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The DX Magazine FEATURE

Isla del Coco

The TI9X/TE9RLI DXpedition to Cocos Island

by David Gregory TI5RLI

Call it mere chance or dumb luck, the fact is the operation of TI9X/TE9RLI started with a contact during the CQWW SSB DX contest.

I heard KH8AL/HKØ and called it. Bob Preston W7TSQ was operating and we arranged to meet for a chat on his return to the U.S. He and the rest of the operators had a layover in San Jose, Costa Rica.

From that layover Craig KH8AL, Yuki JH1NBN, and I, TI5RLI, began discussions on a possible trip to TI9.

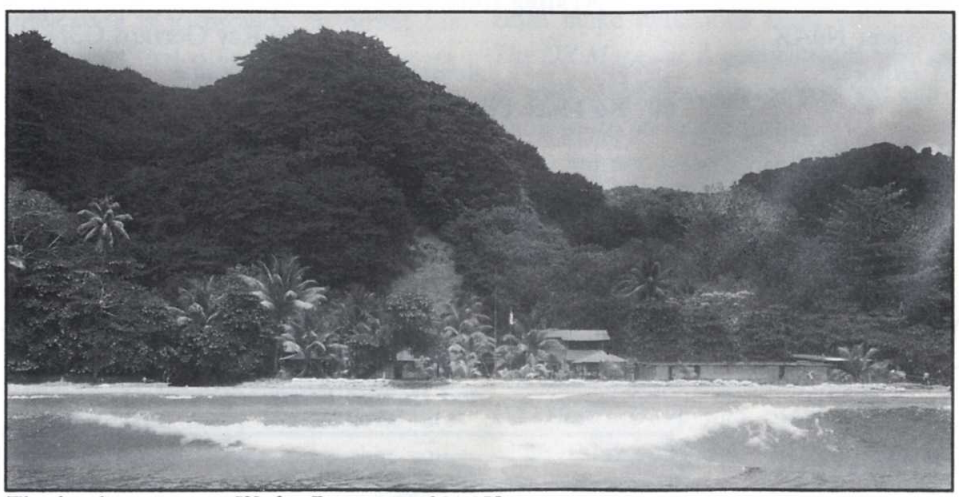
The first thing to determine was the feasibility of a group operation. Recently the only operations from TI9 have been one- or two-person affairs. A group operation would give many more people a chance to make contacts.

After a few inquiries at the Radio Control Office it was determined that the difficulty would not be in the issuance of a license, but in the permission to land and stay on the island.

Carlos Diez TI5KD and I contacted the Parks office which controls access to the island and set up an appointment. During the meeting and in later discussions we carefully explained the purpose of what we wanted to do and assured them that we did not want to disturb the island or the wildlife there.

As a demonstration of this even the balloons we would use for the 160-meter vertical were biodegradable. These were selected so that if they burst, they would not harm the environment should we not be able to recover all the pieces.

Throughout our discussions Juaquin Alvarado, the head of the Cocos Island Park and Area de Conservacion Marina Isla del Coco, was most attentive and helpful. He told me a little about the island and his responsibility to protect it.



The landing area at Wafer Bay, site of TI9X.

Cocos Island

Cocos Island is situated southwest of Costa Rica and due west of Colombia. It is part of the same oceanic ridge that gave birth to the Galapagos Islands.

The isle rises vertically out of the sea with walls that are several hundred feet high. Cascading down the walls are hundreds of waterfalls. In places the rock of the wall is exposed due to landslides. While there are a few bare spots caused by past inhabitants, most of the surface is covered by thick verdant vegetation. The island is blessed with trade winds that keep the humidity down and the environment livable.

There are four bays but only two of them are safe enough to use as anchorages and afford a place to land.

Chatham Bay, opening to the north, is the safest place to anchor boats but the hills rise steeply behind it. There is not much room for anything except a ranger station.

Wafer Bay opens to the northwest and the seas are more choppy. There is more low lying area at this site so this was the place chosen for the operations. Still, steep hills rise all around except where the sea enters the bay. These hills caused the signal levels to be low to Europe, Africa, South America, and parts of Asia.

The Isla del Coco is a National Park

and Marine Conservation area. Established in 1978, it includes 24 square kilometers of rocky, hilly land of volcanic origin and over 950 square km of the Pacific Ocean.

There are several rookeries and the Island is home to at least three separate species of birds found nowhere else on the face of the planet. Other smaller indigenous animals such as lizards can be found there. Several trees and plants are also unique to the island, but the real attraction lies in the sea.

Every year divers come from all over the world to contemplate the fascinating undersea life and enjoy the clear, deep waters off the rocky shores of Cocos. Undoubtedly, sharks and rays draw the most attention but many other sea creatures may be seen. There are corals in abundance.

In addition to the indigenous species on land, cats, pigs, deer, rats, and goats live there, courtesy of past visitors to the Isle.

As mentioned before, there are several guards on the island that care for the land and the sea. They work incessantly from early in the morning until late at night dealing with the visitors, maintaining trails, and patrolling for violators of the conservation area.

