

TE VEGA EXPEDITIONS

GENERAL NARRATIVE - INSTALLMENT 17

TE VEGA Cruise 7 was supposed to leave Honiara, capital of the British Solomon Islands Protectorate, as soon as possible after the arrival of Dr. Robert Bieri and 12 graduate students on March 30. However, instead of the expected influx of scientists we received a radiogram informing us that the party had been forced down at Munda by bad weather. This was not surprising since at least Guadalcanal had been drenched by tropical downpours for several days. Next morning we learned that our group had been further immobilized by trouble with the plane's electrical system, so it was not until April 1 that they arrived, were welcomed on board, indoctrinated in the ship's routine, and briefed on the program.

It was not until April 2 that we could depart for Rennell Island to pick up our final faculty member, Dr. Torben Wolff, who had been there for three weeks completing natural history investigations that he had initiated and pursued on two previous visits. Rennell is one of the Protected Territories, and we required special permission to go there and a medical inspection and spraying immediately prior to departure. The local government also requested us to transport a number of Rennellese natives back, since ships seldom visit the island. We carried 13 of them as deck passengers--all that our life-saving equipment would permit.

The trip was uneventful, and next day we dropped our guests at two villages on the south shore. As we were riding at anchor at the second place a canoe approached bearing two natives and a bearded and disreputable-looking white man--the eminent Dr. Torben Wolff of the University of Copenhagen. In his inimitable way he immediately became the effervescent center of the ship. Before he had been on board two hours he had launched a lecture on the history and geography of this fascinating place.

Rennell Island is a Polynesian outpost in Melanesian waters and was practically unknown to white man until the third decade of the present century. It is an elevated atoll with the ancient rim of the reef now at an altitude of a little more than 100 meters. The central part of the island is the old lagoon floor, knobbed with long-dead coral heads and slightly tilted so that its eastern end holds Lake Tageno, about 17 miles long and some 6 miles wide, the largest lake in the Pacific. This lake still has a subterranean connection with the ocean, but the heavy rainfall keeps it almost fresh. It contains a number of endemic organisms and some relict marine forms that have managed to survive the drastic reduction in salinity.

On Sunday, April 4, we all went to see the lake. This involved a climb up the almost vertical cliff, using hands almost as much as feet, and a descent on the other side that was not very much easier. The old coral was almost as irregular as that on the fringing reef today, and even in the few places where enough soil had accumulated to hide the limestone, roots of trees sprawled in net-like patterns over the surface to make the footing extremely rough. It was really tough going in the humid heat under the dense vegetation where no sea breeze could seep through. Incredibly, the natives who carried

our food and equipment took it all as a lark. Two even carried an outboard motor between them up that unbelievable trail, and they did it in their bare feet! I found it an exhausting trip and was not ashamed to lag a bit behind.

Coming into a clearing where the natives had planted taro, sweet potatoes, cabbage and coconuts, I found our party stopped and mingled with a goodly crowd from the village of Hutuna that had come out to meet us. Here I was treated to one of the nicest receptions that anyone ever had. Someone handed me a drinking coconut and I took a long refreshing swig. Between 20 and 30 children ranging in age from about 5 to 12 formed a compact semi-circle in front of me to watch me drink. Then Wolff said, "How about sing for big fellow master" and immediately they burst into loud and astonishingly melodious voice. It was impossible to make out most of the words and they may have been Rennellese, but at intervals "Happy WELLCOME" came through loud and clear. Torben had found time during his busy stay on the island to become a great pal to the kids, and waving his arms like a conductor he led them through a marvelous concert, including "The Lady and The Crocodile" in English and with gestures. The gusto with which the songs were delivered, the flashing eyes, the broad grins or the furrow-browed concentration on the little brown faces of those cute half-naked kids made a tremendous show.

At Hutuna Dr. Frost set up a clinic in one of the huts and treated a stream of patients for ailments of all kinds, while half of the village formed an appreciative audience. We examined Wolff's crude laboratory, his water-level guage in the lake, his fancy insect trap, etc.; we had lunch on the grass near the shore of the lake; we went for a short canoe trip and saw the smallest cormorant in the world, climbed a hill for the view and visited bat caves, Wolff meanwhile keeping up a rapid-fire commentary on various aspects of the local geology, biology and anthropology. At last it was time to return, because we didn't want to negotiate that trail in the dark. When we reached the ship that night everybody collapsed and slept the sleep of the just--and the fagged out.

