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410694

DAILY LOGS

BIKINI - ENIWETOK - RONGELAP FIELD SURVEY

JULY 27, 1964-SEPTEMBER 5, 1964

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The daily notes covering the field portion of the Bikini-Eniwetok -Rongelap Field Survey, July 27, 1964-September 5, 1964, were recorded each day from the field notes of the field staff. The daily notes were summarized, but no attempt was made to interpret or evaluate the individual observations.

Lauren R. Donaldson

Locality: Seattle-to-Honolulu Date: July 27, 1964
Personnel: Donaldson, Palumbo, Welander
McClin, Lewis, Billings

Picked up McClin, Lewis & Billings and drove to the airport for a 0900 departure on Pan Am for Hono. Met Palumbo & Welander at the airport.

Bill of $71.20 for 40 K. of excess baggage handled on a field order signed by Maxine.

Arrived in Hono. 1155 and were met by A.E.C. representative and Keith Allsup, H & N who had just arrived on Pan Am from L.A.

Went direct to A.E.C. - Hono. office where Robt. McCurtain helped us get started through the paper mill. Found our freight had arrived but had not been delivered from the ship. H & N were to pick it up and get it booked on the next flight.

It is obvious that PMR or--someone has not passed the word along the line that we have any priority for all the seats on the plane due out Wed. morning have been assigned to others. McCurtain and his associates in A.E.C. spent the day begging seats wherever they could--finally they were able to come up with eight (8) spaces--but no assurance that the freight would be shipped.

Stayed at the Waikikian Hotel.

Date: 27 July, 1964. Monday.

Donaldson, Palumbo, Welander, Lewis, Billings, McClin left Seattle by PAA for Honolulu at 0930. Arrived Honolulu at 12:10 PM local time (-3 hours). Met Keith Allsup, H & N Las Vegas and Virgil Simpson, AEC Honolulu. Group taken to AEC HQ. 544 Ohohio St. for travel orders, ID badges for forward area, and to check on baggage and other items relating to the trip. Bob McCurtain, AEC Security very helpful in getting us checked in and "squared away." Checked in at the Waikikian Hotel, Honolulu.

Locality: Honolulu

Date: July 28, 1964
Tues.

Personnel: Donaldson, Palumbo, Welander, McClin, Lewis, Billings, Allsup, and John Koranda from L.R.L.

Weather: Fair.

Allsup went to A.E.C. - H & N to work on orders, supply needs, transformers, etc. Rented a car from Avis and went to the University for a visit with Vice Pres. Robt. Hiatt, exchanged chitchat, etc. Then to POFI where we found Jack Marr had gone to England on a fellowship. had a very bad accident that killed two of his children and put his wife and two remaining children in the hospital.

Went to A.E.C. to pick up travel orders and to check on the movement of the freight. Some questions about space for the freight and after much phoning it was decided that we would have to split the load and take a portion with us and the balance would be flown out on the next flight--Sunday.

Palumbo and I went through all the packing lists making the decisions as to which should be loaded and which should be held for later shipment.

Phoned LRB at 1450 and talked to Paul and Joan--be sure and pass the word on each subsequent person sent out with exact schedule so orders can be cut--and space booked. Send info to Robt. McCurtain AEC Hono.

Date: 28 July 1954, Tuesday - Same personnel

Rented car and drove to Univ. of Hawaii to pay visit to Dr. Hiatt, Manager-Director of the EMBL, Eniwetok. Hiatt will be at the lab for a few days, leaving Honolulu Aug. 2. Apparently some support is available at Eniwetok, but not much. Then visited POFI - Jack Morris on a Guggenheim fellowship in England and Mr. Sprague is acting Director. Heard that wife and four children were involved in an auto accident on the Pali Road--two of the children were killed. Did not see Bob. The Gilbert is out on a survey. The new ship, the Cromwell, was also out on an oceanographic survey--Dr. Seckel asked us to drop by on our way back for a seminar on our work in the islands.

At 1:30 P.M. back to AEC HQ to check on our baggage--we traced it to Damon Tract and upon request of the H&N warehouse manager, marked 2400# of baggage to hold because all our baggage might not go on the plane with us on the morrow. Dr. Donaldson placed a call to the lab and talked with Paul Olson about various things including: directions to Stan Gessel to facilitate his passage through Honolulu; reservations at the Waikikian; all travelers to contact Bob McCurtain immediately upon arriving in Honolulu; extension of our plant

28 July 1964, Tuesday

quarantine permit; and the baggage problem. Joan Catoni also was on the line.

Contact: Bob McCurtain, AEC
544 Ohohio St.
817-341 ext 158

John Koranda-LRL-arrived today.

Locality: Hono & westward. Date: July 29, 1964 Wed.

Personnel: Palumbo, Welander, McClin, Billings, Lewis & Koranda. Allsup and Donaldson in Hono. Weather: Fair.

Called at 0400 for a 0500 pick up with departure scheduled for 0700. Arrived at Hickam check in baggage had a bite of breakfast and Allsup & Palumbo went to check on amount of freight that had been loaded--found that none of our freight was aboard. After a hurried check of possibilities it was decided that Donaldson & Allsup stay in Hono and battle the "paper mill" and the rest go on and get set up at Eniwetok as fast as they could. Left at 0730--with our clothes, etc.

Allsup and Donaldson started making the rounds--found that Whalen--asst. MATS traffic manager had pulled our freight off the flight--after it had been scheduled--"because we had no authorization." AEC, H & N, JTF-8, etc., etc. had no authority to put people or freight on the flight.

Went to A.E.C. and got a copy of USAC Berkeley, Calif. to Commander Pacific Missile Range Point Mugu, Calif. p232100Z with info to Pacmisran Liaison Officer Hickam, etc., etc. No action had been taken on the request by any Navy or PMR agency. Called Ernie Campbell to call Cdr. Graves, Pt. Mugu to try and get some action.

Kept the pressure on every contact we could find during the

July 29, 1964 - Wed.

day by late-evening Mr. F. Tim P.M.R. air cargo promised to get our freight out on a flight leaving at 0220 July 30 --will have to wait and see.

Date: Aug. 29, 1964, Wednesday

Same personnel--plus John Koranda LRL

Picked up at 0530 by H & N and to airport. Checked in through MATS and after breakfast Allsup and Palumbo ran down cargo--not on plane and notified Dr. Donaldson. We could get no action to expedite matters so Donaldson and Allsup remained in Honolulu to fight this battle without personal luggage which was already stowed deep in the aircraft. The remainder boarded the Northwest craft and left Hono at 7:45 A.M. Arrived Johnston Island 10:30 AM-at terminal met Sgt. Bill Gaines (RadSafe at Christmas Island) who gave us the following information:

J I Base Commander Col. Belville - ext 242

*Capt. Gaseor - operations - ext 433

Cmdr. Clark - Navy (boats) 359

Capt. Gaseor is in charge of logistics and is the man to contact during our JI survey. Sgt. Gaines will assist him and us.

Jack Livingston is Supt. of Supply at JI.

H & N Rad Safe died a few months ago--cause given as heart and liver complications. He was a good friend of the lab and assisted us in the alpha surveys in Aug. 1962 to Aug. 1963.

Left JI 11:26 A.M.

Arr. Kwaj 2:43 P.M. July 30 after crossing dateline.

Left Kwaj 5:12 P.M.

August 29, 1954 - Wednesday

Arr. Fred, Eniwetok 7:15 P.M.

Went through short welcome and taken to billets at Barrack no. 46, reserved for EMBL personnel.

Earl Murchison, U of Hawaii is in charge of the lab and is assisted by Carl Frogner. Their prime objective is to look after EMBL and its scientists and make all the contacts with Global Associates for support. They were very helpful and anxious to see that we get our program going.

Locality: Hono.

Date: July 30, 1964 - Thur.

Personnel: Donaldson & Allsup

Weather: Fair

Day spent in trying to get some action on transportation. Our efforts of yesterday had some results; every agency on the Island is becoming aware of our transportation needs. During the night P.M.R. cargo dept. loaded our freight on a 127 and started it on west. The flight departed at 0400--30 July. Should reach Kwaj during the day and Eniwetok by dark--we hope. Sent a twix to Ralph telling of the cargo flight and alerting him.

Made the rounds of A.E.C., H & N, P.M.R., GTF 8, and Navy (14th Naval District) to try and get space reserved for Sunday's A.M. departure for the seven of us. Sure like begging money for the starving heathens--finally got a promise--that 14th Naval Dist. would give 7 seats on the flight to us for Sunday morning. Hope we have no hitches from now on.

I swear I'll never go on another expedition unless the priority is 1 ++.

H & N provided transportation today by truck, station wagon, etc. They try to be helpful but are limited in their efforts because the Navy at Pt. Mugu has never been very realistic in setting up an operational plan.

Locality: Hono.

Date: July 31, 1964. Friday.

Personnel: Donaldson & Allsup, Bonham, Lowman, Sneddon & Williams.

Weather: Showers.

Picked up a Hertz car and drove to A.E.C. office to continue to work on seats on Sunday P.M.R. flight. By begging and urging we were able to get 4 increased to 6 and finally to seven: cost--10 cups of coffee.

With Bud Bascom driving a H & N car and we in the Hertz car we went to meet Pan Am flight from Seattle. Flight one hour late.

Bonham, Lowman, Sneddon & Williams--no Held--were taken to A.E.C. office for check in, get travel orders. Then out to Hickam to check extra gear and make the rounds again to check on seats and cancel the now extra one requested for Held.

Picked up request for permission to stop at Johnston Island and also Twix of authority to enter Johnston Island. Request is for Palumbo, Held, Gessel, Joseph and Donaldson to visit Aug. 31-Sept. 5 ± dependent upon transportation.

Sneddon tried out film speed and checked with Kodak on proper exposure.

31 July 1954

To lab and conference with the people there re space and support reqts. Went to O in CE office to see Cmdr. Kennedy, but he was not in because of some all nite operations--which we missed. We were told to contact Mr. Scougal of Global who is to assist us with our program reqts. He came to the lab and laid out the facilities available on the island. It appears that the helicopter is grounded and that the 2-20 will be available only at the wish of the O in C. However--T-boat and M-boat reqts can be met within reason and if a 24 hour notice is given for M boats and 48 hours for T boats.

A meeting was held to decide how we can best carry out our program and the following schedule has been set up and okayed.

Date	Site	Objectives
31 July, Fri.	Fred	Clean up lab and prepare for field trip.
1 Aug., Sat.	Glenn - M-boat Lunches (req'd)	Collection and observations - fish, Coenobita, plants, sea cucumbers, algae, soils, plankton, tree cores, Birgus (Koranda)
2 Aug. Sun.	Fred	Process samples from Glenn
3 Aug. Monday	David (Lunches req'd)	M-boat--general collections + Launch as for Glenn
4 Aug. Tues.	Fred	Conference wih new arrivals and unpacking baggage and setting up program and eqpt.

July 31, 1964 - cont.