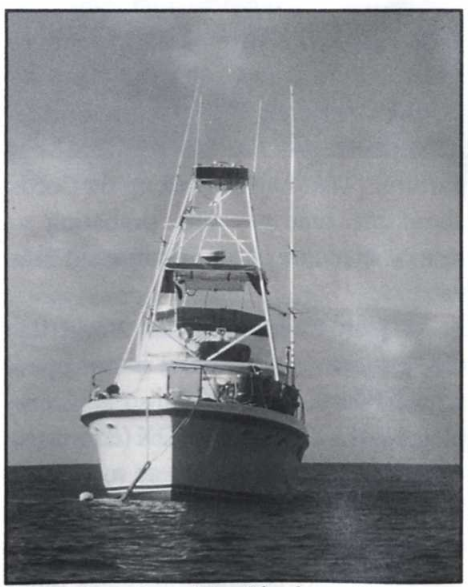
Only recently has the parks department established a couple of bases there. Before 1990 the island was cared for by the Coast Guard.

The Parks Department has only one patrol boat to cover the entire area. This same boat is used in transfer of equipment and meeting visiting boats. There are several smaller open boats in use, too.

The history of the island is interwoven with tales of pirates and treasure. At Chatham bay, since the 1700s visitors have left their marks etched in the rocks.

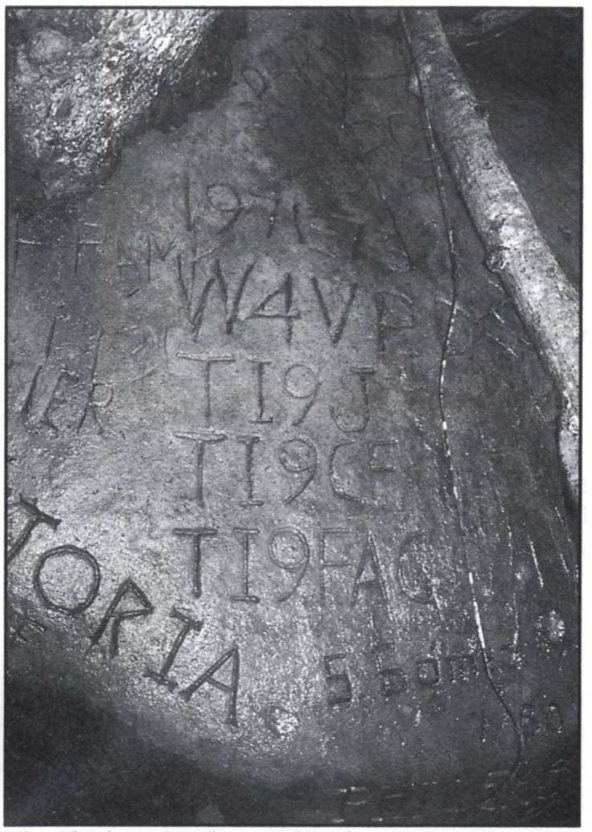
Today visitors can see the names of renowned individuals such as Sir Francis Drake and W. Morgan scratched in stone. Just by studying the rocks, one can get an idea of the history. The tradition continues today with ham radio operators, DXpeditions, and boat crews or passengers leaving their marks. No, you will not find the TI9X call on the rocks, as I do not approve of the practice.

The parks department has accepted this practice and tradition; nevertheless, they are trying to preserve the older markings. Consequently, they have established a rule that rocks with inscriptions made prior to 1978 cannot be added to.



"Zarpe" anchored in Chatham Bay.

During the first meeting we got verbal permission, but we learned that there were several conditions to meet before anything written could be obtained. There are really three permissions involved in any operation from Cocos. There is a permission to land, a permit to stay on the island, and the radio license. Parks issues the first two and the Radio Control Office grants the last. Failure to get any one of these means that an operation cannot proceed.



The Chatham Bay "register" rock, with W4VPD, TI9J, TI9CF, and other calls.

Once assured that all the permissions would be obtainable, we began work on the problem of how to get there. We were limited to only two means of transportation: seaplane (there is no place for landing strip) and boat.

The seaplane was rejected because it couldn't haul the amount of equipment needed to support such an operation. It could haul less than half a ton of people and equipment. Additionally its capacity allowed for only four persons and we were planning on five.

In the middle of February, Yuki came down from the U.S. to firm up details and help in the search for a boat. At that time we still needed a fifth person. During some of his spare time Yuki obtained a license and operated a number of hours on the 20-meter band as JH1NBN/TI5. It was during this time that the final decision was made to attempt the operation.

We found there were few boats with

adequate range and safety to make the trip. Eventually we lined up a boat and got the permissions. We began to relax.

We felt we were home free—airline tickets were purchased and all the logistics arranged. Much of the details were handled on e-mail and the telephone.

The expedition group was firmed up at five persons: Yuki JH1NBN/TI5 (the team leader); Aki JI3ERV; Tetsu 7L7RPY; Carlos TI5KD; and myself TI5RLI.

Carlos was the only one in the group who had operated from there before. He had been there twice—once as TI9W.