Monday was devoted to indoctrination into snorkeling and Scuba diving, to an introduction to the coral reefs close to shore, and the examination of the limited material collected. That evening Wolff discussed the natural history of Rennell Island and demonstrated the material he had collected during his stay.

On Tuesday morning preparations for a fish-poisoning station were interrupted by the capture of an eight-foot tiger shark, Galeocerdo cuvieri, by hook and line from the fantail. This was too large a specimen to preserve, but he did not go entirely to waste. His gills yielded a fine series of parasitic copepods for Dave Egloff, and the intestinal spinal valve was full of tapeworms which were preserved for Lorraine Morin who was with us on Cruise 4.

The capture of the shark and the opportunity to sense its strength and to examine its rather fearsome dental equipment brought home some of the points made in an earlier discussion of dangerous marine animals, but this did not dissuade anyone from participating in our fish-poisoning venture. We selected an area between two overhanging walls of coral that rose from a narrow sand-floored corridor

at a depth of about 20 feet to within two feet of the surface. We spread the poison and within five minutes were joined by ever increasing numbers of people from the neighboring village. They came in all ages and both sexes, and when we did not have nets enough to equip them, they caught fishes in their hands and brought them to us. It was a grand melee with people swooping down from all angles in competition for the prey, and the fishes didn't have a chance. The catch has just been roughly tabulated, and we estimate that we took about 140 species. Since only 68 were previously known from the island and **that** list contains several species that we did not catch, and since we took another poison collection on shallow sand bottom in the afternoon which we have not yet tabulated, there is little doubt that we shall triple the known ichthyofauna of Rennell Island.

On Thursday we left Rennell for a return to Honiara, and stopped briefly at Ballona Island, Rennell's little sister, to drop mail and some supplies for two Danish anthropologists working there. It was a lovely spot, but we could not stay. Our planned work lies to the east and we must be on our way.

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Honiara provided a break for shore-side relaxation while new electrical elements were installed to bring the winches into operation, and fuel, water and food supplies were replenished. Dr. Richard Thompson, of the British Solomon Islands Geological Survey, invited the group to visit his institution, where he gave a most interesting talk on the flourishing research program and led the party on an inspection of the various laboratories. He also provided a land rover to take the students to the limit of the road on the western end of Guadalcanal, which enabled them to see something of the country and the native population.

As usual, individuals or small groups of the ship's company sampled the hospitality of various local citizens, usually people with scientific interests who were able to contribute to our ever-growing fund of knowledge. For example, the faculty enjoyed an excellent dinner at the home of Mr. Geoffrey Dennis, a government forester and superb naturalist, inspected his tropical garden which was of great botanical interest, and learned much of the biology and history of the Solomon Islands. Dr. Frost, catering to his medical interests, visited the leprosarium. This is operated by three nuns, two of whom had been here prior to World War II. From them he got a fascinating first-hand story of the Japanese invasion, their flight and life among the natives in the bush, and their subsequent rescue from the southern shore by a U. S. naval vessel.

On Sunday morning we put out and headed eastward up Iron Bottom Bay. Since the water was relatively shallow we decided not to attempt any hydrographic or plankton work, and we did not care to risk our beam trawls or dredges among the many sunken ships littering the bottom. Instead we spent the time on a lively seminar on ocean bottoms and sediments with all of the faculty and a number of the students contributing. When we finally did reach deep water we also encountered wind--strong head winds. These not only kicked up a heavy sea in which I did not care to introduce the students to the handling of heavy equipment or delicate instruments over the side, but they reduced the speed of the ship drastically and brought on a plague of upset stomachs that made any kind of work almost impossible. Even that redoubtable Dane, Torben Wolff, who has sailed around the world from the North Sea to the subantarctic and has led his own expedition in these same waters, was sick. With field work out of the question we occupied our time with two seminars a day (almost everyone attending) and with reading, while waiting for conditions to improve.

It was not until the wee dark hours of April 15, a day-and-a-half behind schedule, that we arrived in Vanikoro in the Santa Cruz Islands, or the Eastern Solomons, as they are sometimes called. We cruised back and forth waiting for the sun to climb high enough so that a man on the spreaders could see beneath the surface and guide us through the tricky entrance into the lagoon and to safe anchorage off the tiny village of Peu, where we unloaded medical supplies provided by the hospital in Honiara.