Checked in at Sick Bay as requested and were given shots for Cholera. McClin also given typhus vaccine--cameras were also registered with Security.

Rest of day spent going through lockers, trunks, shelves, etc. to clear out old, unusable gear; cleaning the place up and trying to assemble sample collecting items for the Glenn survey.

Aug. 1, 1964. Same personnel.

Left for Igurin (Glenn) 8:10 A.M. by M-boat, arrived about 8:45 A.M. Went ashore with gear on truck. Collected soils, land plants, algae, fish and invertebrates.

Fish were collected in a shallow pool just inside the outer reef.

General appearance appeared to be normal with lush growth of vegetation in healthy condition, lots of fish and invertebrates around the island, many birds--sooty, fairy terns and 2 species of shore birds. The sooty terns were nesting near shore in some numbers with eggs and young in several stages of development. Very good opportunity for photos of nests and young. (See Palumbo's notes for details on vegetation.) Many Coenobita, shore crabs and coconut crabs here.

Left for Fred about 4:10 P.M. and arrived about 5 P.M.

Aug. 2. Sunday. Same personnel.

Processed samples from Igurin.

Plane with six people arrived 1720--but none of ours--false alarm.

Locality: Hono

Date: Aug. 1, 1964
Saturday

Personnel: Bonham, Lowman,
Sneddon, Williams,
Allsup & Donaldson

Weather: Showers

Visited University of Hawaii to get bird books, note books, etc. Went to Bishop Museum to study birds, corals, fish, etc. Tried to visit Dr. Bryant but found he was out of town.

Did last minute shopping, drove up to the Pali spent a quiet day.

Hope nothing has happened to our plane reservations.

[illegible]: Hono. Date: Aug. 2, 1964--Sunday

[illegible]: Donaldson, Allsup,
[illegible], Lowman, Sneddon,
[illegible]ams.

[illegible]alled at 0345 and dressed for 0430 pick up. H & N called [illegible] in two cars. At Hickam checked in to P.M.R. flight #27. [illegible] the day with a hassel with the passenger checkers who [illegible] to tell us we couldn't check cameras, etc. as personnel [illegible]. After a sharp round they backed down and we got our total [illegible] checked in.

Flight left at 0730, stopped at Johnston for 1 hour. [illegible]ity confines everyone to the one small waiting room.

Arrived Kwaj 3:20 P.M. and went to the base store for [illegible] items. Flight delayed until 7:00 P.M because of engine [illegible]e.

Arrived at Eniwetok at 8:30 P.M. with Ralph and Raul at [illegible] terminal with trucks and Jeeps to move the gear and personnel.

Visited E.M.B.L., checked in for bunks, made beds, etc. in preparation for staying awhile.

Dr. Robt. Hiatt came out on the plane with us with three [illegible]iting biologists.

Aug. 3, 1964 Monday--

Left Fred at 0800 for Japtan (David). Drove around island to select sampling stations. General appearance of island one of disturbed habitats. Coconut plantation disrupted by buildings and large areas demanded to make room for buildings, antennas and other equipment throughout most of the island. Only a few small "virgin" forests remain, these composed of large Pisonia-messerschmidia associations and located near the seaward side next to the deep entrance. Before lunch, made collections of soil and plants and others surveyed reef for fish collecting. Raul McClin made gamma surveys with picker lab monitor at 3 feet--readings variable from 200-600 c/m ± 50 c/m at each reading (?). Background not determined yet (?).

Lunch at 11:30 at mess hall here on Japtan. After lunch poisoned at northeast side of island in fast flowing water about 150 yds. from Nickajack trail. Collected 1 1/2 fish! Welander and Murchison (U. Hawaii) and Palumbo each placed 1 gallon fish poison in cubitainer on bottom--2 to 4 feet of water. Tide and currents too strong--Palumbo and Billings to reef edge for algae collection--footing difficult and tide too strong to swim--algal population very sparse from shore to reef edge, a distance of 300 yds. Collected a few species for identi-

fication and only two for analysis. Did not get to reef edge because of heavy surf. Lewis and Murchison collected plankton from pier; drifted net for 1 hour--poor collection resulted. A poor day all around except for the plant collection and soil pit (#3) samples. Also collected 3 sea cucumbers in algae collection area and 4 coenobitas at southern end of island (Welander). While waiting for M-boat, collected algae (Lyngbya) in lagoon near pier. Arrived Fred at 4:20. Put samples away for later processing and to clean up for dinner at 5:30-6:30 P.M.

After supper to lab to work up plant samples while waiting for the second group to arrive from Honolulu.

Group arrived at 8:30 P.M.: Dr. Donaldson, Lowman, Bonham; Keith Allsup, H & N Las Vegas; Hill Williams and Jim Sneddon, U.W. Billeted in same barracks as rest of group. Retired at a late hour after reviewing events to date.

Locality: Eniwetok Atoll

Date: Aug. 4, 1954 - Tues.
Weather: Fair

Personnel: Palumbo, Sneddon, Bonham, McClin, Williams, Allsup, Welander, Lowman, Lewis, Billings, Donaldson, Koranda (L.R.L)

Started the morning with a group conference where all hands were invited to make suggestions and comments on operational schedules. Ralph brought the newcomers up-to-date on reports of local import.

Palumbo, Allsup and Donaldson called on Commander C.L. Kennedy who offered every assistance available to him. Cdr. Kennedy introduced us to Mr. Serafino, Resident Manager for Global Associates, who also offered every assistance. For support we are to deal with Mr. H.D. Scougal, manager for Maintenance and Engineering.

All new arrivals had to check at Hospital for cholera shots.

Security Dept. was contacted where Mr. D. Courtney gave permission to use the shotgun for collecting birds. He even produced the riot gun left from previous expeditions. The gun is in good condition. If we had known we could have saved much time--and money--getting a new one.

The freight shipped from Hono Friday morning had been put in the warehouse at the airport but Ralph had not been informed of its arrival nor had the Twix we sent been delivered to advise him.

A flat bed truck was obtained and all the boxes transported

to building #115 where they were unpacked and the contents transferred to EMBL.

Request was made for "M" boat for a trip to Runit Island for tomorrow.

Locality: Eniwetok Atoll, Fred, Yvonne. Date: Aug. 5, 1964 Wed.

Personnel: Palumbo, Lewis, McClin, Allsup, Welander, Lowman, Billings, Sneddon, Williams, Bonham, Donaldson & Koranda. Weather: Rains.

Radiation level(s): McClin--survey meter #2651 at 3' 1" max. average ground level .34 m4/hr at 3' max. average 0.31 mr/hr. for B+γ average at ground level .39 mr/hr.

Entire party went to Yvonne (Runit) Island by "M" boat for a major collection. Two members of the U. of Hawaii E.M.B.L. crew went along to work on their special problems.

Welander & Donaldson collected fish north of the island with very good success. Large numbers of big goat fish and convict surgeon fish were collected--no groupers were captured --gray shark present.

Palumbo collected land plants and algae. Plants and soils were obtained on the lagoon side of the Cactus crater. Algae were collected from the edges of Cactus and LaCrosse craters as well as the small deep crater. Lagoon collections of algae from a coral head near south end of island. Algae collected from the channel about 300 yards south of the island.

Lowman--(2) rats obtained about 200 yards north of the dock site. Clams collected from new coral growth in 20± feet of water. Many fish were seen about the coral head. Seven clams, five large cucumbers, snails obtained. Area had been destroyed and new growths were evident everywhere.

Aug. 5, 1964 (cont.)

Bonham found fewer sea cucumbers than he had expected and felt that the destruction from the tests had only partly healed.

Lewis made extensive plankton tows from the "M" boat.

Soils were obtained by Billings 100' west of the Cactus crater. Soils at 1" increments to 10"s for quantitative studies and one 4" soil core was driven. A well point was hammered 8' into the center of the island--no water was obtained.

Locality: Eniwetok — **Date:** Aug. 6, 1964 - Thurs.

Personnel: Same — **Weather:** Showers in A.M.

P.M.R. event this morning so we were a little late getting started.

Talked to Dr. Hiatt who agreed that our support should be arranged by one person from our group--not the U. of Hawaii crew who have enough to do to take care of the needs of EMBL. Talked at length with Mr. H.D. Scougal, Global Associates outlining our schedule and needs in the way of support. "M" boats will be made available for trips to Rigili, Engebi, and for water-sediment use. A "T" boat and "DUKW" will be available for a trip to Bogombogo for next Monday. The reef is such that an "M" boat cannot get into Bogombogo.

A group meeting was held to (1) outline administrative procedures, (2) agree on the use of the original names for all islands rather than the T.E. code names that have been used, and (3) to organize daily reports for each individual investigator and the group log.

Keith Allsup announced that he planned to return to Las Vegas for he felt he could not be very helpful to us out here. A.E.C. is just another agency, H & N a naughty word.

August 6, 1964 (cont.)

John Koranda packing to leave for home--LRL--on tomorrow's plane. He was able to get most of the samples he needed--except a deep water sample and photo of the atoll from the air.

Cdr. Kennedy does not want to fly the L-20 and the chopper is out of commission.

Locality: Rigili Island. Date: August 7, 1964.

Personnel: Same. Weather: Fair.

Water conditions: Fair.

Palumbo & Billings collected land plants in the Pisonia grove at the north end of the island in the same location as soil samples were obtained. Land plants generally in good condition and growth luxurious. Exceptions were chloratic Messerschmidia plants at the northern tip next to shore, and badly chewed up Guettarda plants in the same area. Collected algae in pools at the northern tip of the island both on the lagoon and seaward side; lagoon side with few scum algae mostly adhering to dead rock and debris,--seaward side in the coral gardens contained several species of algae, including Halimeda, Lyngbya, Laurencia and Dictyota.

Locality: Eniwetok-Rigili

Date: Aug. 7, 1964
Friday

Personnel: Bonham, Palumbo, Welander, McClin, Lowman, Billings, Lewis, Sneddon, Williams, & Donaldson.

Weather: Showers

Radiation levels: McClin reports a max. average radiation level of 0.024 ± 0.005 mr/hr for B-8 radiation.

Trip to Rigili was delayed two hours because of expected missile arrival--called off. "M" boat 379 had engine trouble, no gasket on the front ramp, really a pile of junk.

The island has grown over with a dense tangle of vegetation, birds swarm about in great numbers, new coral growths cover the reef flats. A few old scars remain but one would have to know where to look to find them.

Birds--noddy and sooty terns many, fairy terns few, 10 bristle-thighed curlew, and 1 reef heron. Lowman shot 2 noddy & 2 fairy terns for samples, no rats were collected.

Fish--goat fish, convict surgeon, groupers and 1 large jack were used for samples. A number of fish were preserved.

Plants on Rigili have made a remarkable recovery. Coconuts that had been badly burned were in full fruit. Messerschmidia merinda, guettardia and pisonia trees were covered with a tangle of Ipomea making it impossible to follow the old cutout sections on the island.

August 7, 1964 (cont.)