At the last minute the boat was cancelled and we really had to scramble. To make matters worse, most of the work was left to Carlos because I had to take a business trip to the U.S. It was a relief when Carlos found Dr. Rogelio Pardo, the owner of a 41-foot fishing yacht, was willing to rent his boat for the trip.

Dr. Pardo is familiar with ham radio and Cocos since he had been there twice (once on a DXpedition) and his son operated there once as TI9XXX. Besides his boat, the "Zarpe," we counted on the "Sea Hunter" to carry some of our heavier gear. This was much more complicated than originally arranged but it was the best we could do on short notice.

The inland operating site, with the operating tent in the back covered in plastic.

We thought ourselves free at last from ol' Murphy, but that was not the case.

Just days before departure, Carlos announced that because of a contract he had not yet fulfilled, he could not accompany us. That cut the group to four.

The date of our departure was less than 24 hours away when disaster struck. Aki and Tetsu, coming from Japan on American Airlines, lost one bag with two transceivers and accessories. Additionally two bags and an antenna were seized by customs. This set the hour of departure back a little but we were still hopeful of getting out of port close to schedule.

Through contacts in customs we were able to get the equipment released without too much red tape.

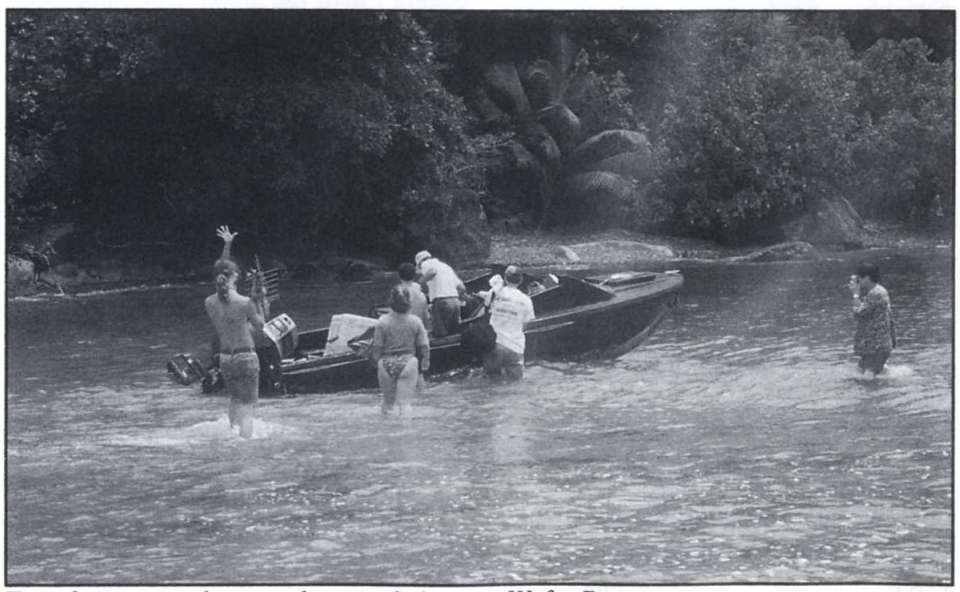
The lost baggage was another problem. American Airlines determined they had sent it to Brazil and assured us it would be on the evening flight (delaying us by only four hours) so we waited. The evening flight came but no bag. We were then told that it would be on the next morning's flight. Now we were delayed by 16 hours.

By noon on the 26th the bag had not appeared. Now we were down one operator and two transceivers.

Because of the tides the boat could only leave at certain times of the day. Finally, after assurances that American Airlines would do everything it could to get the missing bag to us, we got ready for the next acceptable tide, more than 24 hours from the planned time of departure. (That bag showed up on Cocos about the time we were preparing to return so none of the equipment was used.)

A loan from Adventist World Radio—a shortwave broadcast station operating in Costa Rica and the author's employer—of a Yaesu FT747GX (converted from commercial service as a FT80C) was arranged so that at least one of radios would be substituted.

This radio became the main radio



Transferring gear between boat and shore at Wafer Bay.

for communications for the group while on the boat and the group used the calls of KJ6P/mm, TI5RLI/mm, and TI9X/mm depending on our location with respect to the coasts of Costa Rica and Cocos Island.

We left Puntarenas at the setting of the sun on the evening of the 26th of April, optimistic that the worst was behind us. We were well-prepared for the waves because we had started taking the seasickness medicine, thinking we would be departing much earlier. By the time we arrived at the island, I had taken three pills which were designed to be taken once every 24 hours. My travelling companions had taken pills, too.

The "Zarpe" was designed for short excursions and not for the 600-mile trip we required of it. The tanks held 200 gallons of diesel fuel. Another 400 gallons in plastic drums was lashed to the deck. It was arranged that, at the island, the "Sea Hunter" would sell us the fuel needed for the return trip.

Using the latest in electronic equipment, we set sail at 207 degrees South out of Puntarenas. The boat was equipped with sonar, radar, and GPS equipment. At all times we knew our position and relation to the island.

As if to wish us an improvement in our luck, several dolphins jumped and played nearby as we left the shelter of the harbor and passed out of the Gulf of Nicoya.