In the afternoon we all went to take a reconnaissance of the extremely rich barrier reef about a mile-and-a-half from shore. It was much more spectacular than any that we had previously encountered, with forests of stag-horn coral showing blue tips at the ends of the brown branches, small tightly branched heads of rose pink, compact types with luminous green polyps, thin jutting shelves of pearl grey, corals so dense and hard that we could not break them loose with a wrecking bar, and corals so delicate and brittle that they could be plucked more easily than flowers. Although seemingly totally unsuited for life in this region of surf and strong currents, these latter types flourished as small fantastic shrubs of unbelievable colors. Embedded in the dense coral, and impossible to remove, were large Tridacna clams displaying brilliant green or blue mantles until they closed at the passing of a shadow. Tube worms of several different species showed single or twin rosettes of banded feathery tentacles that vanished in an instant when touched. Snails of various types crawled here and there, starfishes, brittle stars and sea urchins could be found for the hunting, grey or black sea cucumbers occupied protected niches, crinoids, jet black or black with green bands clung to the coral and yielded symbiotic crabs, shrimps and brittle stars colored exactly like the host. Over and through the coral swam swarms of colorful fishes. Neon-blue damsel fishes cavorted in clouds in the free water above the reef while larger yellowish-brown members of the same family sought refuge in the coral thickets and defended their territories against others of their kind. They even made half-hearted attempts to scare us off. Orange red clown fishes with pearly white bands nestled among the tentacles of large anemones. Black surgeon fishes, with bright red blotches around their wicked knife-like spines, picked at the minute algae growing on the coral, while green, blue and red parrot fishes bit off chunks of the coral itself. Blue and white wrasses chased madly around picking parasites from all of the other fishes. It is a riot of color and action that amazed those who had seen nothing comparable before.

After returning to the ship and taking care of our collections and gear, we climbed back into the Boston whalers and went up the small Lawrence River for about half-a-mile. Here, in a beautiful setting, with tall trees meeting overhead, we went swimming in cool fresh water and washed our clothes--an important measure for conservation of the ship's water supply. The river banks, with tree ferns, flowering red ginger, towering philodendrons, colorful begonia leaves, and the moss-covered trees dripping with epiphytic ferns and orchids, made it a pleasant duty to so conserve water at this lovely spot every evening during our stay.

That night some of us went out armed with flashlights to hunt Periopthalmus in a small tidal creek. We took a few of these strange mud-skipper fishes, and also came back with several species of crabs and a toad, the latter a strange companion for crabs, indeed.

On April 16 we hit the coral reef again with a concerted attack. Everyone was assigned a particular plant or animal group to

concentrate on, and was given the responsibility of reporting on it later. Backed by the knowledge gained on the previous day, our multipronged attack was very successful.

The next day's efforts were divided between two parties. One ran a poison station on the barren coral rock and mud of the shoreline and took several gobies, flatfishes, parapercids, goatfishes, mullets, etc., not previously collected. The other group worked the barrier reef once more. On this field trip they took along a native who showed them the location of the two sunken ships, "Boussole" and "Astrolabe," that marked the tragic end of Laparouse's ill-fated expedition in 1788. In addition to biological specimens, they were able to collect a few rusty pieces of iron from the ship as souvenirs.

As soon as the sun was high enough on the 18th for a man on the spreaders to see submerged coral heads we set sail for Tikopia. We arrived before dayligh next morning in a driving tropical down-pour that obscured the island and made it impossible for us to approach the anchorage. Brief moments of visibility were soon cut short by new torrents of water from the sky, and it was not until early afternoon that we were finally able to drop the hook.

Tikopia is the peak of a volcano that just penetrates the ocean surface to form an island, about two by three miles in extent, which reaches an extreme elevation of about 1200 feet. The ancient crater holds a beautiful lake, almost surrounded by a horseshoe-shaped rim of small but steep heavily wooded mountains. However, to the south the lake is separated from the sea only by a sand bar. During the height of the wet season the natives dig a drainage canal through this bar and set nets to collect fish going out through the overflow. We were able to purchase specimens of most of the fishes found in the lake, and we took several bathythermograph casts in it to a maximum depth of 232 feet. The cooler fresh water of the surface rests on a deeper layer of warm salt water.

The surf was so heavy at Tikopia that any work on the outer portions of the fringing reef was out of the question. Even on its inner parts it was as much as a swimmer with swim fins could do to stay in one position. As a result we had to limit our work to running a poison station in the very shallow water immediately along shore where the bottom appeared to be made up of barren sand, and even here the current was too strong for our liking. However, we dribbled a little fish poison in, and as it drifted away repeated the process. With the enthusiastic help of about 100 laughing, shouting natives we managed to get a fair catch, echelid and ophichthyid eels being prominent in the collection.