Plankton tows of two hour duration, seven separate tows pooled into one sample. Tows were from east of the island with the "M" boat drifting.

"Invertebrates of the regular sampling series were scarce on Rigili as they have usually been. Samples were taken of Holothuria leucospilota (3), Graspus graspus (3), Ocypode ceratophthalma (3), Dardanus (?) and coral (acropora and Fungia). Lacking in the sample were tridacnid clams, spider snails, coenobita, and Birgus.

Locality: Eniwetok

Date: August 8, 1964
Saturday

Personnel: Same as yesterday.

Weather: Rain

General processing of samples and working up notes on yesterday's collections at Rigili.

Sneddon and Williams working on the T.V. script that they started yesterday. 50 feet of black and white film to be sent back to the Univ. showing various steps in field work, was described as to sequence and work in progress.

Copy of a Twix Sanders to Gooding, Trust Territory requesting info on (1) exact arrival date of Ran Annim, (2) is water needed? (3) additional food required? (4) advise. Copy of Twix attached to this log.

Palumbo and Billings went to Parry Island with U. of Hawaii group in EMBL launch. The balance of the U. of W. crew that have an interest expect to go over to Parry Is. tomorrow and then on to Japtan.

Lowman suffering from wasp stings. McClin out of action from too much heat.

Soils statement left from yesterday, "Soil samples for radiation measurements collected beneath a young pisonia tree in soil characteristic of the island center. Samples are in one-inch increments to 10", supplemented with litter and bulk

density samplings. Outline map of vegetation was constructed, showing location of soil pit.

Two foreign bodies arrived today right on target. Twenty-six minutes required for the 5,000 mile trip. Missile was not seen but the noise of breaking the sound barrier knocked the rust from the building.

Locality: Eniwetok Date: August 9, 1964 - Sunday

Personnel: Same~

A number of visitors are at EMBL working on various projects.

1. Robt. Josephson, Associate Professor, Dept. of Zool., Univ. of Minn. and Steven March, grad. student are working on functioning of primitive nervous systems.
2. Louis H. DiSalvo, Arizona State Univ., Tempe, Grad. assistant working on primary productivity and bacterial populations of small coral heads (living and dead).
3. Dr. Chas. G. Danforth, Glendale College, Glendale 8, Calif., parasites of isopods (Bopyridae)
4. Earl Murchinson, U. of Hawaii, Ph.D. candidate in fish behavior, general manager of EMBL for Hiatt.
5. Karl J. Frogner, Graduate student working for M.S. in herpetology. Asst. manager of EMBL for Hiatt.

Sneddon, Bonham, Williams, Billings, and Donaldson went with other EMBL personnel by launch to Parry and Japtan Islands. We toured the outer reef at Parry. The former rock pit is very much recovered with lots of fish, new coral, snails, etc. The old EMBL is marked only by the footings, the coconuts planted in '56 or '58 are forming a trunk. Most of the buildings are gone. I couldn't find 118. The church remains only as a moldy

rat nest. Better not to have gone to the island.

Japtan has a small camp of Bendix personnel. The island is neat and clean. Coconuts are growing en masse between the old rows. Monitor lizards were abundant. Jim photographed some as Carl Frogner tried to catch them.

Locality: Bogombogo (Belle) Island. Date: August 10, 1964.

Personnel: Same. Weather: Flat calm--hot.

Water conditions: Smooth.

Radiation level(s): McClin--maximum average radiation level (B-γ) was 0.25 mr/hr. Maximum radiation level in one area = 0.7 mr/hr, these readings are ±0.05 mr/hr.

All team members except Lewis who remained at Eniwetok Is. to prepare for the water sediment trip for tomorrow were up at the crack of dawn expecting to depart by "T" boat and DUKW for Bogombogo. After waiting for 3 hours for the DUKW to be repaired it was necessary to change to an "M" boat and get the skiff from EMBL that Carl Frogner operated. We arrived at Bogombogo at 1:00 P.M. late on the tide and departed at 4:30 P.M. and arrived back at Eniwetok at 7:15 P.M. Chow hall closed but Gary had foraged some cold chicken and a couple of loaves of bread.

Fish were collected on the N.E. side of the island with fair success. Two quarts of Chem. Fish. Tox were placed above the "holes." The change of the tide moved most of the water mass out over the reef flat where the kill was complete with about 20 species captured including a member of Myripristis sp. for David Greenfield.

Birds were collected by Lowman, 2 fairy terns and one as yet unidentified shore bird.

August 10, 1964 (cont.)

Land plants. "General impression of excellent growth throughout the island,--some Messerschmidia plants to 15 feet tall, Scaevola, 10-12 feet tall, plants mostly green and healthy except for an occasional yellowing of Messerschmidia and Scaevola and chewed holes in Guettarda. Grasses not healthy looking, especially the Lepturus clumps which often contain more dead than living tissues. At the center and eastern end of the island the parasite Cossytha covered most of the shrubs, making it difficult to penetrate the vegetation. Did not find our old 1954 stakes although four of us roamed the areas staked for some time. A few sprouting coconuts 2-3' were seen and a few clumps of Suriana 3-4' tall were observed. Ipomoea tuba covered the ground and vegetation along with Cossytha, especially at the eastern end of the island. Collected the usual plant specimens in the pit #6 area.

Algae. Samples were collected at the west end of the island and in the fish collecting area N.E. of island. Heavy silting observed in all areas with algal growth poor. Species most abundant were Halimeda stuposa in the lagoon, H. opuntia and Lyngbya in other areas. Some excellent growth of Codium geppii in fish collecting areas, under rocks in dark spots only. Scum algae

covered dead coral in all areas. General impression is that algal species are few in number and not much better than observed in 1961." Palumbo.

Billings took soil samples to 26" at each end of the island. One bulk density sample was driven at each location. Wood sections of principal trees were sawed out.

"Invertebrates appeared to be more numerous than when cursorily observed last year. In the one-hour perusal half way across the outer reef flat from the islet, there were corals and clams on the old coral heads and auger snails and hermit crabs on the sand. There were still no sea cucumbers, spider snails or Hippopus. Tridacna crocea embedded in the coral were small, 2-4 inches. Coenobita were sought widely in both the lagoon-side and ocean-side vegetation, but were seen only near the east end on the lagoon shore against the cut bank. Grapsus on the lagoon side shelf rock and Ocypode on all sandy shores were seen. Estimating the abundance of new coral on the reef: about 1/2 pound per 1,000 feet^2 or about 20 pounds per acre. This estimate was based on pacing and visual estimation of coral weights." --Bonham.

Williams and Sneddon concentrated on photo and words of the activities of Palumbo, including the hacking his way through heavy brush with a machete, hunting for marker stakes, gathering plants

and algae. Sneddon made color movies of the "M" boat landing and birds over Bogombogo island. A total of 800 feet of movie film has been shot to date.

Dr. William B. Jackson of Bowling Green University arrived on today's P.M.R. flight. He started at once getting ready to collect rats.

Locality: Eniwetok and northern lagoon areas

Date: August 11, 1964

Weather: hot--little wind

Personnel: Jackson added to the 10 already present at this tropical paradise.

Water conditions: Smooth

The much-talked about water and bottom sediment collecting trip got underway after many false starts. Lowman, Lewis, McClin--and Jackson, with Sneddon photographing the start left for the northern part of the atoll on a decked over "M" boat. The dredge was lost on the first grab when the cable splice parted. Sediment samples were obtained from the Mike Crater using a closed pipe dredge. Water samples were obtained by pumping. No particular problems were encountered with the pump. Excess water and suspended material above the compact sample were poured off, pooled and constitute a separate, (fifth) sample.

Messages from Trust Territory indicate the Ran Annim will arrive August 12, 5:00 P.M. We really have a busy three days cut out for ourselves to collect at Janet, process the samples, load the ship, install the equipment, etc., etc.

Talked to Cdr. Kennedy--and he suggested a photo flight--so a request was typed up for same--with Thurs. suggested.

Wm. Jackson put out 100 traps on Engebi Island and spent the day observing rats. Returned to Eniwetok Island in evening.

August 11, 1964 (cont.)

Eight gals. of sea water were collected from 5 meters of the bottom in the Mike Crater. Samples were taken with PVC Van Dorn samplers.

Thirty gals. of sea water pumped within one meter of bottom of Mike Crater for radiochemical analysis.

Two half-meter nets and 1 one-meter net #6 mesh towed for plankton samples, all samples pooled.

Location: Eniwetok and Engebi Islands.

Date: August 12, 1964--Wed.

Personnel: Same.

Weather: Hot--few showers.

Water conditions--Smooth.

Radiation level(s): McClin--Maximum average radiation level (B+γ - ground level) was 0.22 mr/hr, maximum radiation measured 1.0 mr/hr. These readings are ±0.05 mr/hr.

Fish samples were obtained from the shell craters north of the island. Tide was dropping and poison was slow to react so after 2 plus hours of collecting the fish were still dying. Many species of fish were collected.

Plankton tows were made in the lagoon by towing the 1/2 meter nets from the "M" boat. 16 tows of 15" each pooled for sample.

Soils. A pit was opened in the center of Engebi Island for soils samples. A well point was driven to six feet deep at the same site, but no fresh water was obtained. Seepage areas were noticed on the north side of the island in the vicinity of the fish collecting area; water was only slightly salty to taste. Wood sections and litter samples also collected.

Lowman: "The sandburr (Cenchrus echinatus) has disappeared from Engebi Island. The principal ground cover includes sedge, morning glory, and seda. The Scaevola and Messerschmidia have grown high and replaced most of the grasslands. Terns were nesting in the Guettarda and Messerschmidia. Birds present in large

numbers were noddy and fairy terns. Reef herons, golden plovers and ruddy turnstones were also on the island.

The rat colony has almost disappeared. The rats appear to be scattered over the island rather than being concentrated in small areas.

In the water, the most outstanding observation is the one I noticed everywhere in the north end of the atoll. Silt is smothering the sedentary organisms. The silt is much worse than in 1961."

Jackson: "Rat traps were set overnight in several habitat areas but were concentrated in the areas of the test building. Evidence of rat sign was limited, but 11 rats were captured. All were the roof rat (Rattus rattus). The previous reporting of the Polynesian rat (Rattus exulans) from the area may have been in error. All rats were autopsied, and two were made into study skins.

No reproduction was indicated, but 3 of the 6 mature females had been bred previously. No tumors or other pathology was evident on general examination. An exceptionally heavy load of Ascaris, like worms was present in the stomachs.

Additional trapping needs to be done in areas of dense morning glory, what areas of dense grass and sedge remain, and in

areas of very dense Scaevola and Messerschmidia growth, there appear to be good rat habitat and may have dense populations. Rattus exulans, especially in the latter area, might be present.

Bonham--"Invertebrates collected include 3 Grapsus near "M" boat landing, 1 22-inch T. gigas and 2 Hippopus from fish poisoning area, on N.W. reef, 4 Coenobita, 3 H. atra, and 3 H. leuco, from shore N. of there, and 3 coral samples from reef off N. tip of islet. The outer reef flat was quite barren except with 100 feet of reef edge where coral growth was good."