The night was dark, but now and then we could see the splashes of flying fish as they crashed back into the sea. In the ship's wake there seemed to be a trail of underwater explosions as the algae disturbed by the turning of the propellers luminesced.

Wind in this area pushes northward so we had a head wind all the way and waves constantly broke on the bow of boat, drenching the equipment lashed to the deck. A vigil was kept to make sure none of the antennas, camping supplies, or tools got loose and floated away. At times the sea was so rough the non-sailors could hardly keep their feet and staggered like drunkards.

Communications was maintained with the mainland using a wire antenna strung from the front of the boat to the highest point on the boat and back to the cabin. Using an antenna tuner, sufficient power out was maintained to hold

The TI9X/TE9RLI team: JH1NBN, JI3ERV, 7L2RPY, TI5RLI and Cocos rangers.

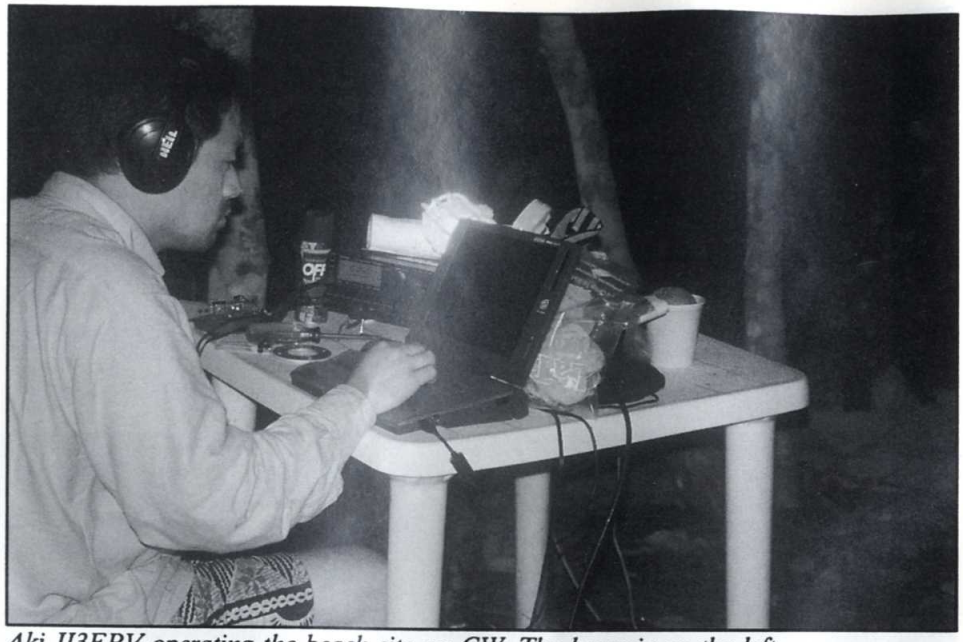
contacts with TI5JOY, my wife, at the anchor point of the DXpedition in Alajuela. Maritime-mobile contacts were also made with two Costa Rican amateurs who have been part of the history of Cocos, TI4CF and TI2SW.

Traveling almost 29 hours, we arrived shortly after sunset the 27th and were welcomed by park rangers in Chatham Bay (5° 33' N, 87° 2' W). During our travel, a park ranger and his wife accompanied us and were happy to see the island again.

We obtained permission to set up a battery-powered station with a wire antenna at Chatham Bay for a couple of hours. We knew we would have to move the next morning but Yuki and the others wanted to get off the boat and get to the real action. We were already more than a day behind our schedule.

The captain and the first mate agreed to help in the attempt to land at Chatham and headed for the beach in the ships dingy. Before long we heard the outboard motor's purr as they returned with the news that the waves and the night made it impossible to assure a safe landing for us or our equipment.

We had come too far to have our equipment drowned in an attempt at a temporary operation so we all headed for our bunks and benches amid the radios, wire, and amps stored in the main cabin. I slept outside near the ship's helm on a bench to feel the coolness of the open air.



Aki JI3ERV operating the beach site on CW. The keyer is on the left.

High tide the next morning was at 10:00, so that was the hour set for equipment transfer. Before the equipment transfer I went ashore to examine some of the equipment the park uses at Chatham for communications with the other ranger base on the island and with the head office in San Jose, Costa Rica. They are using the exact same model as the one loaned by AWR.

Before 10:00 the equipment was transferred to the Park's patrol boat for the trip to Wafer Bay. The trip from Chatham to Wafer took 15 to 20 minutes and there we were taken from the "Zarpe" in a smaller, shallow-bottomed boat that would make the actual transfers from the patrol boat now anchored in Wafer bay.

Timing our passages with the waves, we made four trips to the Wafer Bay estuary and splashed ashore carrying all the valuables. The head ranger piloted the landing boat. His skill and knowledge of the currents and waves were beyond estimate. Not a single piece of electronic gear got damp.

While the equipment stayed dry in the passage, we did not. We had to carry it from the boat in the estuary to the shore and from there to an organization point under the roof of an open kiosk that Parks had near the shore.

