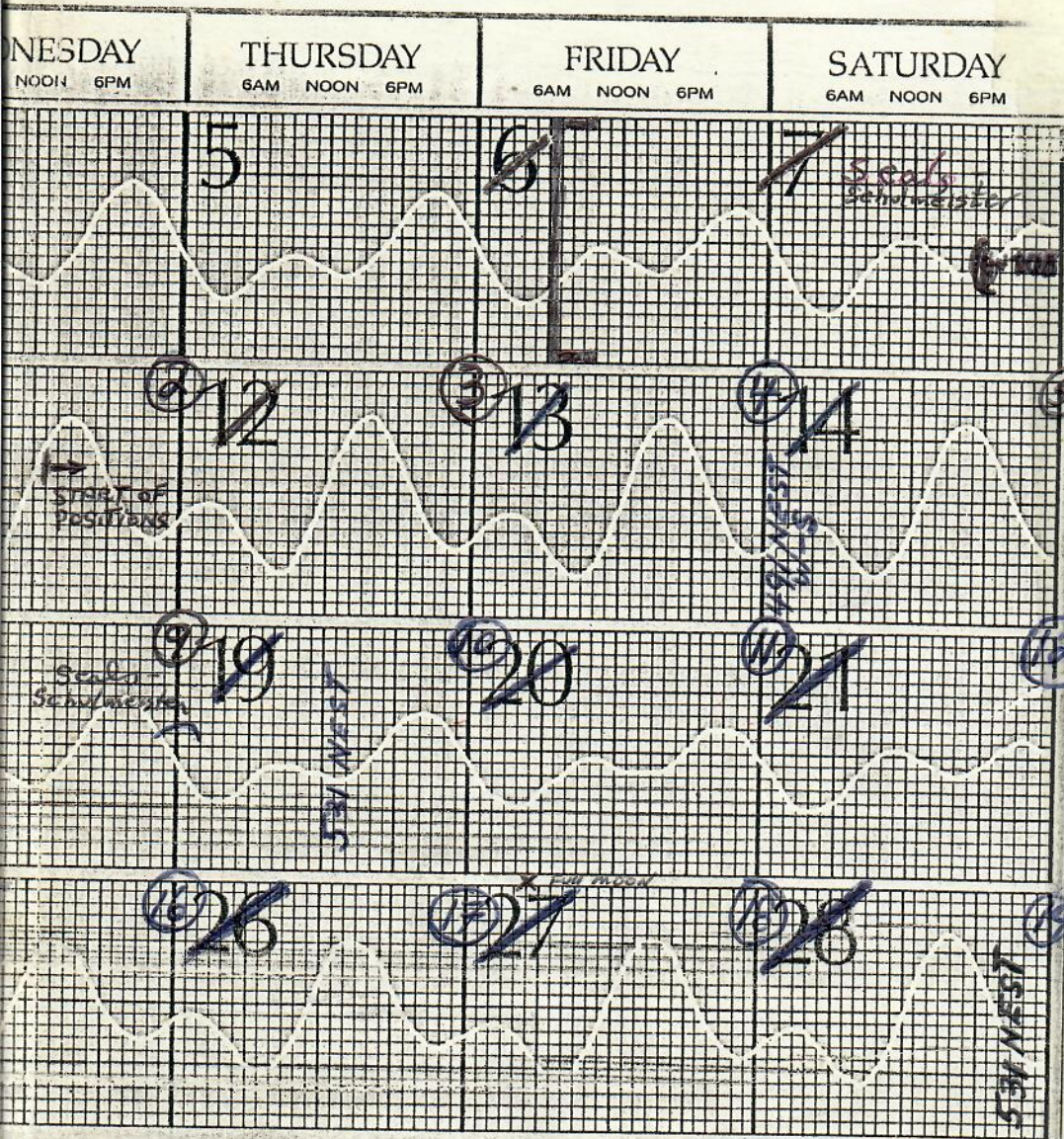
JUNE 1980 TIDE CHART



Twice from bird
bug
(check?)

MONITORED 20 CONSECUTIVE NIGHTS

TIDE CHART



PHASES

For tide time at following places, add or subtract from Honolulu time.