Palumbo--"Vegetation covers the island almost 100%. Largest trees are Messerschmidia growing to approximately 18-20 feet. Scaevola plants, also the largest seen to date, to 15' tall. Ground cover mostly sedge, Ipomoea and a composite (to be identified). Another composite, Pluchea, growing to 10 feet along the old roads. The airstrip is completely covered by plants, especially Ipomoea tuba and I. pescaprae. Most of the plants looked in good condition, the usual exception of plants near shore, crossing the airstrip, and in poorest soils.

Samples of plants collected near soil pit no. 8, 200 feet south of the 3 story building. Saw no sand burrs--this is unusual for Engebi.

Algae collected in the seaward tide flats near and in the fish collecting area. Growth of algae good, especially Lyngbya. The area seems to be recovering from the test series."

Williams took a general look at the island and the test buildings. He also helped Palumbo with land plant collections.

Sneddon made colored movies of M-boat unloading, general scenes on the island, fish collecting and rat trapping. He also made black and white still pictures of various activities on the island.

Locality: Eniwetok Island. Date: August 13, 1954--Thurs.

Personnel: Same. Weather: Hot--not much wind.

Water conditions: Fair.

General processing of samples collected from yesterday's and previous field trips.

Capt. Davis of the Ran Annim came over and spent most of the day getting supplies and equipment arranged to go to the ship. Global Associates are getting the generator, reefer, gas, oil, sheets, jam, fresh vegetables, lockers, camp stools, etc. ready to go over first thing in the morning.

Photo mission around the atoll was flown by Cdr C.L. Kennedy in the L-20. The Bendix Co. put their mapping camera aboard with an operator. Sneddon, Williams and Palumbo completed the passenger list.

Packing for the Bikini-Rongelap trip went on during the day. Many critical decisions had to be made on what to take and what not to take. Held, Gessel and Arnold should have been in to help in the preparations--we have done our best.

Boxes of dried samples were mailed to L.R.B. so that Lou and others can start the processing. A note to Lou is enclosed.

Locality: Eniwetok and at sea on the Ran-Annim.

Date: August 14, 1964 - Friday.

Personnel: Bonham, Lowman, Lewis, Palumbo, Welander, Jackson, Billings, McClin, Sneddon, Williams, Donaldson, Gessel and Joseph. And Allen.

Stan Gessel and Arnold Joseph arrived last evening on the P.M.R. flight and are quartered in #46.

All hands up early, had breakfast and started in with full-scale packing. Global provided three flatbed trucks. Generators for A.C. current, 6 lockers for personal gear, freezer, gas and oil, 12 folding chairs, sheets, pillow slips, medical supplies, fresh vegetables, jam, etc. Equipment began to move at 07.30 and by 12.10 the last truck was unloaded and the ship ready to sail by 13.50.

Cleared Eniwetok harbor and were in the sea by 14.10. Ship's officers are:

D.A. Davis - Master

W.P. LeCompte - Chief Engineer

Demetrio Sabado - Chief mate

Jesus Cabales - 2nd mate

Jesus Cosare - 1st assistant engineer

Andres Flores - 2nd assistant engineer

Gregorio Moncopa - Steward

Sea was very smooth with only a few long swells from the southeast. New moon, so except for a few showers, a very beauti-

ful evening.

Quarters were on the after-upper deck for 11 of our group. William Allen, Trust Territory representative, roomed with Mr. Moncopa the Steward, Bonham and Donaldson occupied the one available stateroom on the port side.

Locality: Bikini Atoll, Enyu Island.

Date: Sept. 15, 1964, Saturday.

Personnel: Same 14.

Weather: Hot.

Water conditions: Flat calm.

Radiation level(s): McClin--Maximum average radiation level was 0.03 mr/hr at ground level for total β-γ radiation.

Beautiful sunrise with Bikini Atoll on the port side. Official arrival at Bikini 07.42, 15 Aug. 1964. Anchored 100 yards off Enyu Island at 08.01.

Brief staff meeting and then on shore for collecting--everything came back on board, including glass balls.

Fish collection was made on the lagoon side about the middle of the island. Two sacks of fish were picked up. A number of species that live in the surf were obtained.

Lewis: plankton sampling. Two exploratory 15 minute tows, one near the surface and one at 25 meters depth, were made a few miles west of Enyu Island, just inside the entrace sill. Indication is that surface tows will yield sufficient amounts of lagoon plankton for analysis.

Bonham--invertebrates on the lagoon side were mostly Grapsus (3 collected) and hermit crabs. On the ocean side reef Holothuria atra were abundant, about 1 every 5 sq. feet over most of the 1/5 to 4/5 of the way to the outer edge. Over appreciable portions of this area there were 1 or more per sq. ft. H. leucospilota was more than 1/10 this abundant, and Actinopyga mauritiana were

plentiful. Collected 3 H. atra and 3 H. leucospilota. Coenobita collected near ocean side of airstrip. About 3.10 p.m. took Kodachromes of Enyu and surroundings from about 230 foot tower.

Gessel--Soils and plants sampled during p.m. Great contrasts in vegetation and soils with regard to productivity. Entire island has the appearance of being leveled by bulldozers. Seems to have a beach rock layer at from 3-4 1/2 feet. Soil in many areas is a composite, as a result.

Potential productivity of the island is good and could actually be greatly improved.

Palumbo: Vegetation covers most of the island, except the airstrip; old buildings, signs, etc., are overgrown with rank growth, especially Ipomoea. The condition of most plants was good, especially the green sedge and lush large leaves of the morning glory. Some of the coconut trees were at least 50 feet tall and bear abundant fruit. Plants for analysis were collected near soil pit #9, in a coconut grove 200 yards from the airstrip. Thirty-two species of plants were counted on Enyu, by far the most on any island visited to date. Arrowroot corms were collected near the S.W. point of the island.

Algae on the lagoon side is very sparse. The one exception is Halimeda. Collected algae in three areas: two in the lagoon and one on the seaward side.

August 15, 1964 (cont.)

Rats: Wm. Jackson--a very dense rat population. An ideal situation for extensive studies of a population at such a high density.

All rats caught were Polynesian rats (Rattus exulans). Traps were set out in early afternoon. Most were inspected in the afternoon and again in early evening; about half the total catch was obtained before dark.

Total catch 65. Of the females (N-27) all had perforated vaginal orifices, indicating sexual maturity. Only 2 lacked uterine scars, indicating pregnancy at a previous time, and only 1 was pregnant.

Of the males (N-35) only 5 were not mature. These five were smaller than the mature individuals. Males were, in general, larger than the females.

Possible explanations of population state: this is the non-breeding season, or population pressure has reduced reproduction.

--Atrophied condition of female reproductive tract

--Lack of young individuals

Could support either hypothesis--the high prevalence of uterine scars supports the breeding season hypothesis.

Three skins were prepared. Stomachs, adrenals, and lungs were preserved. No fleas or lice seen (not thoroughly checked for) but mites were found and preserved.

Locality: Bikini Atoll, Bikini Island.

Date: August 16, 1964--Sunday.

Weather: Fair, hot, little wind.

Personnel: Same 14.

Water conditions: Smooth: very little surf.

Last minute collections of rats, etc., finished at Enyu and ship moved to Bikini anchorage. Anchor was up at 10.20 and down again 1 hour later at Bikini Island about 3/4 mile from shore.

In a.m. Lewis and Lowman made plankton tows over the entrance sill in the Wide Passage. Two tows of 15 minutes with Lowman taking part for trace mineral analysis and balance to L.R.L. for radio-chemical analysis.

General reconnaissance of Bikini Island underway after lunch. Landed on the beach and most members tried to break through the jungle-like growth to the outer reef. Palumbo only one that succeeded. Papaya have grown to giant trees 25 to 30 feet high. Only green fruit was seen. Road along lagoon side was followed, with some difficulty, to the campsite of the south end of the island, then to the outer reef.

"Most vigorous and dense young vegetation I have seen on any island. Particularly on good soil, vegetation so dense we could not walk across the Island. Disturbance by man is almost hidden by new growth as viewed from above. Beneath the cover, however, rusting machinery and rotting buildings are much in evidence.

"I believe the Island could grow coconuts very well and could be rehabilitated."--Gessel.

August 15, 1964 (cont.)

A successful ground water well was driven in the Camp Blondy area and several liters of water were pumped from the lens.

"Several plants were observed for the first time. General impression is that vegetation is vigorous and covering all works of man on the island."--Gessel.

Locality: Bikini Atoll, Bikini Island.

Date: August 17, 1964. Monday.

Personnel: Same 14.

Weather: Fair, somewhat cooler, with a breeze.

Water conditions: A little ripple.

Radiation level(s): McClin--The maximum average radiation level for all Bikini Island was 0.14 mr/hr for B-γ radiation at ground level.

Fish were collected just over the sand spit on the seaward side of the reef. The area was marked by extensive growths of green coral. The usual large number of species were obtained. This is the most ideal collecting spot. Water is 2-5 feet deep, with no surge. Ideal swimming and picking up the great variety of fish. Sneddon photographed the fish collecting and such live fish as time permitted.

Gessel: Major morning work was to cut access trail to the steel tower; then, following old road on north to the seaward side of the island. Luxuriant growth of Scaevola along the route, beyond road burn the forest was largely a regrowth of Cordia, Pisonia and Pandanus. The indications were that the old Cordia forest had burned and new growth was from stump sprouts.

Sampled soil and vegetation at two sites:

1. Relatively undisturbed
2. Construction area.

Well points not successful today but will try again tomorrow. Ants, wasps, and soil insects are plentiful, also spiders and mosquitoes.

Palumbo: "The very dense vegetation covers the island completely except for a few bare strips along the old lagoon road. The impenetrable nature of the growth is evidenced by the fact that it required some hours to hack a path from the lagoon to the ocean side. The usual species of plants are present here and all seem to be well formed. New species reported here are papaya and Caesalpinia, a legume, growing in profusion along the old lagoon road. Papaya trees are in a patch, where planted originally on the lagoon side, about 100 yards inland. All trees are very large, 25-30 feet, fruits were all green, suggesting that the rats eat the fruits as they ripen. Old stands of Cordia are present in the center of the island as well as burned coconut trees. Plant samples were collected in the area of soil pit #11 in a grove of pandanus trees bordered by Pisonia and Scaevola. Lepturus was not seen, nor was Cenchrus, the sand burr. The lush nature of the growth indicates a soil with capacity to support food plants.

The algal populations on the seaward reef is excellent, containing many species growing in abundance. The species picture is different on the lagoon side, but again algal growth is excellent on the coral and the submerged wrecks."

Gessel--completed work 8/13/64--this note represents a summary of observations; data analysis must await material processing.