Since Spanish is the language of the island, I was assigned the position of translator. Yuki, Aki, and Tetsu would confer in Japanese, give me the information in English, and then I'd relay in Spanish to the Park personnel.

The first sign to greet us said "Take

	The Beach Station (Aki and Tetsu)	The Inland Station (Yuki and me)
HF	Yaesu FT900 (loaned by Yaesu)	Kenwood TS690
		Dentron 2500
		MFJ Antenna Tuner
	Cushcraft AP8A	Carolina Windom (160-10)
	Creative Design CD318	Mosley TA33
		80 M Center-fed ZEP
		160 Vertical (balloon raised)
6 M		Kenwood TS690 (same one listed above)
		HB9CV
Satellite	Kenwood TR751	Icom IC290
	Yaesu FT690	Kenwood TM455
	Tokyo HiPower Amplifier	RF Concepts Amplifier
	Elite PreAmp	Mirage PreAmp
	Wave Hunter Antennas	Cushcraft AOP-1

Table 1: Equipment Breakdown.

only photos, leave only footprints," and reflected the philosophy of our group. Long before setting out on the adventure, we had outlined for Juaquin Alvarado our philosophy of "clean camping." We determined that we would leave not even a scrap of paper when we took our leave.

From the kiosk we went and inspected the site we had requested several hundred meters through the jungle away from the ranger station. There we hoped the generator's 24-hours-a-day operation would not disturb park personnel or interfere with their assigned duties.

Following the initial examination we decided the generator should be located next to a swamp that lay between the site and the beach, more than 100 meters away. After the four of us carried it in and set it in place, the laborious transfer of the equipment to the first operating position began. We had around a ton of equipment (700-800 Kg) to carry from the shore to the site using a trail through mud and tree-limb and trunk obstacles. The air was humid and the morning hot. The passage alone exhausted the group.

We decided to split into two teams and put one transmission point on the beach just above the high-tide mark. That position would handle the CW contacts on HF (as well as some SSB) and have one satellite station. Tetsu and Aki would operate that site.

The inland operating position would handle SSB, RTTY, and have the other satellite station. Yuki and I went inland.

The equipment breakdown for each location is in Table 1.

Shortly after setting up the generator and protecting it, the rain commenced. We just managed to get one tent up and put the equipment inside in time to keep it dry. We installed antennas the rest of the afternoon in the rain.

The rain fell torrentially, making it almost impossible to get the Windom up into the trees. Following the Windom, the Mosley tri-bander and the satellite antennas went up. By this time the sun had sunk in the west.

The inland operating tent, covered in plastic, with the satellite antennas.

At the coast site, the AP8A and the satellite antennas were raised. Aki and Tetsu also had to spend quite a bit of time running over 100 meters of power cable through the thick trees of the swamp to the operations table. The long run of cable had so much loss that at night you could see the dits and dahs of the CW cause the trouble light used for illumination to flicker.

Operations commenced with the first contact on the evening of the 28th on 20-meter SSB (0100Z on the 29th) with K5KLA. Yuki started the action while I continued work on the inland satellite station.

On the beach Aki and Tetsu continued to work on antennas and setting up the satellite station.

The rush to get the satellite stations put together was due to the importance of the next morning's pass of AO13. This was the only really good chance that we had to work Japan. This had been one of the key factors in the exact timing of the trip. Because of all the delays, the number of good passes to Europe was down to two also.

Unfortunately, not one of us slept well that night. Since the bedding and remaining tents were soaked in sea water and rain, they could not be used. Yuki slept a little in a chair.

I laid out my sleeping bag and put a dry plastic sheet over it and slept with the plastic as a floor and a blanket. It was fine until the rain started again and the water followed some of the creases into my cocoon. That ruined my second set of dry clothes for the day.

Two satellite stations were included in the operation because of the shortness of some of the windows to the various parts of the world. We wanted

to get the most contacts possible out of Japan and Asia. During the first pass of AO13 (29 April UTC), both stations were operating. Tetsu made the first contact at 14 UTC with JE5FLM and we were on our way.

There was considerable confusion as my announced operating frequency was obliterated by stations calling Tetsu. I moved up to 145.910 to get away from the QRM and created a second pile up.

Though it had been announced that there would be two stations operating, it appeared a number of satellite operators were confused by the two stations. As soon as AO10 was sufficiently high to work from my location, I moved there to concentrate on Europe.