NEW MOON

 JUN 12

FULL MOON

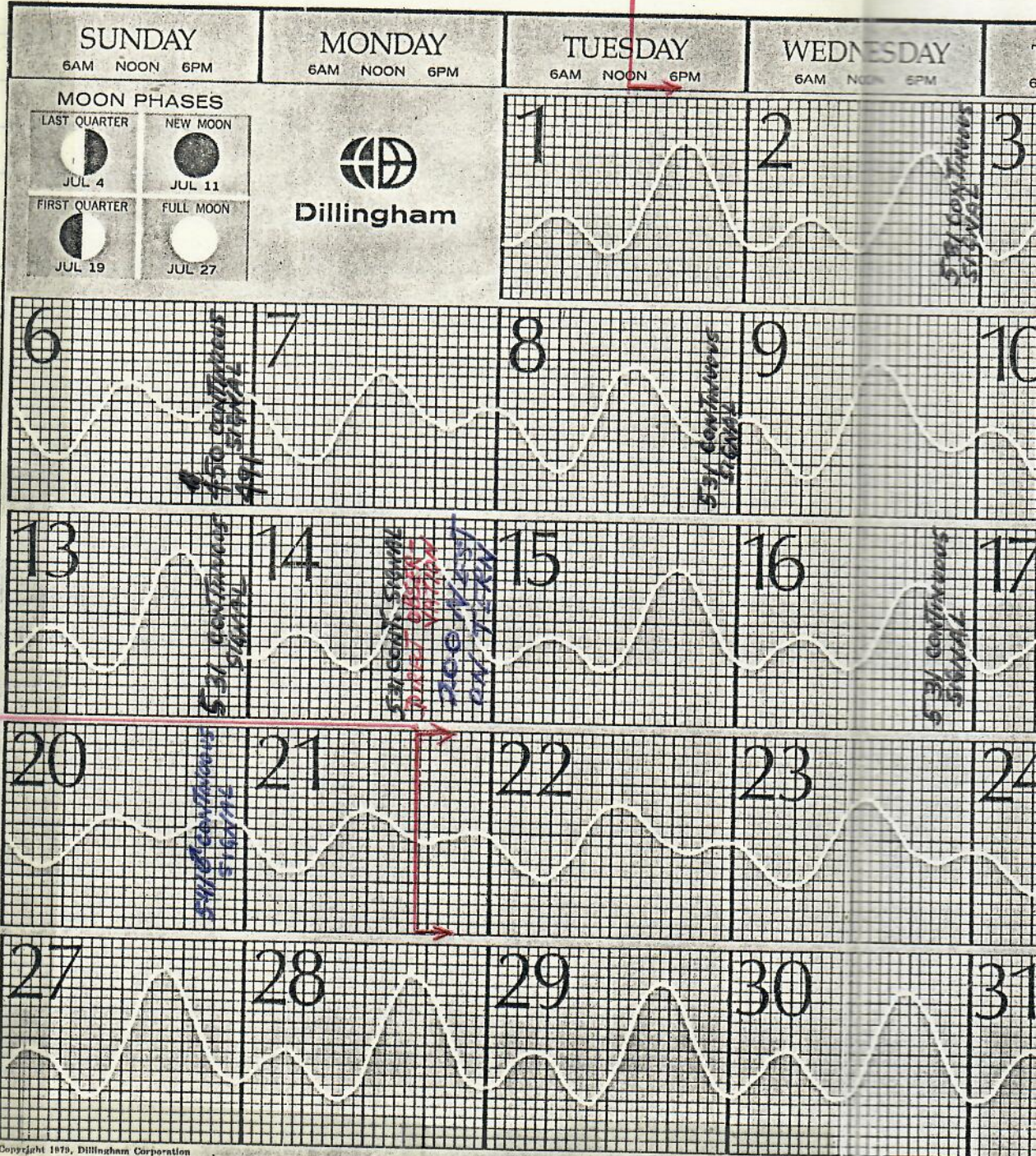
 JUN 27

PORTS	Hrs.	Mins.	HONOLULU	Hrs.	Mins.
PARALEI BAY, KAUAI	-1	40	KAUNAKAKAI, MOLOKAI	-0	09
NAWILIWILI BAY, KAUAI	-0	32	KAHULUI, MAUI	-1	48
PORT ALLEN, KAUAI	-0	32	KIHEI, MAALAEA BAY, MAUI	-0	14
HALEIWA, OAHU	-1	36	HILEI, HAWAII	-0	59
HANAUMA BAY, OAHU	-0	55	HILO, HAWAII	-0	24
KANEHOE BAY, OAHU	-1	35	HONUAPO, HAWAII	-0	24
LAI, OAHU	-1	48	MAHUKONA, HAWAII	-0	24
WAIANAE, OAHU	-10	16	KEALAKEKUA BAY, HAWAII	-0	16
WAIMANALO, OAHU	-1	15			