1. Bikini soils are potentially very productive--high organic content after even severe disturbances.
2. Present plant population is vigorous and generally shows little evidence of deficiencies.
3. Most of the island is in a secondary succession as coconut and grass vegetation is gone. Scaevola, Cordia now dominant.
4. Plant and soil insect life seem to be normal.
5. One well produced adequate supply of potable water. Fresh water lens is apparently a good one.
6. Other factors being favorable, Bikini Island could be made into a productive island.

Bonham--Observations on invertebrates were made in the lagoon and on the reef flat. The ocean reef appeared almost devoid of invertebrate life over a region 1/2 to 5/6 of the way from the beach slope to surge channels. Coral heads with fringing growth of Heliopora, a few (about 1/1000 ft^2) T. crocea up to 6" long, predominated the inner third of the reef flat where the water was

about 3' deep. Near the outer surf (within about 100' to 200') scattered small coral tufts (mostly Acropora) were more numerous. Slate-pencil sea urchins were plentiful. Sea cucumbers were scarce. Only one H. atra was seen.

Lowman--The main change I noted on Bikini Island was the marked reduction of the numbers of papaya trees and the regrowth of coconuts. In 1956, we thought all the coconut trees had died, although a few nuts were sprouting. The island has a large amount of arrow root (Tacca). Bikini is not as heavily silted as the islands on the northeast of Eniwetok. On the outer reef near the southeast end of the island almost all of the depressions in the reef contain BB shot. Saw large numbers of noddy and fairy terns (not as many as at Enyu), curlews, crested terns, reef herons and plovers.

The west end of the island remains a sand spit as before. Evidently the spit moves back and forth because the coral to the seaward about 50 yards has been smothered out.

Jackson: Rats were trapped along the edge of the old beach road. Traps were set in both the very open and very dense growths. Roof rats were caught (10 in 17 traps) in all types of vegetation.

Along the trail cut across the middle of the island. Both roof and Polynesian rats were caught. 25 rats in 30 traps. (Sixteen roof rats and 9 Polynesian rats.)

August 18, 1964 (cont.)

Only roof rats were found in coconut grove areas near shore and around the old concrete bunker. Past the tower, Polynesian rats were caught, but some roof rats were caught. Rats were not caught in areas of sparse vegetation.

Roof rats were quite variable in pilage color suggesting multiple origins for the population (in contrast to the situation on Engebi).

Two of 9 adult roof rats pregnant. It appears that roof rats here reach sexual maturity at a larger size (hence age) than elsewhere, but this symptom of a very dense population needs to be checked.

No ectoparasites were found. Three rat skins were made. Stomachs were collected for further analysis. One rat had a small growth on its paw.

Ship left the Bikini anchorage and moved southwest to a point 6 miles on a triangle from the middle of Bikini and Enyu islands to do deep water and sediment sampling. The area selected is southwest of the old crossroads site. (11° 34.0' N., 165° 27.5'E. --165 feet deep). The Ran Annim was allowed to drift with the currents and wind to provide motive power for the bucket dredge. 10 gallons of water were collected from near the bottom with Van

Dorne bottles. Fifty gallons were pumped with the little pump. Four hauls were made with the bucket dredge to obtain sediments. All hauls were successful. Three species of Halimeda and 1 species of Caulerpa were also obtained.

A C^{14} sample was made with temperature, salinity, alkalinity, nitrate, phosphate, pH and chlorophyll determination. Secchi disc reading also obtained. Water for this sample was from 5 meters.

Went to the Ironwood for a movie last night. The Ironwood, arrived yesterday and will remain for a day or so doing some loran work. Seemed like old times to hear the sailor cuss at the movie.

Locality: Bikini Atoll, Amen, Romuk and Uru islets.

Water conditions: Calm.

Personnel: Same 14.

Date: August 19, 1964 (cont.)

Weather: Cloudy--rains.

Heliopora, Porites, Fungia, and a few others. Siltation and debris indicate conditions like those on Runit Island at Eniwetok Atoll.

Jackson--no rats. Trap line was set across eastern half of island Amen in morning and removed in late afternoon. Virtually all the traps had been sprung by hermit crabs.

There was no indication of rats being present on the island. At the east end where the vegetation is most dense and bunkers are present would be the most likely site. No burrows, feces, runways, or other signs of rats could be found. While nocturnal observations were not made, there seems little possibility that there are any rats on these islands (Amen and Romuk) or the several islands to the west.

Lowman--Birds on these islands were nesting and rearing young. Fairy terns, crested and noddy were abundant. Collected fairy and crested terns and a bristle thigh curlew. Observed both wandering tattlers and ruddy turnstones in numbers.

Locality: Bikini Atoll--Namu Is. Date: Aug. 20, 1954--Thurs.

personnel: Same 14. Weather: Pt. cloudy--some rain.

Water conditions: Calm.

We left the Amen-Romuk anchorage at 0804 and arrived at Namu at 0850. We are anchored about one-half mile offshore in clear, light blue water. On our way from Amen we passed by many broken structures. The reefs were covered with iron pilings driven in like a picket fence. Yuro Island, where in 1945-7-8 and 9 we used to have picnics and swim in the beautiful little pool is now a barren sand spit. Not a living plant appears to have grown in the past six years since the tests. The area is one of complete desolation.

On arrival at Namu the entire party, except for Gary Lewis who collected plankton, went ashore. Namu Island looks battered, with many changes since we last visited it. Messerschmidia cover part of the island with open grass-covered areas. Birds are everywhere. Nesting terns, fairy, noddy, crested, fly overhead and young birds and eggs are in evidence everywhere.

Fish were collected on the northwest shore of the island in about the same area as the deep pool where we used to swim and collect Tridacna clams. The pool is gone now; a sand flat with only a few large rocks replaced it.

August 20, 1964 (cont.)

Fish kill was good, mullet, goat fish, convict surgeon fish, wrasse, eels, groupers--and sharks.

Locality: Bikini Atoll--Namu Is. Date: August 20, 1954--Thurs.

personnel: Same 14. Weather: Pt. cloudy--some rain.

Water conditions: Calm.

Radiation level(s): McClin--Maximum average radiation level was 0.28 mr/hr at ground level for B-γ radiation.

Jackson: Rats were not found on Namu Island. The trap line of 30 traps was run through representative vegetation--Messerschmidia, morning glory, grass, etc. By evening, the traps were untouched--so were picked up.

Based on previous observation, that if rats are not diurnal they become active by 1700, the conclusion follows that no rats are present. The habitat seems sufficient to support a rat population both in terms of cover and food. Hermit crab population was very small so was of little consequence in trap disturbance.

Gessel: "Namu Island, which has suffered much damage, probably total destruction of vegetation, is now on a cycle of improvement. Messerschmidia is the dominant vegetation except in the center areas where Ipomoea and sedge is dominant. Soil is beginning to improve through addition of organic matter and essential elements. I personally believe the sea birds are a very important factor. Distinct differences in vigor and color of Messerschmidia on Namu are associated with presence or absence of nesting terns. I hope to substantiate this by analysis of foliage and soil samples."

"About 5" of fine sand now covers the coarse gravel on the recovering areas of the island. This is stabilized by the plant cover and with the help of the birds, should provide a basis for improvement of the environment.

Fresh water was found in a depression at a depth of four feet."

Palumbo: "The vegetation on Namu Island is reminiscent of that on Christmas Island, especially in the extensive grassland areas composed almost completely of Fimbrystilis and dense stands of Messerschmidia bordering the open areas. Occasional isolated Scaevola plants and patches of Boerhaavia were observed and rare clumps of Lepturus were seen. Large areas of Ipomoea in the old crater area were characterized by plants with much wrinkling and thickening of the leaves, especially of Ipomoea pescaprae, the purple flowered variety. A single clump of Pemphis, about 2 feet in diameter and 18" tall was seen, on the lagoon side near the beach line. This is the first record of Pemphis on this trip. Of note was the usually brown Fimbrystilis in the open--but the green large plants of Fimbrystilis under the Messerschmidia trees. These green plants may be a result of the higher moisture content under the trees and the higher nutrient level--or both.

"The algae at Namu I. were especially abundant in the lagoon

but not on the seaward tide flats. About 13 species were identified in the lagoon with Hydrodictyon, Podina, Lynghya and Dictyota the most abundant. Halimeda and Caulerpa were also present. On the seaward flats a few Halimeda plants were seen and Caulerpa dictyota and Boodlea were noted as rare.

Lowman: About one-half of the island missing to the Bravo-Tewa crater. A central grassland area on the island opens to the northeast and is surrounded on the other three sides by Messerschmidia groves. Noddy and fairy terns were nesting in the Messerschmidia. These terns and the crested terns were nesting in the grasslands. The noddys built rough nests on the ground and the area contained many young noddys in all stages of development. Many shore birds were present on the island.

Locality: Bikini Atoll--Namu to Boro to Arji-Emon chain.

Date: August 21--Friday.

Weather: Fair--increasing winds

Water conditions: Increased wave action in P.M.

Radiation level(s): McClin--Boro Island--The maximum average radiation at ground level was 0.47 mr/hr for both B-γ.

Underway at 0745 bound for the Bravo-Tewa crater. The ship stopped in the crater and drifted slightly where an oceanographic station was taken.

Pumping started at 0800 and by 0835, 30 gallons of seawater from one meter from the bottom had been obtained. Also obtained 32 liters of water from the bottom with Van Dorn bottles. The bucket dredge was put down and two good samples of bottom silt were obtained.

Ship was underway for Boro Island arriving at 0905. As soon as the anchor was down all hands except Gary Lewis went ashore in the copra boat. Lewis took six 30-minute plankton tows (2-5 m) with #6 mesh, half meter nets from the pass south of Boro Island and from near the reef inside Boro Island.

In going ashore on Boro the native crew of the copra boat found a very simple landing by going about 1/2 mile north of the reef working through the seaweed of the inner reef, between coral

heads to a protected area about 100 feet from shore. The easiest landing we have ever made on Boro--we left the same way.

Boro Island is still the garbage dump of the lagoon. A big wave or storm must have passed over the island and washed the accumulation of litter on out to sea. Now only glass balls, light bulbs, bottles, etc. litter the island.

As always, large numbers of birds live or rest on the island. We did not take time to set rat traps as the ship moved on as soon as we finished the collections.

Fish were collected with Fish-Tox on the reef flat just seaward of the island. A fair number of fish were collected with a few different ones from the regular run. As in so many locations silt covered the reef, reducing visibility and smothering the coral. New growths of many kinds of coral were observed in the fish collecting areas.

Gessel: "Boro Island is a rock pile with little soil as such. Very difficult to even find an area to sample. The island is covered with vegetation though, and apparently had not been disturbed by the tests to any extent. Birds were numerous and apparently were contributing a good deal to general fertility of this rocky area."

Palumbo: "Land plants were collected by soils men, but did have a chance to look over and photograph the vegetation. The island looked undisturbed. Eight species of plants were seen, most with good growth. The tallest trees were about 15 feet tall (Messerschmidia and Pisonia), the latter often with leaves chewed by insects. Scaevola is abundant as is Lepturus. Others seen were Triumfetta, Guettarda and Ipomoea tuba. One stand of Fleurya, an annual, was seen in a Scaevola thicket.