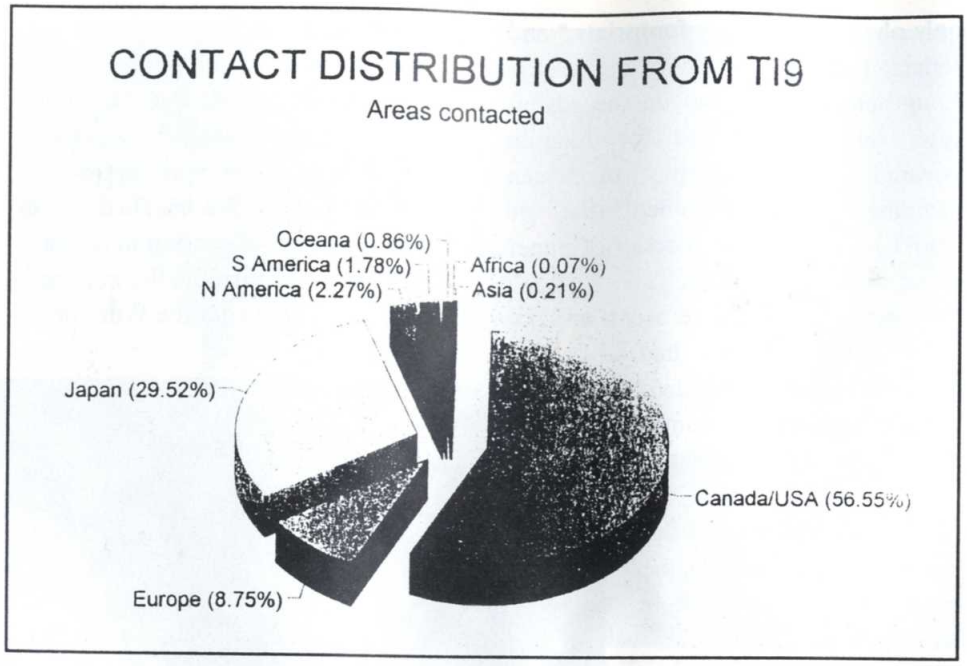
The inland satellite station was the only one of the two with a view to the East to access AO10 and, through it, Europe.

CW operations began shortly after the first satellite contacts. WØJCB had the first QSO at 14 UTC on 20 meters.

Blowing and heavy rain continued off and on for a good portion of the operation and we ended up with very few dry clothes. In spite of the three pairs of shoes I took, there were times when all were soaked.

The tents over the equipment and the tarp over the generator had to be monitored to keep the rain from building up into pools in the sags. We wanted to make sure the tents would not collapse from the water's weight. When the rain was heavy, the process of pushing up the roof and jumping away from the side of the screen tent was repeated every 10 to 15 minutes.

At the beach, CW operations continued with Aki pulling a sheet of plastic over himself, his keyer, his computer, and the radio when the rains came. As soon as it ceased he, tossed the plastic aside.



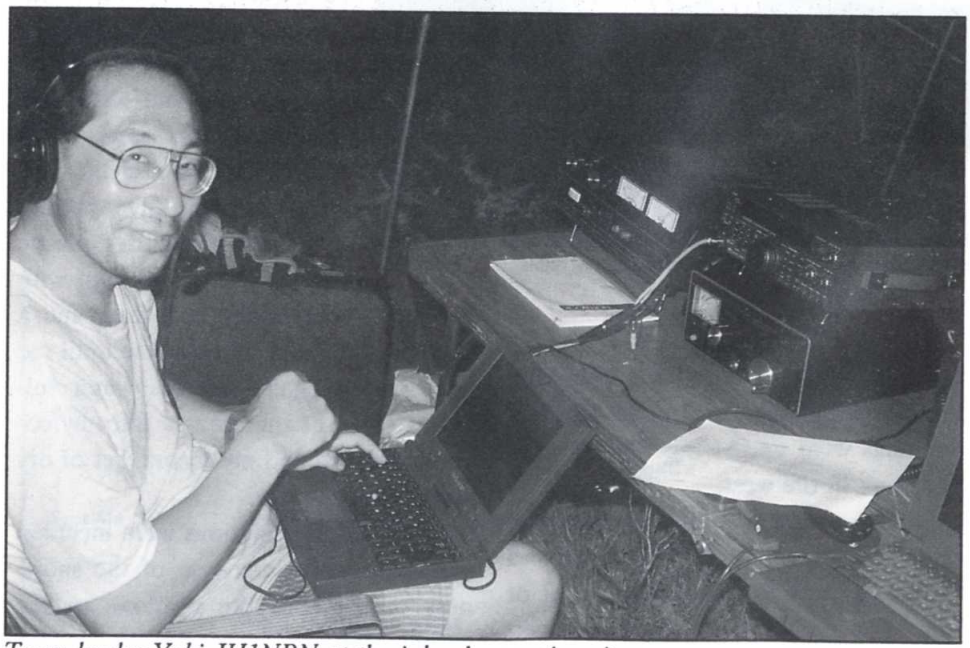
Regardless of rain or sun on the second day, we continued our work on both stations. The six-meter beam went up on the push-up mast of the inland station while a tri-band beam was added to the station on the beach. Tents went in and when the sun came out, one dome tent served as a hot house to dry things out.

During the entire operation only one paper log was kept—Tetsu wrote out his contacts on the satellite. It was quickly transferred to computer after the satellite pass ceased.

The rest of the operators entered their contacts directly into computer. On one occasion when a station called in giving me a message, I had to hunt for a pen and paper because at the inland station we used only computer logging. On satellite I had InstaTrack and the DOS-based logging program running under Windows and using "[alt]Tab" switched back and forth between them.

The 80-meter center-fed Zepp went up late in the operation and was not used much.