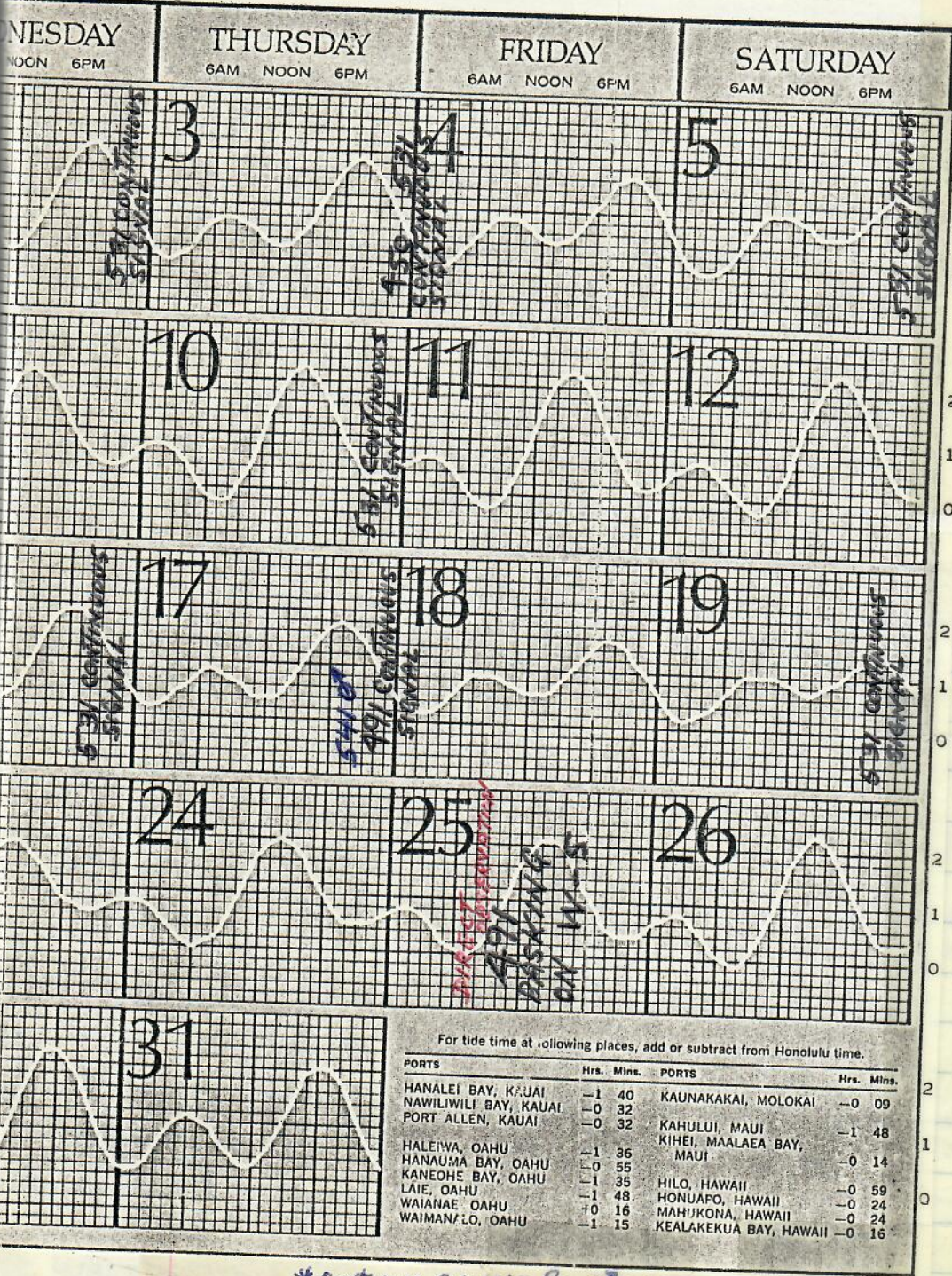
START OF SCHULMASTER MONITORING - 1 hour/DAY