The lagoon algae consisted of infrequent clumps of Halimeda attached to the almost bare dead coral in the region of heavy surf. A few plants of Udotea and Caulerpa were noted. This is one of the most barren areas seen to date. The new coral growth seemed to be excellent, with the massive encrusting coral being dominant.

On the seaward flats, near shore, 9 species were noted, the most common being Codium and Halimeda; the others were definitely less frequent, and usually mixed with the dominant species. Many species of coral were seen in this area, and probably will continue to increase in numbers of individual colonies, since most of them appear to be actively growing."

Lowman: "At Boro Island 2 fairy terns, 1 brown bobby, and 2 ruddy turnstones. Terns were nesting on the island. Shot and wounded a frigate bird that flew out to sea and could not be retrieved."

Bonham: "The northwest reef flat where most of the collecting occurred is partly oceanic and partly inter-islet in location. There seems to have been smothering because of siltation, judging from the dead centers of most of the coral heads, but most showed new growth peripherally.

Organisms collected were a 42-cm. Tridacna gigas (possibly the only one at the islet), Grapsus (abundant), Coenobita (common under Messerschmidia trees), spotted crab, staghorn coral, blue coral, encrusting coral, sponges, a single Holothuria atra, 3 small H. leucospilata, 3 Tridacna crocea and 1 Hippopus."

The rubble-strewn pass and lagoon shores had Grapsus, but no other invertebrates could be seen on the narrow inshore reef flat.

The Ran-Annim (Aloha) raised the anchor at 1:00 P.M. and started east along the chain of small islets that make up the southern reef. On our starboard bow we passed Boka, Oruk and Aran; each had low, shrub type of vegetation and appeared through the glasses much as I remembered them from previous years. Chieerete

has a tower and made a bunker indicating construction of some scope on this tiny islet. Ruji was green with Messerschmidia and other shrubs. Eniirikku appeared to be severely blasted as if some tests were carried out on the islet or just across Eniirikku Pass for the coconuts that once covered the island are gone. One young tree was spotted but the entire island had that "burned out" look.

We anchored at Arji at 2:20 P.M. and all went ashore to look over yet another study area.

Locality: Bikini Atoll--Arji--Eman. Date: Aug. 22, 1964--Sat.

Personnel: Same 14. Weather: Fair.

Water conditions: Good.

Radiation level(s): McClin--The maximum average radiation level for all the islands was 0.34 mr/hr at ground level for B-γ radiation.

Studies started yesterday afternoon on the Arji-Eman chain of islands were continued today.

Gessel: "The general surface terrain of Arji Island indicates it had been graded, leveled, dyked, etc., so that no undisturbed part remains. An airstrip, camp, roads, etc. covered the island. In its abandoned state, vegetation is returning. Messerschmidia, showing varying degrees of vigor, covers the airstrip. The islands swarm with Coenobita; they even attack the Messerschmidia, feeding on the bark and roots. Many trees show evidence of this. The food supply must be very low-level to force them to eat bark."

Eman Island, at the west end of the chain, was the site of a number of tests. The destruction of the land and vegetation is pronounced. Crater areas are still largely devoid of higher plants, but do have algae. Great differences in vigor of plants is evident and must be related to degree of soil destruction. The area is on the way back with both coconuts and pandanus beginning to be established.

Collected ground water on Arji at a depth of 7', but not in large quantity. Wood, soil cores, plants, and soil samples were collected in both areas and will provide the basis for more definitive information.

Palumbo: "This complex of islands is a good example of the changing patterns in vegetation as related to distance from nuclear detonations. The eastern island, Arji, contains good cover of the expected vegetation and is the only one with fruit-bearing coconut trees. Some coconuts were mature, 8-10' tall, with many in different stages of development. Arji is the farthest from the detonation site. On the other hand, Eman, to the west, was the site, apparently, of several detonations and has now the least developed flora. The other islands also reflected this pattern of vegetation. The photographs will show these features better than words.

Algae growth at the west end of the island chain was no less than that at the eastern end. Off Arji only Halimeda was seen in abundance at various depths near shore and in the deeper water at the eastern tip, near the deep entrance off the central islands, large beds of algae were seen. These observations lead one to conclude that recovery of algal growth is proceeding at a good rate."

August 22, 1964 (cont.)

Fish were collected in the old channel that used to flow between Biren and Airy islets. A causeway now blocks the channel. The Fish-Tox was put out in between the islets on a shallow reef on the lagoon side. The tide was stock so the water mass did not move much. Only a limited kill of fish resulted. The excessive silt in the water made pickup very difficult for visibility was very poor. Two large bone fish were collected.

Bonham: "Eman Island was the site of several tests. Collections of Coenobita were made from under Messerschmidia trees. On the ocean reef flat were sponges, corals, and many hundreds of sea slugs, Dolobrifera (not collected), rock oysters, Eriphia, Grapsus, Tridacna crocea, Actinopygia mauritiana, at the edge of the surge channels. No Holothuria. Growth on this narrow reef flat seemed fairly good in spite of evidence of siltation. Evidence of Ocypode on land, but not seen." Photos taken from tower.

At the east end of the chain at Arji islet Grapsus and Coenobita (under Mess. trees) abundant.

An expedition of Palumbo, Lowman, McClin and Lewis went to the east end of Arji islet and took six Tridacna gigas 2-2.5 feet. Three of the clams were used by Lowman for kidney material and three were sampled by Bonham for radioassay.

August 22, 1964 (cont.)

Jackson--caught 7 rats this afternoon and should have more in the morning.

Lowman--collected birds for study on Arji islet. One long bill dowitcher, 3 ruddy turnstones, 2 wandering tattlers, 2 fairy terns, and a bristle thigh curlew were shot. The birds are nesting on the island but are using the trees rather than the ground as at Namu. The presence of rats may force the birds into the trees.

Locality: Bikini Atoll.
Arji to Enyu.

Date: August 23, 1964.
Sunday.

personnel: Same 14.

Weather: Good.

Water conditions: Calm.

Lewis and Donaldson went plankton collecting in A.M. Four tows were made with 2 nets hauled at a time for 30 minutes a tow--a total of 2 hours. Tows were made at the western end of the Wide Passage. This should produce a mixture of oceanic and lagoon plankton.

Jackson went back to Arji islet in the A.M. to pick up his rat traps. The trap line had been set in sedge growths and in mixed communities with Messerschmidia dominant. Competition from hermit crabs was most severe.

Only Polynesian rats were caught (8 male and 15 female). None were pregnant, though all females were sexually mature. Of 14 females examined, 10 had had previous litters.

No trapping was done around the old installations, but it is believed that only Polynesian rats would have been found here.

While a few rats were seen abroad during daylight hours, this population does not have the diurnal characteristics of that on Enyu.

At 1300 the ship moved across the Wide Passage and anchored at Enyu Islet. Everyone went ashore for one last collecting, observation, or scrounging trip. The crew worked until after

dark dismantling the old Nan mess hall and bringing it on board for their use at Majaro. Ralph reported 2 banana trees growing near the mess hall on Nan.

Locality: At Sea and Rongelap Atoll

Date: August 24, 1964
Monday

Personnel: Same 14

Weather: Showers

Water conditions: Calm

Anchor was raised at 1200 midnight and the ship cleared Bikini channel at 1214 A.M. and headed for Rongelap. The sea was flat calm, except for a few ground swells we might as well have been in harbor.

Arrived off Rongelap at dawn and anchored at 0930, the exact minute Capt. Davis had said we would. Rongelap was alive with a hundred or more children swarming the beach. We went ashore and visited with the new magistrate, Edmil Edmon. Gifts were given; the suit should fit the magistrate who is my size or slightly larger. His mother had died so he was occupied with family problems.

Breadfruit, Pandanus, and coconut samples requested by Held from marked trees were obtained by S.A. Bevilo ($7.50). Gessel and Billings spent the day fertilizing young coconut trees with artificial fertilizer and measuring the growth of the young trees. Samples of foliage were removed from trees for further assay.

Sneddon and Williams had a field day. Everything and everyone was photographed and interviewed. A recording was made of native songs--I hope it will be useful.

August 24, 1964 (cont.)

Palumbo--reports the seaward reef is little changed from last year. In the lagoon extensive growth of Symploca has developed where only a few tufts were seen last year.

Locality: Rongelap Atoll--Rongelap Island. Kabelle Island in afternoon.

Date: Aug. 25, 1964.

Personnel: Same 14.

Weather: Hot.

Water conditions: Calm, flat water.

Radiation level(s): McClin--The maximum average radiation level was 0.23 mr/hr for Kabelle Island, at ground level, for γ-B radiation.

Gessel and Billings went ashore on Rongelap Islet to finish up the plant work, Sneddon and Williams for last minute photographs and Jackson to pick up his rat traps.

Gessel's notes on Rongelap--Aug. 24th:

"Arrived off Rongelap Island about 9:00 A.M. Edmil came out to greet us as new village magistrate. Party went ashore to greet old friends in the village--Kotea, Jøha, Jojig, all there except Nelson who was away at Ponape.

Got some native help and began work. Pit 1 and swale area plantations surveyed and measured. All treatments look good and show marked improvement. Village plantation not growing well because of old coconut overstory. Foliage samples taken and some additional treatments made.

Visited village at night for general discussion and to record singing."

Gessel's notes on Rongelap--Aug. 25:

'Ashore early to complete discussions with natives in Rongelap

village, pay them for work and inventory Ed's supplies in the warehouse. A tent, axe, and mouse traps are about only items left.

Left for Kabelle at 10:00 A.M. Arrived at 12:30 P.M. and ashore by 1:30. Coconut treatments continue to look good. Measured these, photographed and refertilized some. Made collections at pit 38 and checked the wash area. Everything seems normal at Kabelle."

Jackson--Rats at Rongelap Island. "Trap line set in coconut plantation away from domestic fowl. Very little trap disturbance but only 1 female R. exulans caught. That she was pregnant might be chance in a small sample or this might indicate general breeding taking place where population density is less.

Joba indicated rats had been very bad when they returned to the island and that poison--Warfarin--had been used. Rats are not numerous now; the area trapped had been poisoned last year, he said. Joba indicated that he recognized two sizes of rats and that some rats infested the cocos trees. (Only roof rats do this regularly.)

"My judgement is that both roof and Polynesian rats are present on this island in fair numbers. Trapping them in the village area or in the boondocks would have revealed this."

Palumbo's notes on Kabelle: "The survey of Kabelle Island was

partially done in the afternoon and finished Wed. morning, Aug. 26. Algae were collected in the lagoon, in the hole where fish were also collected and on the seaward reef edge. In the lagoon only Caulerpa serrulata was seen, attached to the sandy bottom in wide-spreading patches. Halimeda strepoa was present only as an occasional clump. Last August it was common. The algae in the deep hole were abundant and of several species. On the reef edge Halimeda, Dictysphalsia intermedia and the Porolitham types were most common. Collecting on the reef was difficult because of the heavy surf." (Sneddon, in attempting to photograph the reef edge, was upended and skidded over the coral, receiving a number of cuts. L.R.D. got a similar treatment--but less severe for he had no camera to protect.)