Tikopia has been less influenced by white man and his civilization than have most Pacific Islands, since it is a Protected Territory which few vessels are permitted to visit. However, the culture of this tiny speck is rapidly changing. Its Polynesian people are good workers, and most of the families have at one time or another been transported to larger islands for a period of

labor on plantations, so that now only about a third of the population has not had direct and prolonged contact with more sophisticated societies. It is a place where both sexes go around bare to the waist, where young children romp through the villages stark naked, where a few people still wear loincloths made of tapa (the bark of the mulberry tree), but where umbrellas are common! It is a place where intricate tribal tattoos adorn not only the body and limbs, but the face as well, where spears, bows and arrows, and carved ceremonial staffs are much in evidence, where bettle-nut chewing has turned teeth black and lips blood red, but where a native pedals his foot-powered generator to contact Honiara on the radio! It is a place where pierced ear lobes are stretched out of shape by the weight of various ornaments ranging from flowers to heavy shells, where many men wear the tooth of grandfather on a string around the neck as a mark of respect, where many women wear a crown or circlet of a departed relative's hair as a memorial, but where almost all people speak acceptable English and everyone belongs to the Church of England! We found them to be friendly, hospitable, jolley and altogether delightful. We should have liked to stay among them much longer.

Our major purpose in visiting the island was to collect blood samples from the native population for a study of malaria that is in progress at the School of Tropical Medicine of the University of Sydney. Consequently, after presenting a large box of medical supplies from the Honiara Hospital as token of our medical connections, making gifts of a goodly number of fishhooks to each of the four Chiefs and spreading around a fair quantity of cigarettes to establish good will, Dr. Frost set up shop in a dark, thatched native hut and prepared for the blood letting. The first volunteer was the son of the Number 2 Chief, a very intelligent young man. After he had set a good example it was not too difficult to keep a stream of people coming, particularly when the Chief or one of the village elders issued harsh commands to reluctant individuals. The main difficulty was the poor light, largely obscured by the curious crowd that insisted on peering through the single window in front of which the work was being done. Next morning the work was resumed in another village under better conditions, for with the cessation of rain it could be done outdoors, and the Number 1 Chief provided a man to fan the flies away. Dr. Frost managed to get smears from 132 individuals of both sexes ranging in age from about 7 to 85. Since this represents well over 10% of the total population we feel that we got a really good representative sample and that Dr. Black in Sydney should be happy.

Late on the afternoon of April 20 we reluctantly left this charming little Eden and set out for Suva. It was the same story all over again; strong winds and heavy seas prevailed, and working conditions were anything but favorable. Our activities were once more limited to two seminars a day and reading, interspaced with occasional plankton tows and examination of the catch by those whose stomachs would tolerate peering through a microscope while the ship rolled and pitched.

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At last, on the night of April 26, as Dr. Frost was leading a seminar on the after deck during a rare dry period, we picked up a glow on the distant clouds that meant that the lights of Suva were underneath. Since the authorities would not be available to enter until morning, we hove to outside and found the passage in by daylight. It was a relief to tie up to a wharf in quiet water, to get ashore, to step ashore and see paved streets with shops, hotels, and all the hurry and bustle of this crossroads of the southwestern Pacific.

Here we were due for an overhaul of an ailing generator and the required parts had not yet arrived. The necessary delay made it important to plan for a program of work in the local area and we gave the students a day and a half of shore leave while we considered the situation, contacted the proper officials for advice and permission to work in the selected areas, and gathered together a few pieces of equipment. The mangroves of Kumbuna Creek were selected for particular investigation. On April 29 and 30 we chose a spot in a small tributary of the creek as our key station and selected three other places for comparison. One was a point farther up the same tributary, the second was the pier of a bridge across the main creek where vertical zonation of the sessile and sedentary organisms was diagram clear, and the third was a mud flat extending out from the edge of the mangroves at a point about half a mile south of the mouth of the creek and separated from it by an island that was almost a peninsula. We hoped that this locality would be less influenced by fresh water than the other stations and would provide an interesting contrast. Collections were made at all of these localities, and notes were made on the distribution and the behavior of the organisms.