JULY 1980 TIDE CHART



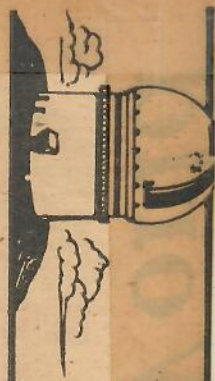
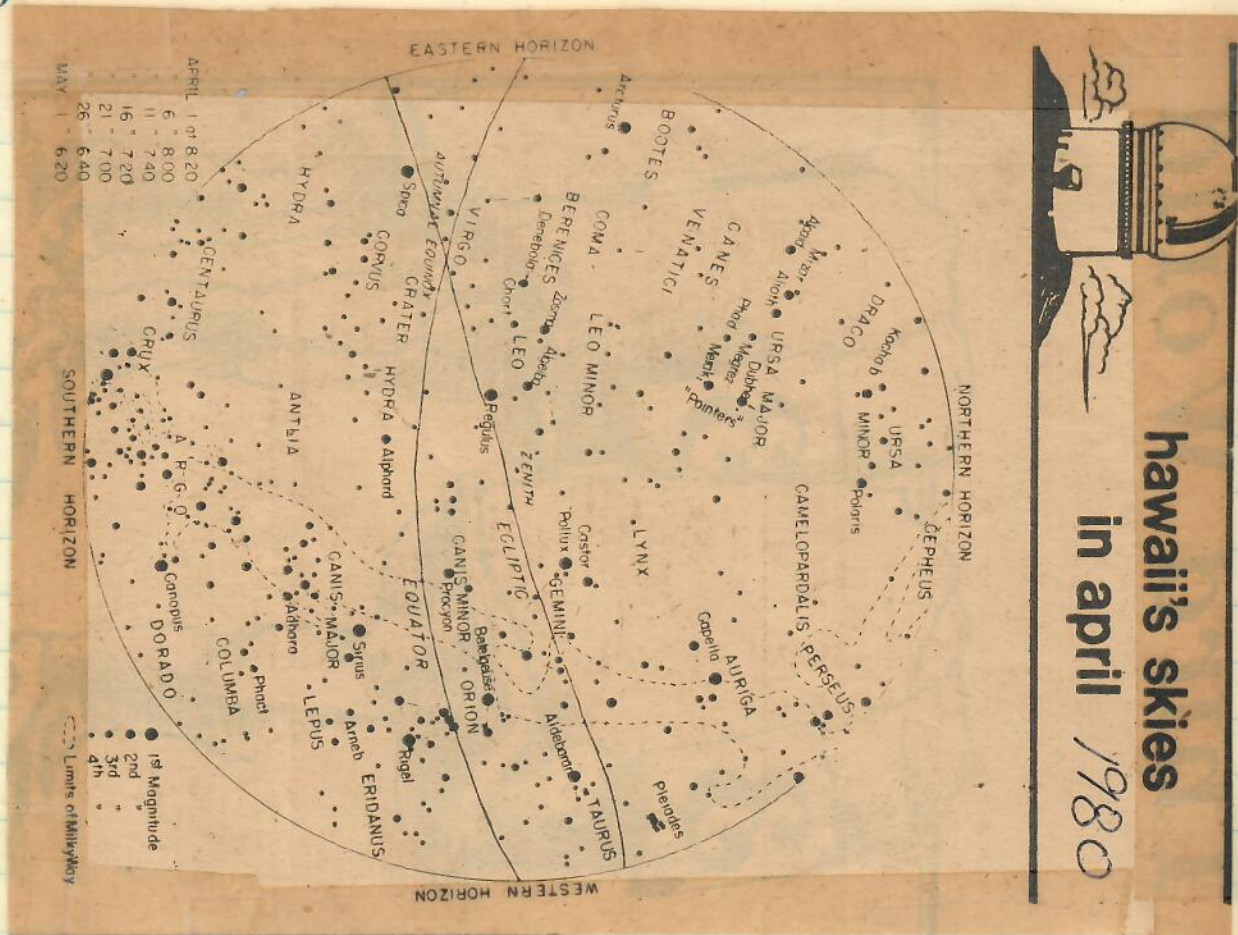
START OF BOTH ITTNER MONITORING

TIDE CHART



* CONTINUOUS SIGNALS FOR DAY-NIGHT EVENTS

* "CONTINUOUS SIGNALS" ONLY RECORDED ON THIS CALENDAR FOR NOCTURNAL EVENTS (PRESUMABLY NESTING)



hawaii's skies
in april 1980

- 6/6/80
- 6/7/80
- 6/8
- 6/9
- 6/10
- 6/11 We
- 6/12 T
- 6/13 Fr
- 6/14 Sa
- 6/15 Su
- 6/16 Mo
- 6/17 Tue
- 6/18 We
- 6/19 Thu
- 6/20 Fri
- 6/21 Sa
- 6/22 Su
- 6/23 Mo
- 6/24
- 6/25 We
- 6/26 Th
- 6/27 Fri
- 6/28 Sa
- 6/29 Su
- 6/30 Mon
- 7/1 Tues

The chart shows the sky from horizon to horizon as seen from the latitude of Hawaii during April in the early evening.

The table of dates and hours indicates when the chart will coincide with the sky. To use the chart, hold it overhead with horizon directions on the diagram corresponding with those of the true horizon.

Chart by E. H. Bryan Jr.; astronomical information by Walter Steiger, Hawaii Science Center, Bishop Museum.

Mercury will be visible in the early mornings before sunrise above the eastern horizon, becoming brighter during the month and reaching a magnitude of -0.6 by the end of the month. The greatest elongation west occurs on April 2.

Venus continues as our bright "evening star" in the western sky, reaching a magnitude of -4.2 by the end of the month. Its greatest elongation east occurs on April 5.

Mars continues to be visible in Leo as a bright reddish object, gradually diminishing in brightness from -0.3 to +0.4 magnitude at the end of the month. On April 24, Mars will be 2 degrees north of the moon and on April 29, it will be 1.8 degrees north of Regulus.

Jupiter will be a bright object (magnitude -1.9) in the western sky after sunset, very near Mars and the bright star Regulus, of the constellation Leo. By 10 p.m., it will be almost overhead. On the night of April 23, the moon passes within 1 degree north of Jupiter and 0.3 degree of Regulus.

Saturn follows Jupiter across the sky, lagging by about 20 degrees and is not nearly as bright as Jupiter or Mars, having a magnitude of about +1. The moon also comes very close to Saturn. In fact, at about 7 p.m., April 25, Saturn will be seen from Pacific locations as if passing behind the edge of the moon. However, since sunset is at 6:55 p.m., it is doubtful that the sky will be dark enough to see Saturn.