Invertebrates were also collected for K. Bonham, who was confined to the ship with infection in his legs. In addition to the usual invertebrates 5 Birgus were collected. Three were giant-size smoked from Messerschmidia trees by Wm. Allen. The smoking process caused a fire to start in one of the trees that took the combined efforts of our group and the crew to finally extinguish. One small coconut crab was intended for Ed's collection but inadvertently K.B. put it in the freezer.

Fish were collected in the "deep hole" with poor success.

Tide was fairly low but very few fish were in this slot. Gary Lewis helped Welander with the collection.

Most of the personnel returned to the island in the evening to collect the bulb soils for greenhouse use and to work on confining the fire in the tree.

Locality: Rongelap Atoll, Kabelle Island.

Date: August 26, 1964, Wed.

Weather: Hot.

Personnel: Same 14.

Water conditions: Flat calm.

Gessel--ashore at Kabelle Island first thing in the morning to complete sampling and measuring. Thanks to the help of all members, work at Kabelle was completed by 11:30 so that return to the ship for a noon departure could be arranged.

Palumbo, Welander, Williams helped Gessel measure plants in the wash area between the island to the south of Kabelle, and also in the Pisonia grove near Pit #7. Some of these trees have grown well in a year's time. The vegetation is closing the gap between the islands mentioned and the sand is filling this area. Collected coconuts in the area near Pit #7.

Jackson--Traps were set along lagoon edge in cocos plantation, and in Messerschmidia-Pisonia forest. Especially in the forest, trap disturbance by coconut crabs was extensive. Many crabs were caught in the traps--but no rats. "My conclusion is that no rats are present here."

Two rats--Polynesians--trapped alive on Enyu Bikini--were individually placed in the water about 3/4 mile from Kabelle Island. Theyoriented toward the boat and tried to climb aboard upon reaching it. Observations lasted less than 1/2 hour. During this period, pictures were taken. The rats swam strongly, some-

times in circles, when last seen were swimming away into the sunset.

Wm. Allen and other Marshallese searched the island for small coconut crabs, in the hope we might add a few more to Ed's collection. A number of crabs, 4-15 inches, were captured, but no real small ones were found. Extinguished fire on Island.

Engines were started as soon as all hands were back from the island and at 12:15 P.M. the anchor was up and the ship underway. We left the lagoon by the northeast passage and by 2:30 had made the turn around Rongelap Island and started west. We passed just south of Ailinginae Atoll at 5-6 P.M. and on west into the sunset. The Rongelap people apparently do not use Ailinginae. It would seem they have plenty of land area to develop for copra, breadfruit, Pandanus, etc., if they would just forget about handouts and go to work. The big mistake would be to <u>give</u> them the $1,000,000,000 some of them keep talking about.

The night at sea was just beautiful with a very slight following breeze. The inside of the ship was hot as h--- so some of us spent a major part of the night up on the deck above the bridge. We even saw a satellite travel from S.W. to N.E.

Locality: At Sea. Date: August 27, 1964--Thurs.

Personnel: Same 14 Weather: Hot.

Water conditions: Calm.

Never have I been at sea in this part of the world that the sea has been as smooth--day after day--. The ship rolls a little but it is only because of a gentle billowing of the sea. With no breeze the ship was hot as h---.

Arrived in sight of Eniwetok about 2:30 P.M. and the Capt. called in for docking instructions. We docked at the deep water pier at 3:20 P.M. and were told unloading would start about 7:30 the following morning. The delay was due to a freighter that had all the boats busy unloading.

Kelly Bonham left the ship and went over to Eniwetok Island to get medical attention for his legs that had become infected from coral cuts. The rest of the crew stayed on the Ran Annim to be available for unloading.

Jackson set a line of traps on the island to sample the population of rats. During a walk in the evening among the remains of the Perry Island camp I saw 11 rats and heard many more scurry through the morning glory patches that cover the island.

The native boys in the Ran Annim really went to work tearing down buildings and carrying the siding, timbers, etc. away. They seemed to have owl eyes for they worked much of the night.

Locality: Eniwetok Atoll

Date: Aug. 28, 1964--Friday

Personnel: William Allen, Trust Territory Representative, left the party with the Ran Annim.

Weather: Rain--storms in P.M.

Water conditions: Rough in P.M.

Everyone was up and ready to unload by 7:30 A.M. as scheduled. The "T" boat and the trucks arrived about 9:45 and unloading the equipment and personnel gear started at once. The ship's crew had everything on pallets so the loading took only a few minutes.

A major flap developed about paying board bills on the ship. We had assumed on past performance that each person should pay his board bill of $5.00 a day or a total of $70.00 for the 14 days of the cruise. Arnold Joseph said no, the letter said "subsistence"--so no pay. We 12 from the U. of W. paid. Arnold Joseph did not.

Back at EMBL the two trucks piled high with equipment, materials, samples and glass balls were unloaded during the afternoon and sample preparation and packing got started.

Wm. Jackson went to Japtan Island to set his rat traps. He had picked up his traps set on Parry Island in the early morning. Only roof rats were caught on Parry Island, total 23, with 12 males and 11 females.

The rats were not diurnal to any extent. First rats were caught about 1830-1900. Most of these were still alive in the

traps when checked. The roof rats were very large and strong. Their general condition was very good. Of the 8 sexually mature females,

2 were pregnant (both had early pregnancies)

3 had been pregnant previously.

Ten of the 12 males caught were sexually mature. One of the sexually immature males caught was large enough to be sexually mature. This phenomenon, which had been observed in several of the population, could be the result of intense population pressure.

Roof rats seem generally distributed over the island in considerable numbers. Why reproduction is occurring here and not on some of the other reasonably comparable sites is not clear.

Norway rats were <u>not</u> found, though they might be expected to be here. Their colonial habits might have produced a distribution pattern which would have been missed by the sampling procedure used.

Locality: Eniwetok Atoll, Eniwetok Island.

Date: Aug. 29, 1964 (Sat.)

Personnel: 12 + 1.

Weather: Hot--showers.

Water conditions: Calm.

These are days of decision--what to pack--what to leave--what to throw away. As always on expeditions of this sort with many people involved in the planning, much more equipment and supplies are shipped out than can be used. Just as many more samples--and glass balls--are often collected than can be used. As a result of pressure a move to mail glass balls as a personal project was started. The cost: $1.50-$1.80 to mail a glass ball to the States.

Sample processing concentrated on the birds, sediments, crabs and other odds and ends that had been left over from field trips.

Jackson went to Japtan to pick up his rat traps put out the day before.

A total of 28 rats were caught in the trap site on the south side boondock area. This trap-catch ratio is high, indicating a very dense population of Rattus exulans.

There were 19 males, 7 females, 2 not determined in the catch. Of the 6 sexually mature females, 2 were pregnant (early gestation). Of the 16 males autopsied, 10 were sexually mature. Crabs of various species caused considerable disturbance.

The living area in the heart of the cocos planting was not trapped. It is possible that roof rats might be caught in these areas, but I feel that this would be unlikely.

"Could the full moon be responsible for this rash of early pregnancies in the last trappings?"

Notes of Professor Gessel for 8/29/64--received after others had been forwarded to L.R.B.

Japtan today with Bill Jackson to pick up rats and look around. Coconut grove is in poor condition. Island generally gives me the impression of extremes. Some areas and plants good and some poor. Saw groves of very sick Pisonia trees--yellow sparse foliage but don't know what may be wrong with them. Messerschmidia also shows great extremes, some being very vigorous and some very poor. Saw and collected a strange variant of this species. Terminal leaves of some plants, but entire foliage on others was narrow, elongated, almost needle-like, with deformed margins. Saw such plants throughout the island. Saw no monitor lizards. Military personnel report large number of coconut crabs.

Locality: Eniwetok Atoll--Eniwetok and Runit Islands

Date: August 30, 1964 Sunday

Weather: Rains

Water conditions: Increasing roughness

Major operations were sample processing and packing. Everyone had lots of material left from the field trip; the birds were processed by Frank and Raul. Gary and Frank were drying and packaging bottom samples.

Glass balls were boxed and shipped out by the dozens and large clam shells showed up in the most unusual places. The major packing problem was presented by the water and soil samples because of the very great weight.

Jackson, Gessel and Joseph went to Runit Island with Earl Murchison, and the EMBL little launch. The trip was scheduled primarily to provide the late comers a chance to visit this island.

Jackson set out his rat traps and picked them up the following day on the way to Engebi. The trap line was set on the north side of the island in typical sedge, Ipomea, Messerschmidia, vegetation. Hermit crabs bothered some traps.

10 roof rats were caught.

Four males, all mature.

Six females, 5 sexually mature, 1 pregnant, 4 had previous

pregnancies. The development of the embryos is consistent with the full moon hypothesis.

One roof rat was caught by hand the day traps were set on the south end of the island.

Seven of the total of 11 rats caught on Runit were of the block phase, (Rattus rattus rattus). This phase occurs in many parts of the world. We found it rarely at Panope. In my opinion, (Jackson's)--if memory is correct--this is the first time it has been recorded in the Marshalls. This block phase could have resulted from the introduction of an individual from a ship. Conceivably, it might be a mutant form induced by radiation. In either case, why has it not been found on other islands? I think the sampling was adequate, and I see no basis for believing that the Polynesian rat exists on this island.

Gessel's notes on trip to Runit Island on EMBL boat:

"Island has obviously been devastated and is in various stages of redevelopment. Apparently, wave deposition has been important in re-establishment of vegetation on this narrow island. Messerschmidia is predominant but very scattered, a few Scaevola, at least 1 Morinda and 1 Pandanus plant. A number of coconut trees in the old camp site and also near the tower. Fimbristylis and Triumfetta are very abundant, as are species of Euphorbia.

Reef area littered with metal and shoreline has a layer of fine sediments, almost clay size but purple and brown in color. Sand is also colored.

Plant and animal life seem normal for the type of soil and cover. Ants and grasshoppers are numerous."

Locality: Eniwetok & Engebi Islands.

Date: August 31, 1964. Monday.

Personnel: Keith Allsup, H & N and John Koranda arrived on the evening plane.

Weather: Fair.

Water conditions: Normal.

Most of the group remained on Eniwetok Island to continue packing of the equipment; checking out in preparation for leaving. The packing to go to L.R.B. was a mountain of 64 pieces; several, however, with soils and water in the "cubitainers" were banded together. Two large boxes of water, sediments, clam shells, etc. were packed for Puerto Rico Nuclear Center and three small parcels of rat traps were packed for Wm. Jackson.

Palumbo, Welander, Jackson, Arnold and Gessel went by "M" boat to Runit where Jackson picked up his rat traps--see note in yesterday's log. Then on to Engebi where Jackson spent the day observing rats.