Daylight on Monday morning, May 3, was chosen as the time to begin a continuous 26-hour occupation of our key station with periodic visits to the others. Observations were made on the temperature, salinity and oxygen of the surface and bottom waters, the height and the rate of flow of the water throughout a complete tidal cycle, and of the organisms seen day and night and during high and low water. It would hardly have been possible to select a more disadvantageous and uncomfortable period in which to do the work since it rained all the time and floods of fresh water poured out of the swamp, not only through the normal channels but everywhere. This probably gave us atypical surface salinities and temperatures, and influenced the behavior of the organisms. No respectable insect would be out in the downpour, and we had no opportunity to use the fine insect net that we had borrowed from the Department of Agriculture, but at least we were spared a mass attack by mosquitoes. Even the hermit crabs appeared to seek shelter from the continuous shower bath by congregating on the under surface of the arching mangrove roots. However, since the residents of Suva claim that there are only two seasons here, the wet season and the rainy season, conditions were undoubtedly normal for a good part of the year. I was proud of the students who endured the discomfort of their six-hour watches in good spirits and without any serious grumbling. The data were taken, the observations were made, and the mass of material is still being worked up.

When the ship arrived in Suva Mrs. Jane Cooper, a local resident and very keen naturalist who is working in cooperation with a team from the University of Hawaii on the problem of fishes that are poisonous to eat, came down to offer whatever assistance she could. She suggested that during the spring tide of May 4 she might lead us on an excursion to a coral reef that had been destroyed by a hurricane in February. At that time almost 50 inches of rain had fallen in the mountains during a 72-hour period, 31 inches of it in one day! The rivers had flooded and left many square miles of the low coastal areas under as much as 10 feet of water. A large part of this flood drained through a new channel of the Wainibokasi River and rushing seaward had subjected a stretch of reef far removed from the normal river mouth to a prolonged freshwater bath. The result was disaster with most of the marine organisms killed and the whole area turned into a rotting odoriferous mess. Two months passage of time had begun the healing process and new pioneer organisms were moving in to the devastated area, so we thought it would be interesting to have a look at the situation.

On the appointed morning it was not raining and the weather looked more promising than it had for days, so equipped with snorkeling gear, buckets and lunches we piled into a chartered bus for the trip to Wainibokasi Landing, about 30 miles away. There Mrs. Cooper had made arrangements for us to be met by Turagauru, our guide, with speed boat and an outboard-powered punt for the long trip down the river that had caused all the damage. Local protocol demanded that we stop at the mouth of the river to pay our respects to the chief and village elders. Mrs. Cooper had come prepared for this with some yagona root and a whale's tooth for me to present to the chief. Turagauru offered these for me and made a long and evidently flowery speech in Fijian on my behalf, which was well received, judging by the murmurs of approval. The chief then made a speech, and there was ritual chanting punctuated by hand clapping, and then we drank yagona. Yagona is the Fijian name for Kava, the national drink of most of the Pacific Islands. This is made from the root of a shrub, Piper methysticum. In the old days the method of grinding it was to have one or more of the young virgins chew it up and then spit the residue into a bowl. I understand (and hope) that this habit has been discontinued, and that now the roots are pounded. The drink was dipped in half coconut shells from a beautiful old bowl carved from a single piece of wood in the form of a turtle standing on four legs, and was ceremoniously presented to each of us in turn, with a hand clap followed by murmurs of approval when we had downed it. Yagona is supposed to be slightly intoxicating or narcotic, but I noticed no effect after drinking four helpings. It tastes and looks somewhat like soapy water, and I find it curious that several of the local Europeans have developed the habit of drinking it daily.

Formalities ended with a thank you speech by me, translated by the guide, and we piled into the boats once more and made our way to Tomberua Island to inspect the reef in the vicinity, which had been heavily damaged. There we were welcomed by Mr. H. J. McHugh, a wealthy Australian who was building a fantastic vacation home in Fijian style, which he invited us to inspect. It consisted of several huts with woven walls and thatched roofs beautifully done with the roof members tied together with sennit by master craftsmen. Coconut and pandanus mats woven in striking patterns, and colorful tapa hangings gave the place just the proper decor. After the first shock, fluorescent lights, porcelain sinks with running water, re-

frigerators, hi-fi sets and flush toilets did not seem out of place.

After a look around we left in two punts for Mambualau Island, considerably farther out, to see if the damage had extended that far. It was a beautiful uninhabited island, although crawling with one of the two species of sea snakes that come out on land. These are rather closely related to the cobras and are extremely venomous, but they are picked up and roughly handled by the natives, even the little children, and they made no attempt to bite. It is said that a couple of hundred years ago the Fijians and the snakes made a pact that neither one would harm the other! Since I do not believe in magic and know that deaths from sea-snake bites are not uncommon in the Malaysian-Indonesian areas, I discouraged our group from handling them. We had a look at the nesting gannets and the frigate birds patrolling the skies above, and then turned our attention to the reef which appeared to be undamaged. Certain portions of it were so green with heavy growth of Cladophora that it looked like a well kept lawn.