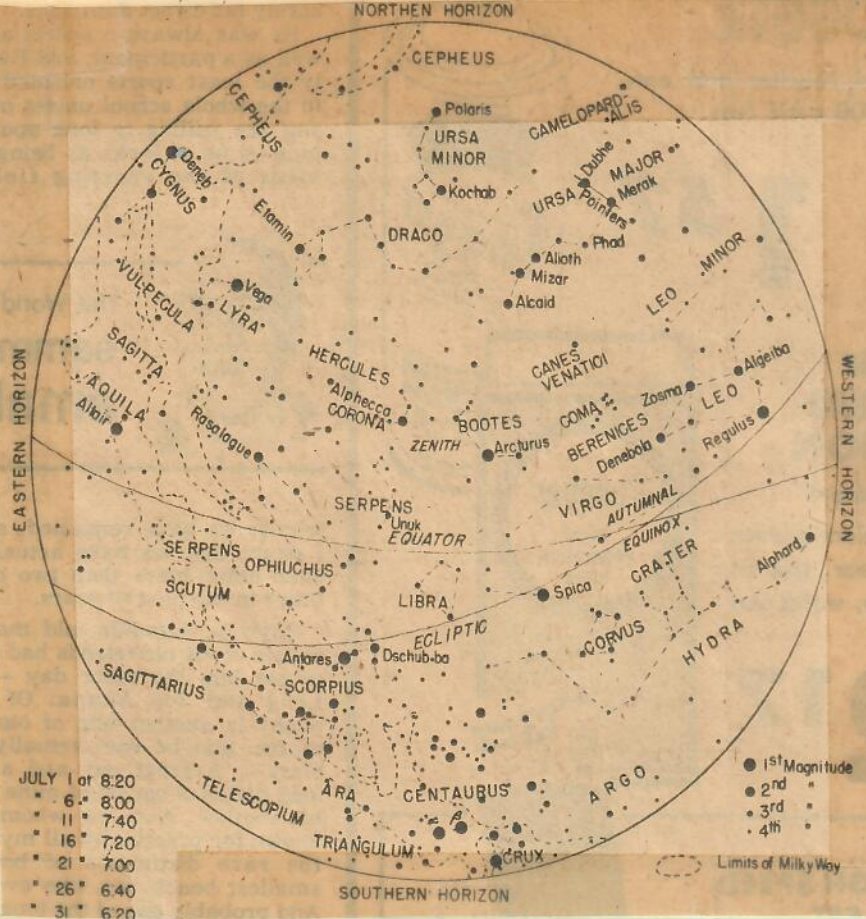
Phases of the Moon:

- Last quarter — April 8
- New moon — April 14
- First quarter — April 21
- Full moon — April 29

The current show in the Bishop Museum Planetarium, "A Gathering of Worlds," which describes the unusual motions of Jupiter, Mars and Saturn now taking place, continues until May 4. For show times and other information, call Bishop Museum, 847-3511.

CLIMATIC

DATE	SEAWATER TEMP.	OBSERVATIONS
6/6/80 Friday	-	~ 10 kts Sunny
6/7/80 Saturday	-	19 kts - Sunny
6/8 Sunday	-	light winds - calm seas - sunny
6/9 Monday	-	some "south-west" swell
6/10 Tuesday	-	
6/11 Wednesday	-	Moderate trades sunny - choppy seas - shirt rain
6/12 Thursday	27.2°C (stere)	~ 3 AM Gusty NE trades - severe showers AM
6/13 Friday	-	AM: Very strong gusty wind accompanying regular rain showers - cool day lots of overcast - air temp 24.5 PM: showers
6/14 Saturday	-	AM - a few showers; cold wind - very windy; Wind up strong from NE PM - pour rain after dark
6/15 Sunday	~ 26.2°C (stere)	Gusty NE wind - sunny skies; PM - winds have decreased somewhat AM night air temperature 24°C
6/16 Monday	-	Moderate NE trades - no rain
6/17 Tuesday	-	Very gusty trades - rough seas
6/18 Wednesday	-	Sunny overcast skies - passing gusty rain showers - short calmer periods with strong upwds.
6/19 Thursday	26.5°C	moderate to strong trades - sunny skies no rain.
6/20 Friday	26.2°C (anoy)	Wind down - light - to moderate light AM high cloudy overcast - pleasant
6/21 Saturday	-	light NE winds - calm seas - mild
6/22 Sunday	-	light breeze in tent. A few short rain showers
6/23 Monday	-	
6/24 Tuesday	-	(Almost glassy edlm; almost no wind - very sunny. PM - light wind S-SW.)
6/25 Wednesday	27.5°C	very light NE winds - calm seas - sunny & hot (Moon low and yellow - 0355h) light NE - sunny - hot (Moon set - 0410h)
6/26 Thursday	28°C	light winds, calm seas - sunny & hot
6/27 Friday	28.5°C	Light winds, some short showers "glassy" - Very hot in tent at east -
6/28 Saturday	28°C	Light NE wind (breeze) - Sunny and Hot.
6/29 Sunday	28.2°C	Light winds - slightly E; A few short rains late afternoon
6/30 Monday	-	Light to Light moderate trades - a few rain showers AM - sunny
7/1 Tuesday	-	



hawaii's skies in july

The chart shows the sky from horizon to horizon as seen from the latitude of Hawaii during July in the early evening.