On the third night we tried our



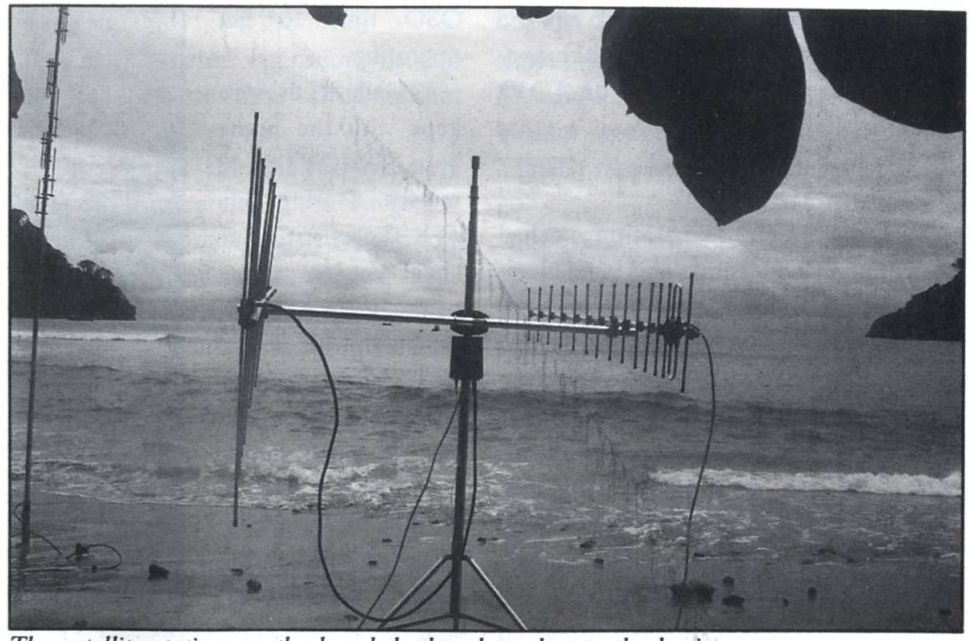
Team leader Yuki JH1NBN at the inland operating site.

balloon-raised, full-sized, 160-meter vertical with three full-length radials. When we found we could get only a few contacts on 160, we used the antenna tuner and found it was one of the best antennas we had for 80 and 40. Even with all the calculations we made, the antenna was resonant on the AM broadcast band (1600+ kHz) so a tuner was always used to load the antenna.

The only problem was, because we had a limited amount of hydrogen, the antenna had a slight sag and so it drifted around a bit in the light breezes. Hydrogen was chosen because it was considerably cheaper than helium and none of the operators smoked. After one of the balloons burst, operations continued because there was still enough lift to keep the antenna off the ground.

This most successful of low-band antennas was also the source of the only operating disaster we suffered. We thought Murphy had left but he had only taken a brief vacation.

In one of its excursions the 160-meter antenna wrapped itself around my satellite antennas and fried my two-meter pre-amplifier. That took out one of the satellite stations. We quickly transferred the station from the beach inland since the passes to Japan had ended. Even though operations on the satellites continued in a diminished capacity, many contacts were still made.

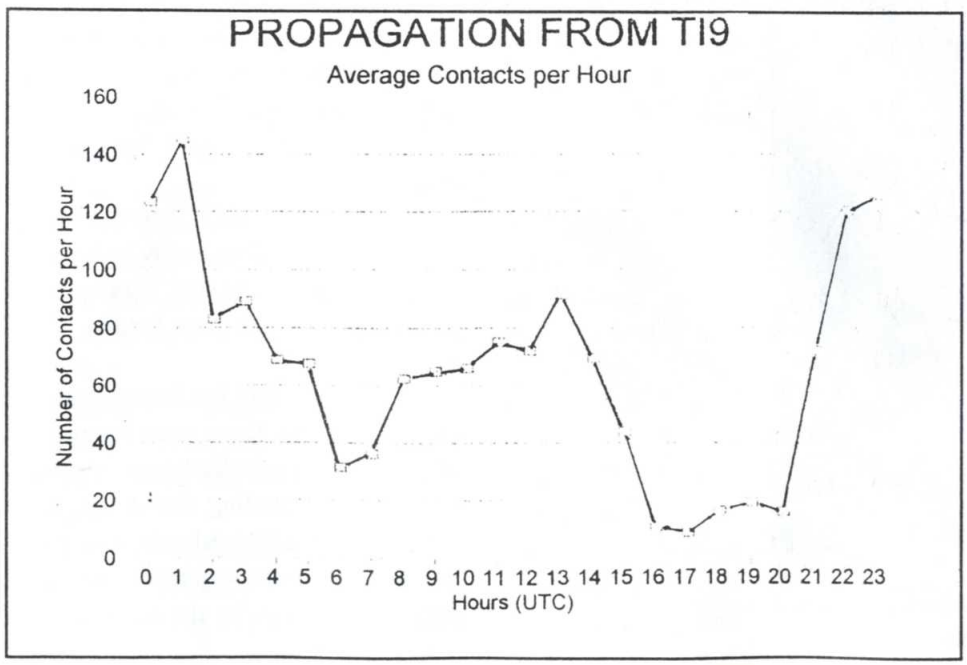


The satellite station on the beach had a clear shot to the horizon.