At about four o'clock we noticed that the sky toward the southeast had turned an ugly blue black, and Mrs. Cooper and I began to shout and wave at our scattered party, urging them to return. They were so wide spread and the sound of waves and wind so loud that our efforts were rather ineffective and it took considerable time to get them assembled at the punts. The wind had now begun to blow in earnest and back we went picking our way among the coral heads which were hard to see through the disturbed surface. When we reached the channel we made a mad dash for Tomberua Island, the closest shelter, bailing like made to keep ahead of the water that we shipped and that poured in on us from the horizontal sheets of rain. When we arrived, drenched to the skin, we sought shelter in Mr. McHugh's boathouse to wait for the weather to abate. Instead it continued to get worse, and finally darkness began to fall. At last it began to dawn on us that we could not reach the mainland that night, and this was corroborated by Mr. McHugh and Turagauru.

If one is to be marooned it would hardly be possible to select a better place for it than Tomberua Island. With astonishing hospitality Mr. McHugh first provided gallons of coffee to warm us up, stretched his wardrobe to provide us with dry clothes, produced food and drink for the unexpected and uninvited multitude, and managed to give one a place to sleep under blankets or mats. Although Mr. McHugh had been preparing to leave for Australia next day, and was consequently relative short on supplies, he managed to work miracles in making us comfortable during a perfectly miserable night of howling wind and driving rain. We are all deeply grateful to him for his hospitality.

In the morning the weather was somewhat better although intermittent rain squalls still swept down, and we set out for shore and the river. At the landing, the bus that we had ordered for 5:30 the previous evening was patiently waiting for us, much to our surprise. We were back on board the ship in time for lunch, dead tired, but with an experience behind us that we would not have missed for anything.

Since we were still waiting for generator parts that had not arrived, we decided to use a few days for work at Great Astrolabe Reef, about 50 miles south. We left on the morning of the 6th and

anchored that afternoon in the shelter of Mbulia Island after a very rough passage. Weather made it impossible to go to the outer barrier reef about five miles from the sheltered anchorage, and we had to content ourselves with making observations and collections on the fringing reefs in the lee of adjacent islands. At the first place we worked the stoney corals were completely overshadowed by alcyonarians in bewildering variety. These soft corals occurred in masses of white, brown, green, purple, and yellow; and they formed spongy blobs, fanciful folded masses, or sent up stubby coarse fingers, all covered with large extended polyps waving in the water currents. It was surprisingly different from anything that we had previously seen, and therefore interesting, but it could not compare in beauty with the fantastic coral gardens of Vanikoro. Later we found good fringing reefs of stoney corals and ran very successful poison stations on the outer and inner margins of these.

During our stay we visited the native village on Mbulia Island and had the pleasure of watching them launch a fleet of outrigger canoes to go to another island to pick up school children returning home. The canoes were quite large, about 30 feet in length, and hollowed from a single log with the gunnels raised by lashing a hand adzed plank to the sides. The sails were raised on shore, and then the canoes were shoved into the surf across a series of logs placed parallel to the shore. As soon as they hit the water the men had to be quick about jumping on board as they took off with astonishing speed in a shower of spray. They were certainly doing well over 10 knots right from the start, with the outriggers rising high above the water and the men scrambling out on them to weigh them down. It was a brave and exciting show.

We were invited to visit the village that evening for yagona drinking and dancing, and most of us went. It was a pleasant and sociable evening but I was disappointed because the yagona drinking was more casual and accompanied by less ceremony than I expected, the music was provided by guitars instead of by native instruments, and the dancing was not Fijian but the twist! It is surprising and depressing how rapidly the fruits of American culture penetrate the odd corners of the globe.

On Sunday, May 9, we returned to Suva and on Monday, while work on the generator got under way, we went back to our key station in the mangroves for fish poisoning. We had not wanted to disturb the area in this manner previously. As usual, it rained, but we did not mind very much as we waded through the thick brown water and mud of the creek dipnetting the groggy fishes as they swirled into visibility at the surface. It was a hectic, wet and dirty job, but it yielded a surprisingly large number of species.