Schedule 0805 Lv Eniwetok "M" boat #382

0915 Arr Runit

0955 Lv Runit for Engebi

1100 Arr Engebi

1105 Lv Engebi for Edna (Sanildefonso)

1135 Arr Edna with Joseph taking "M" boat back to Engebi. Palumbo, Gessel and Welander collected fish, algae and land plants.

August 31, 1964 (cont.)

1420 Lv Edna

1445 Arr Engebi to pick up Jackson and Arnold

1500 Lv Engebi

1705 Arrive back at Eniwetok

On Engebi Jackson caught 1 roof rat in a Scaevola bush where he was apparently feeding on small green Scaevola fruit. "Virtually no mature Scaevola fruit was seen on the island."

"Hypothesis: Rats and disappearance of Cenchrus (sand burr) from the island are causally related. Apparently the seeds of this plant were 'preferred' food.

"Forest mice can effectively prevent reseeding of evergreen forests in some situations. Might it have been possible for these rats to have literally eaten the plant to extinction?

"Now that this food source is gone, the carrying capacity of the island is reduced and fewer rats are present.

"Japtan has many rats (but of a different species) and much Cenchrus, but coconuts and other food plants are present in great abundance. Is there another island comparable to Engebi in these respects?"

Observations by Palumbo on Sanildefonso (Edna) Island: "Photographed the island and its vegetation and collected plants for analysis. The 'main' island appears smaller than the 'sand'

spit which extends to the north toward the ocean reef. The vegetation on this arm consists of Messerschmidia trees, the tallest of which measured 100" in height, Triumfetta and Lepturus. Most of the plants seem to be in fair condition, except for those that have been victims of the hermit crabs.

The arm of the island rises about 10-15 feet above the mean low tide. The slope of the shore is steep on the lagoon side.

Hermit crabs are in abundance all over the island.

On the original part of the island two large Messerschmidia trees dominate the view, measuring 125" and 110" high and 254" and 217" maximum diameter. Other plants of this species were scattered widely and varied from 1 inch to 35" tall. One coconut was germinating in the middle of the island and measured 20" to the bend of the leaves. None of our planted stock (1954) were visible or recognizable.

The lagoon and seaward tide flats were examined for algal growth. None was seen in the lagoon area and only one Boodlea (a green algae) was seen close to shore and only in very small tufts 1" in diameter except where attached together. Turbinaria was seen drifted on the shore.

Invertebrates seen include: 1 Hippopus about 5-6" long, 2 Tridacna crocea, 3" long, and several 1-2" cone shells. On the

seaward flats a blue tipped Acropora coral and on the lagoon side a tan colored Acropora was seen.

The water in this area seemed to be clear without suspended matter. Much dead coral, clam shells and other shells were seen, especially in the seaward flats."

Welander collected fish with Fish-Tox on the seaward side of the island in the bend where the "old" island is attached to the "new". Collection was near low tide. Fish collected included mullet, surgeons, groupers, wrasse, goatfish and gobies. On return to Eniwetok the fish were placed in the reefer and frozen before departure for Hono and Seattle with the rest of the specimens.

Covered the equipment standing in the open in the lot across from EMBL to protect it in case of rain.

Gessel's notes on Edna:

"Edna is building each year by increased deposition of coral. The deposition is obviously covered each high tide by wave action. Vegetation is in two stabilized areas and is mainly Messerschmidia. There are about 5 older bushes 6-8' tall and numerous smaller from 6 to 30". The nature of the sand spit will change rapidly as these plants grow. Triumfetta is also present and spreading. About 3 coconuts have germinated but it is doubtful if they can grow. The beach has a number of other seeds, including Ochorsia --so other plants should appear soon. The large numbers of

Coenobita have almost girdled the Messerschmidia trees. They eat the bark and leaves so there is almost no litter under the trees. This is a good island for study of soil-plant relationship."

Locality: Eniwetok.

Date: Sept. 1, 1954--Tues.

Personnel: Bonham, Lowman, McClin, Billings, Sneddon, Williams, Lewis, Jackson, and Joseph left in the morning, N.W. plane. Palumbo, Gessel, Welander, & Donaldson remain + Koranda and Allsup.

Weather: Rain.

Water conditions: Rough.

It rained!! Just poured!! Just as if the weather man was intent upon putting on a big show for the departing members. The weather had been about perfect for a month--then the day of departure for the group, it rained.

Back to the EMBL and cleanup. Swept the floor, cleaned off the desks and benches, washed the glassware that had been piled in the sink--most from invertebrates.

Prepared box of equipment for Johnston Island collecting.

Gessel: Notes--Added fertilizer to hibiscus plants near the camp store. Those fertilized last year still show healthy growth while the untreated are yellow-leafed. "Checking my notes for Aug. 1963, I observed that Eniwetok Messerschmidia and Scaevola look better this year than last, at which time much die back was observed."

Mailed four (4) boxes of processed samples to the Lab. Rad. Bio.--postage $7.79 paid by L.R D.

Previous samples were given to Global Assoc. Mr. V.D. Brophy, who sent them out as freight to Travis--then up the coast --we hope.

Also asked Brophy if he couldn't get our freight under way.

Locality: Eniwetok Atoll, Janet and Edna Islands.

Date: Sept. 2, 1964, Wed.

Weather: Fair.

Personnel: Gessel, Palumbo, Welander and Donaldson, plus Keith Allsup and John Koranda.

Water conditions: Normal.

Radiation level(s): No measurements taken.

John Koranda of L.R.L. had arranged for an "M" boat trip to Janet and Edna to collect samples for the H_3 studies L.R.L. is doing on the biota here at Eniwetok.

The four of us, Koranda, Allsup and Karl Frogner left the ramp at 8:10 A.M. and arrived at Janet at 10:25 A.M. We took the jeep ashore and used it for a tour of the open parts of the island, especially for a trip down the airstrip.

Gessel's notes: "Messerschmidia are in parklike stands over most of the island, particularly in the airport area. These trees are mostly 8-15' tall and go up to 8" in diameter at the base. Great variation in vigor and color was observed. Scattered Scaevola also present but form a minor part of the cover. Ground cover is mostly Ipomea, which is extensive over the airport. Fimbristylis, Triumfetta and Vernonia occur. Near the boat landing, Pleachea was observed.

"I saw at least one 10-foot coconut and there may be more as I did not go through the interior of the island. Palumbo reports some Guettarda and Pisonia observed on the trip in early August.

"Soil on Janet, for the most part, is infertile, with very little organic matter."

While the rest of the group were touring in the jeep, I (L.R.D.) worked my way over to the large building near the middle of the island. The vegetation makes traveling difficult for it is almost impassable at times and one must detour or crawl. The building is surprisingly intact--considering the blasts it has withstood. The area I covered was the general grass area where we used to collect so many rats. I didn't see a single rat during our stay on the island.

Koranda took a number of plant samples for H_3 work. The main trunks of Messerschmidia and Scaevola were cut, leaves collected, and soil and ground litter brought back.

We took the "M" boat to Edna where a fish collection was made on the lagoon side near the middle of the island. Fish-Tox was put out between outcroppings of beach pavement in what appeared to be an unfavorable location--but a good number of fish were obtained. Convict surgeon fish, goat fish, wrasse, damsel, groupers,--I picked up 12 species from one small pool without moving. Fish were brought back and given to Koranda for their work.

Trip back took 2 hours and 25 minutes.

Locality: Eniwetok Island.

Date: Sept. 3, 1964, Thurs.

Personnel: Palumbo, Welander, Gessel and Donaldson.

Weather: Storms, rain.

Water conditions: Rough; almost gale winds.

A howling storm developed during the night. It made us realize just how lucky we were to have completed the field work--boat trip especially--in such nice weather.

Our freight was out in the rain overnight; the tarps provided only partial cover. Went to Shipping and Receiving and complained to Supt. Vince D. Brophy. Asked him to get the boxes under cover--and shipped out at the earliest possible time. Also went to Global office and asked Mr. H.D. Scougal to "please" check on the freight. Talked to Mr. R. Ridgely, Resident Manager for Global Assoc. and asked him if he would try and expedite.

Asked Earl Murchison to check on the freight--he promised to look in on it for had had some in shipment, too.

Checked out with Global, rates were $5.50 per day plus laundry.

Finished the packing and final preparations for leaving the island.

Locality: Eniwetok, Kwaj and Hono. Date: Sept. 4 and 3, 1964, Fri. and Thurs.

Personnel: Palumbo, Welander, Gessel and Donaldson. Weather: Rains.

Put on shoes for the first time in almost six weeks. What a struggle! Long pants, too, are not much fun in this heat.

John Koranda and Keith Allsup took us and our luggage to the airport in the six-passenger Dodge and a jeep. As usual--the U. of Hawaii boys "forgot to get up."

Plane left on time and we were in Kwaj by 10:30. On disembarking at Kwaj we were told that Johnston Is. was closed to all plane traffic and the N.W. flight would leave direct for Hono. We were presented with two alternatives:

1. Stay in Kwaj until the next plane the following Tues.

2. Go to Hono and try and get a flight back to Johnston.

We decided to go to Hono and take our chances on getting back.

Arrived at Hono at 11:00 P.M. and checked through customs, immigration, plant quarantine, etc. H & N had a car to take us to the Waikikian Grand Hotel. Got to bed at 2:30 A.M.

Locality: Hono. Date: Sept. 4, 1964.

Personnel: Palumbo, Welander, Gessel and Donaldson. Weather: Warm.

H & N sent a driver, Mr. Wm. Morrison, to pick us up and go out to Hickam Air Force Base to check on flights and arrange our packing cases. At Hickam we found that flights to Johnston were out until the following week because of the Labor Day holidays. After much discussion we decided to go to Seattle and return to Johnston at a better time.

H & N received our two shipping boxes and promised to send them on next available transportation. Tickets were obtained on Pan Am's flight leaving at 10:00 P.M.

Went to A.E.C. offices and talked to Ed Butts and others. Looked at construction charts for Johnston--the entire island has been reworked with millions of yards of coral added to spread the island to almost double size. It would seem that sampling of Pu contamination to reproduce the areas sampled before is out of the question for if the area escaped being completely covered, the silt from the excavations would smother everything.

Locality: Seattle. Date: Sept. 5, 1964. Sat.

Personnel: Palumbo, Welander, Gessel, Donaldson.

Smooth flying--could have had a few hours sleep but for a couple of talkative women. Passed over the Oregon coast just at dawn and after a short stop at Portland left for Seattle. Pilot announced that Seattle was fogged in and that he would land at Boeing Field. A cold change from the warmth we have become used to. 7:20 A.M. arrival, then a wait for about an hour for our wives to arrive from Sea-Tac and to get the baggage.

Six weeks almost to the day since the expedition got underway and now we are back--except for Johnston Island, all objectives were accomplished exactly as scheduled. That was possible only with 100% effort from every member of the field party. I owe them my utmost thanks.

(Signed) Lauren R. Donaldson
Sept. 5, 1964