The table of dates and hours indicates when the chart will coincide with the sky. To use the chart, hold it overhead with horizon directions on the diagram corresponding with those of the true horizon.

Chart by E. H. Bryan Jr.; astronomical information by Walter Steiger, Hawaii Science Center, Bishop Museum.

Mercury passes between the Earth and sun on July 11, in a movement called an inferior conjunction, as it continues its orbital motion about the sun. Since Mercury will be relatively near the sun, as observed from Earth, it will be difficult or impossible to see most of the month.

Venus, which has been such a brilliant "evening star" since the first of the year, now appears in the morning sky just before sunrise and will continue to be a "morning star" for the rest of the year. It rises earlier as the month wears on, rising almost three hours before sunrise by the end of the month. Its brilliance will reach a dazzling magnitude of -4.2 around July 22.

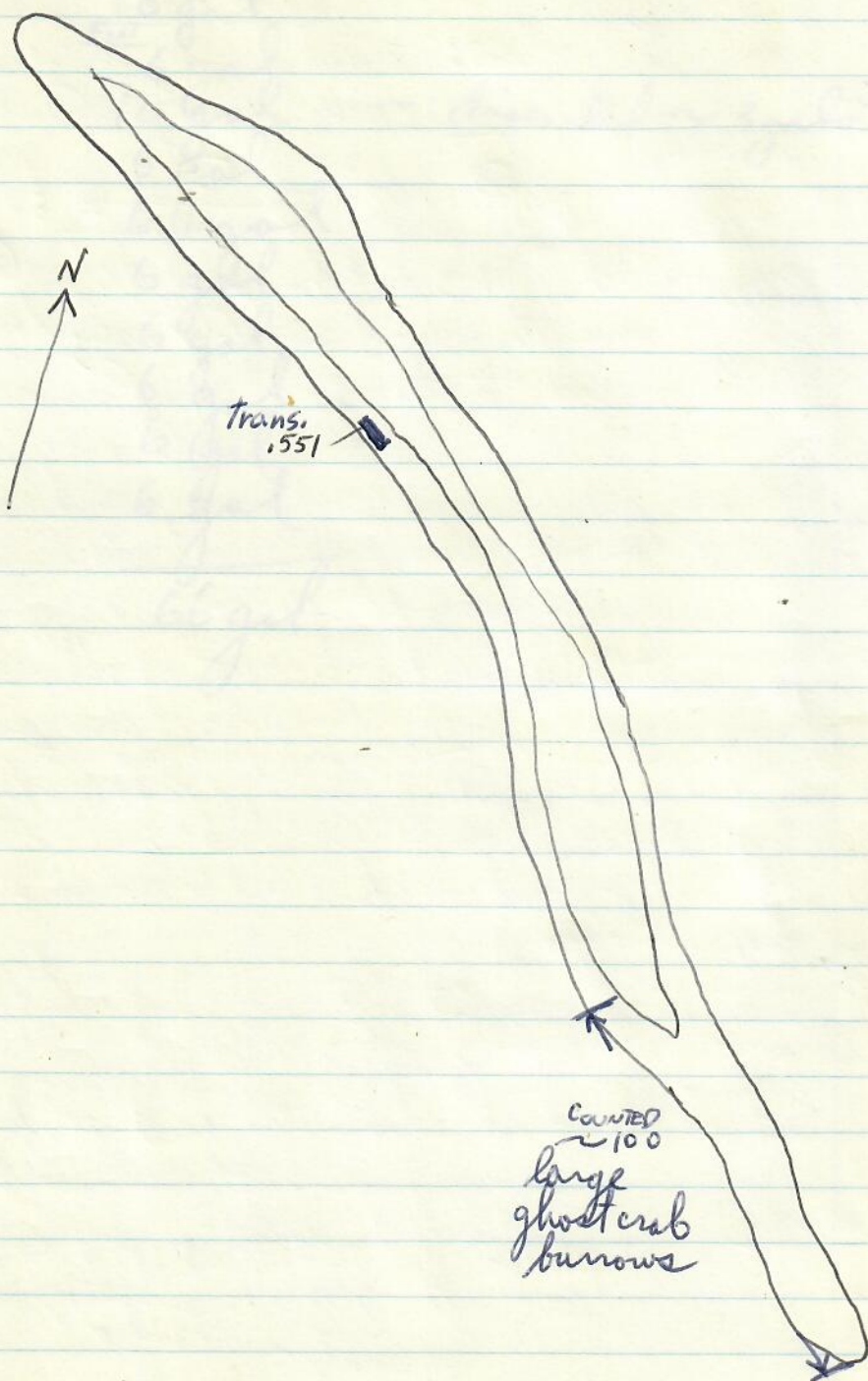
Mars will become a little less "exciting" than it has been during the last six months, being found high in the early evening western sky with a

magnitude of -1.3. Jupiter, now the "evening star," will be the brightest object in the western sky after sunset, with a magnitude -1.3.