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The delay in Suva was long and exasperating and it was not until May 24 that we were finally able to get away. Although we were anxious to tackle some open-water work, the time in port was not wasted. If the ship had become permanently affixed to the wharf the astonishing richness of life in the area would have provided material for many years of fruitful endeavor. The scientific party split into subgroups and pursued further investigations in the mangroves, on the mud flats, on the coral reefs forming a barrier at the harbor entrance and even as far afield as about 60 miles from Suva. Dr. Nieri and one group investigated the plankton distribution in the harbor and began neuston investigations. Dr. Wolff led another group on dredging expeditions in the channel, using the small boats. Roberta Smith studied foraminiferal distribution and density on tidal flats, and Dave Egloff turned his attention to the symbionts living on or in the blue starfish *Linkia*. This last investigation a series of amazing forms ranging from two different polychaet worms through a blue copepod, a blue and white shrimp, a beautiful blue gastropod mollusk, to a carapid fish living in the stomach of the starfish. This particular study should lead to a perfectly fascinating publication.

Of course there were other activities as well. I lectured to the Fiji Society and gave two radio interviews. Various members of the scientific group participated in such diverse social affairs as spending a night as guests in a native village, attending a Rotary luncheon, participating in the dedication of a new hospital wing, gorging themselves on a tremendous native-style banquet at the Koro Levu Hotel, inspecting the magnificent 9000-ton British cable laying ship "Mercury" and having lunch with the captain, enjoying the hospitality of dinner with many of the good private citizens of Suva, and reciprocating as best we were able by displaying our ship and explaining our work to a stream of visitors.

Among the more interesting events was our exchange of visits with the scientific personnel of the two Russian ships "Shokalskiy" and "Voeykov." These ships have been carrying out meteorological investigations over a wide area of the Pacific and came in to Suva for supplies before continuing to the Cook Islands for observation of the total solar eclipse due on May 30. Shortly after their arrival we invited the scientists on board and arranged a display of instruments and a representative collection of the animals we had collected. In spite of the difficulty of communication imposed by language barriers, the Russians seemed to understand and to be interested in our program, and over cake and punch we managed, with the help of an interpreter, to answer their questions and to exchange pleasantries.

Later we were invited to visit their much larger ships, where we examined their equipment ranging from hydrographic current meters and nansen bottles to the electronic components of their radio and rocketsondes. They served us apples, chocolates and sweet Crimean

wine in which they toasted our health and success. They gave us books and matches, and taught us to roll cigarettes with Russian tobacco and newspaper. We came to the conclusion that Izvestia did not taste very good, and in fact turned one of our party quite green, but unfortunately there seemed to be no copies of Pravda on board. Finally we were invited to see a Russian movie which we found to be totally unintelligible since none of us understood a word of the dialogue. However, it was a good party, and since both groups studiously avoided any discussion of politics we parted friends in an aura of good fellowship.

Although Suva had provided us with the worst possible weather, including the rainiest first week of May on record, we were treated to two or three nice days toward the end of our stay and we sailed on the 24th in bright sunshine and with a gentle breeze. Everything seemed to be going smoothly, but we had hardly left port before the second engineer reported he was ill. Dr. Frost diagnosed it as possible pneumonia. By evening the engineer had a raging fever of 103°, and the ship slowly reversed course in case we might have to place him in the hospital in Suva. However, Dr. Frost's ministrations worked wonders, the fever began to abate, and in the morning we were on our way again, the engineer in bed but with the prospects of complete recovery in a few days.

This was the first time on the entire cruise that weather conditions were suitable for open water work, and with great glee we shot the Tucker trawl to a depth of 500 meters, and again at night to 100 meters, and we also put the dredge on the bottom in 1600 meters of water. None of the catches were rich. Nevertheless they were interesting, with their organisms from far below the surface.

On this passage we passed the 180th meridian and had two Tuesdays the 25th. On the second of these we came to Wailangilala, the northernmost of the Lau Group and our first true coral atoll of the cruise. We had previously seen an "almost-atoll" at North Astrolabe Reef, but this was spoiled by tiny Solo Island, the tip of a subsiding volcano, projecting from the center of the lagoon and technically turning the ring of coral into a barrier reef. Now we had a textbook example of a real atoll. It had only one small island on the rim and a total population of two lighthouse keepers, but the dense vegetation, the coconut palms leaning into the wind, the gloaming white beaches, the pale green shallows flocked with purple splotches of submerged coral heads, the cobalt blue of the deeper part of the lagoon, and the line of white breakers along the horizon, limiting this small island world, made it perfect. From our anchorage within the shelter of the lagoon we struck out and visited the lighthouse, investigated the beaches, ran a very successful fish station, night-lighted for small fishes, caught larger ones on hook and line, dredged in the lagoon, took neuston samples, and kept generally busy. We would gladly have stayed longer, but our time was getting short. At about 10 o'clock on the 27th we raised the anchor, took one more haul with the heavy dredge, getting several gallons of what looked like wet white plaster containing a number of white crabs and mollusks, and sailed out through the narrow passage in the reef.

We had intended to go to Niuatobutabu but the wind dictated that our course be somewhat to the north of a direct line to this island and, finding ourselves close to Niua Fo'ou we decided to pay a short visit to this most northern of the Tongan Islands. Niua Fo'ou is the tip of a volcano with the crater filled by a lake so that the island looks like a doughnut on the map. Several eruptions within historic times have laced its sides with steams of frozen black lava. The contrast between the lush green forests and the black jumbled lava deserts was spectacular. The desolation of the latter made it clear why the government had moved the entire population to other islands during the time of the 1964 eruption. What was surprising is that a considerable number of these people have now returned and are living contentedly on a speck of land that may erupt again at any time. Some of us walked up to the rim of the crater and looked down at the lake which contains a number of hot springs. Others walked around part of the island. The main points of biological interest were small green parrots and lovely white tropic birds. The sea was relatively barren. Diving showed a bottom of basaltic rock and black volcanic sand with very few organisms living on it. There were a few isolated corals, sea urchins, mollusks and fishes, but nothing to compare with the richness that we had found elsewhere. The most interesting thing we saw was a black and white banded sea snake hunting on the sea bottom, crawling around and sticking its head into crevices or under rocks, just as a snake might do on land. I watched it for 15 minutes before it came up for air and swam away. How long it had been down before we first spotted it I do not know.

Weather continued good and after more hydrographic stations and midwater trawl and neuston hauls we arrived at Niuatobutabu on the morning of May 31. This island was as rich in its shore fauna as Niua Fo'ou was poor, and we had a fine time working in the coral of the fringing reef. However, our first duty was complete formalities with the government officials, and since the landing place was about two-and-a-half miles from the village in which the officials had their offices it consumed several hours of walking and talking. Aside from the inter-island boat that brings supplies and picks up copra almost every month, we were the first vessel to visit Niuatobutabu since 1960. The presence of strangers was so exciting that the students of the Catholic Mission school deserted their classrooms to swarm around us, and the adults were scarcely less restrained. Since our arrival was such a big event, the Police Magistrate issued an invitation to all of the ship's company to come to a party on the evening of June 1. It was a wonderful affair. At dusk a tractor trailer met us at the landing and took us to the village where the government buildings were located. We found a large hall tastefully decorated with crossed palm fronds on the walls, ferns and banana plants in tubs, and lots of brilliant red hibiscus blooms attached to the greenery. For a time we sat around and talked and drank wine. Then there was a brief formal Kava ceremony, after which we were ushered into another room where a sumptuous Tongan feast had been set. On the mats covering the floor, banana leaves had been spread as a tablecloth, and on these roasted pigs and chickens, yams and breadfruit, leaf containers of fish and other ingredients cooked in coconut milk to make tasty stews, various fruits and drinking coconuts were arranged in gay patterns. We set ourselves down as well as our creaking European knees would allow and dug in with our

fingers to one of the most delicious meals any of us had ever had. There was speech making in Tonganese with translations into English and speeches in English translated into Tonganese. Since the Polynesians have certain individuals designated as Talking Chiefs whose main vocation in life is to make a fine art of oratory, I really believe that we were outdone. The final part of the party consisted of music and dancing, including four solo dances in native costume that gave us by far the best impression that we have had of South Sea entertainment. We were all sorry when time came for us to board the trailer once more for the trip to the landing. The entire village saw us off, and we left part of our hearts with them.

The reefs were good, in marked contrast to the barren ground encountered at Niua Fo'ou, and when we sailed away on the morning of the second we had large collections to take care of. The wind was right, the weather good and we made a very satisfactory passage to Pago Pago in American Samoa. Here we found that progress was in full swing and that the town had changed markedly since our first visit two years ago, with a television tower on one of the high mountains, with a new hotel going up on the site of the Goat Island Club where we had been so well entertained, and several buildings already completed both in town and the neighboring countryside. However, some of the people who were here in 1963 and knew of us from that visit turned up to prove that Samoan hospitality has not changed and that Pago Pago is a good place to terminate a cruise.