Saturn, being found between Jupiter and Mars, will be exactly midway between the planets at about 14 degrees about July 24. Saturn will be about the same brightness as Mars but can be distinguished by a lesser reddish hue. At about 9 p.m., July 16, Saturn will be observed from some parts of the Pacific, although it is doubtful whether it can be seen as far south as Hawaii.

- Phases of the moon:**
 Last Quarter — July 4.
 New Moon — July 11.
 First Quarter — July 19.
 Full Moon — July 27.

A new show at the Bishop Museum Planetarium, "Stars Over Hawaii," dealing with Hawaiian lore of the sky and use of the stars by ancient Polynesians, will begin on July 1. The facility's observatory is open for free public use during evening show times on Wednesdays, Fridays, Saturdays and Sundays. For information and a complete schedule of showings, call Bishop Museum, 847-3511.



GASOLINE & OIL LOG

6/7-6/8	6 gal	
6/8	6 gal	
6/11	12 gal	- discarded ~ 3 gals J. Parrish's ethyl-dirt
6/16 Monday	6 gal	
6/19 Thurs.	6 gal	
6/21 Friday	6 gal	
6/23 Monday	6 gal	
6/26 Thursday	6 gal	
6/27 Friday	6 gal	
6/30 Monday	6 gal	
	<hr/>	
	66 gal	

PHOTO LOG

- ROLL NO. Dates Subjects
- 1 ASA64 ELW 6/6/80 ~#20: nihoa aerial, Trig aerial, 6/8 W-S
 Dizon w/balls; Basking turtles w/teleso; flash of TRANS 193 (351) 2400, 2401
 W-S view; (NO green paint) 1160
- 2 ASA64 ELW 6/8 Sunday - TRANS 194 ♂; TRANS 195 ♀; 2-3 of me w/195;
 (Green paint) (GREEN PAINT) (450)
 Area views of W-S on 6/9 morning; 6/9 Trig (300) 3570-3571
 FWS 665 off 3570 w/transmitter 6/192; Area photo of Trig; 6/9 W-S basking
 TC 18 turtles close together; Whittow by radio at Tern; Campsite
 on East; Basking w/albatross; Tent-stere; 6/12 tent & Steve w/A;
 Steve by radio gear w/A; Seal w/pup; 2 Baskers at SEP; Basker
 hauling out; 6/13 Basker at SEP 5:45 PM East - remainder of roll.
- 3 ELW ASA64
 3A clear view of East looking to the east.
 4 ASA64 ELW 6/14 Baskers at SEP; Molting seal (speed malfunction); 15-20 grey sharks moving
 in circles off area 7-8. 6/15 Seal w/pup w/Turtle w/engine block;
 Chenopodium close-up; 55mm of SEP basking turtles. Many photos of 3606 - missing right hind limb b
 area (1) nesting; r#20-20) Japan albatross sitting by bottles.
 Flash of me by radio; flash of TC 25 (3511) by concrete block
 with seabirds; Kaimi at Tern Island; Turtle stounded on Trig
 with net around neck (went to exposure "3")
- 5 ASA64 ELW (250) telephoto - 6/20
 School of sharks with Laperouse limrock in the background; Masked
 Boobie in the foreground with basking turtle in the background;
 Family of boobies chasing basking turtle back in the water; 6/21 Andy
 by radio gear; Sue by radio gear; Gekko by pole; Baskers at SEP
 with 250 tel; dead shearwater head sticking out of the sand.
- 6 ASA64 ELW 6/22
 6/22 mark seals at Laperouse; Boobies on Little G.W.;
 6/23 Andy at Tern station; Gekko on pole; Flash
 photos of TC 42³⁶⁵¹ and TC 4 by mark seals;
 Tent with 250 tel. 3651, 3652
 (SA seal lying on bamboo 3649, 3657)
- 8 ASA64 ELW 6/25 - Gekko in box; East-overview; copulation off w-s; seals with glass
 ball; young boobie on surf board; 6/26 AM TC 45.
 nesting; 6/26 PM turtle trackers in Boston whaler; 6/27 -
 Antennae on Tern facility, Trig from Boston Whaler,

Roll No

ROLL 8
(CONTINUED)

ROLL 9
ASA 64



BANDING D
 BAND NUMBER
 AGE OF BIRD:
 BANDER: 11
 C/
 BANDING LOC
 RECOVERY I
 LOCATION:

ON BEHALF OF
 REPORTING T
 BIRD WILL BE
 BANDING LAE



<u>Roll No.</u>	<u>DATES</u>	<u>Subjects</u>
ROLL 8 (CONTINUED)	6/28 TC 3 ³⁵⁷⁶ ₃₅₇₇	basking at NEP; TC 48 (2589, 2590) Flash by Frigates; Dead male in Area 12
		Turtles aggregating close to shore at W-S?
		TC 48 Flash by frigates 1160, 2400, 2401
ROLL 9 ASA 64	6/29 - 6/30	Seal with scars at SEP; bottle/shovel line of East at sunset; 351 male basking on W-S; 3 pups by seal on W-S; area view of W-S;
	7/1/80	Personnel by Justman's plane (photo by John Andree); TRIG & East Aerial during departure

Certificate of Appreciation

Awarded To



GEORGE H BALAZS
PO BOX 1346 CCCCNT ISL
KANEHE HI 96744



BANDING DATA:

BAND NUMBER: 568-71220 KIND OF BIRD: BLUE FACED BOOBY SEX: UNKNOWN

AGE OF BIRD: IT WAS TOO YOUNG TO FLY WHEN BANNED

BANDER: IT WAS BANNED BY PERSONNEL OF US NATIONAL MUSEUM
C/O R CLAPP NFWLAB RM E601 WASHINGTON DC 20560

15 yrs old!

BANDING LOCATION: NEAR WHALE-SKATE IS FFS HI

DATE: 06/13/65

RECOVERY DATA:

LOCATION: E IS FR FRIGATE SH POC

FILE REF.: 24256

DATE: 06/25/80

ON BEHALF OF PROFESSIONAL AND AMATEUR BIRD BANDERS THROUGHOUT NORTH AMERICA, THANK YOU FOR REPORTING THE BAND NUMBER AND RECOVERY INFORMATION NOTED ABOVE. THE PERSON WHO BANNED THE BIRD WILL BE NOTIFIED OF YOUR REPORT. THE DATA WILL BECOME PART OF THE PERMANENT FILES OF THE BIRD BANDING LABORATORY.

24-hour continuous monitoring
Diving DATA

	FEMALES				MALES			
10-11 JUNE	200 0828- 0946	450 0755- 0838	491 0747- 0658	531 0744- 0850	351	361	511	541
(New moon)								
N =	152	80	51	77	74	78	119	104
RANGE =	1-42	1-85	1-112	1-96	1-74	1-65	1-75	1-94
21-22 JUNE								
(FIRST QUARTER)								
N =	90	66	34	62	61	24*	—	93
RANGE =	1-36	2-46	4-71	1-61	1-115	1-21*	—	1-58
29-30 JUNE								
(Full moon)								
N =	154	73	50	70	70	—	—	108
RANGE =	1-40	1-148	1-61	1-44	1-88	—	—	1-53

METRIC SYSTEM WITH U.S. EQUIVALENTS

METRIC UNIT (1) U.S. EQUIVALENT

LENGTH

millimeter	(mm)	0.04 inches
centimeter	(cm)	0.39 inches
decimeter	(dm)	3.94 inches
meter	(m)	39.37 inches
decameter	(Dm)	32.81 feet
hectometer	(hm)	109.36 yards
kilometer	(km)	0.62 miles
myriameter		6.2 miles

AREA

square centimeter	(cm ²)	0.155 sq. inches
square meter	(m ²)	1.196 sq. yards
are	(a)	119.60 sq. yards
hectare	(ha)	2.47 acres
sq. kilometer	(km ²)	0.3861 sq. miles

WEIGHT

milligram	(mg)	0.015 grains
centigram	(cg)	0.154 grains
decigram	(dg)	1.1543 grains
gram	(g)	0.035 ounces
decagram	(Dg)	0.353 ounces
hectogram	(hg)	3.527 ounces
kilogram	(kg)	2.2046 pounds
quintal		220.46 pounds
metric ton		1.1 tons

METRIC UNIT (1) U.S. EQUIVALENT

VOLUME

cubic centimeter	(cm ³)	0.061 cubic inches
cubic decimeter	(dm ³)	0.0353 cubic feet
cubic meter	(m ³)	1.31 cubic yards
cubic decameter	(Dm ³)	13.10 cubic yards

CAPACITY, CUBIC

milliliter	(ml)	0.06 cubic inches
centiliter	(cl)	0.6 cubic inches
deciliter	(dl)	6.1 cubic inches
liter	(l)	61.02 cubic inches
decaliter	(Dl)	0.35 cubic feet
hectoliter	(hl)	3.53 cubic feet
kiloliter		1.31 cubic yards

CAPACITY, DRY

deciliter	(dl)	0.18 pints
liter	(l)	0.908 quarts
decaliter	(Dl)	1.14 pecks
hectoliter	(h)	2.84 bushels

CAPACITY, LIQUID

milliliter		0.27 fluidrams
centiliter		0.338 fluidounces
deciliter		0.21 pints
liter		1.057 quarts
decaliter		2.64 gallons

G.H. BALAZS

P.O. BOX 1346
KANEHOE, HAWAII 96744

247-6631
395-6409