Propagation at this time of the year and the sunspot cycle was poor and an analysis of contacts showed very slow rates from midnight until 2 or 3 in the morning (0600-0800 UTC). Contacts were also very low 10 am and 2 pm (1600-2000 UTC).

In spite of the lack of co-operation from mother nature, the operation netted over 7500 contacts in 4.5 days of actual operation. Contacts were made on all bands from 160 meters to 10 meters and on satellite. We managed a limited number of contacts on RTTY and satellite with many indications that a further DXpedition with these modes in mind is needed.

It was unfortunate that on both satellite and RTTY, a number of amateurs felt compelled to make duplicate mode and band contacts. When we caught them with the logging programs, the duplicate contacts were not entered but the process slowed us down. A number of strong stations in the pileups were ignored because they already had contacts on that band and mode.



The site on the beach had a commanding view of the bay and gave excellent propagation towards Asia and Japan. The bay itself is fenced in on three sides by hills.

The inland station was surrounded by trees, bushes, and the same hills that affected propagation from the beach.

To the North the minimum take-off angle was close to 40°. That affected Canada and the United States. To the East and South, the angles varied from 20° to 40° but were generally around 30°.

I took advantage of every curve and dip in the semi-circle of hills to make contacts into the US and Europe on AO10. Only to the west did we have a great TOA.

Throughout the operation we had many requests for mode and band changes. We tried to accommodate as many of these as possible but because we had lost the two stations, thanks to American Airlines, and we were down by one operator, many pleas had to go unheeded.

We did have a second linear but could not use it with the radios we had. Because of the boat switch we were down by one generator, too. It arrived on the "Sea Hunter" in time for the last day of operations, but was not used because it would have taken too much QSO time to get operating.

Daily skeds were kept with the home base (TI5JOY) on 40 meters. During one of these, Carlos checked in from where he was working in the jungles of Costa Rica to wish us well.

The fun came to an end on the morning of the 3rd. I had made a schedule for tear down and we were able to follow it fairly well.

The CW station went silent at 6 am with the last contact with JE2HGA at 12 UTC on 40 meters. In less than an hour we had the station apart and back at the kiosk by the ranger station.

The next station to leave the air was the satellite station. Tetsu made the last contact with N3LKI at 12 UTC.

Following the beach site, we began taking down tents and antennas at the inland site. At 13 UTC Yuki made the last RTTY contact with JL3TWE on 30 meters and moved from the wire antenna to the TA33 yagi and proceeded with SSB operations.

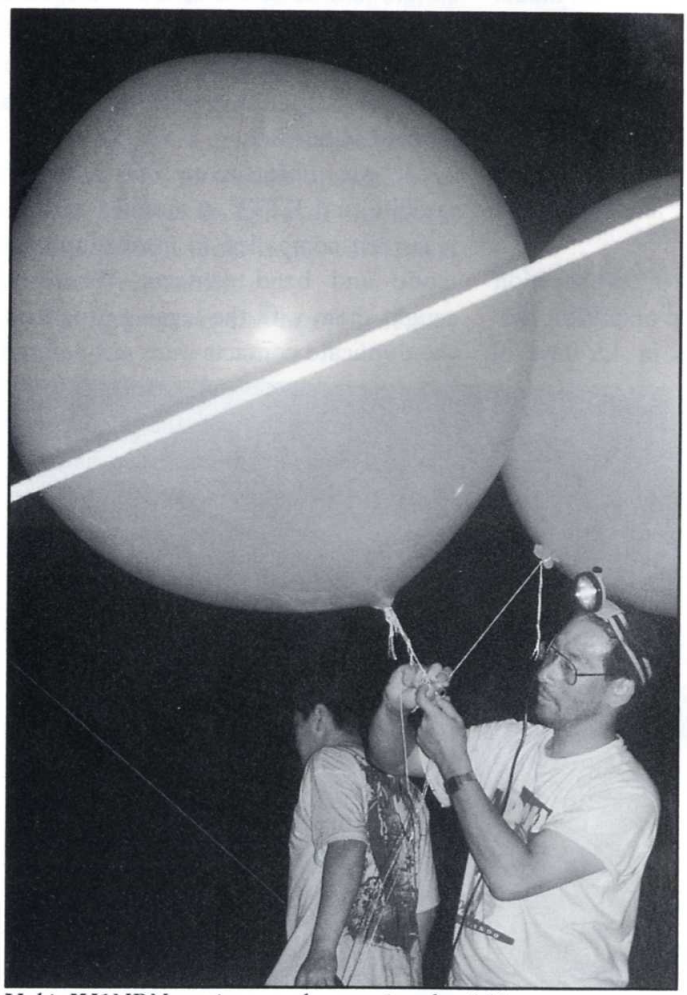
The satellite antennas at the inland site.

All antennas and tents were taken down and packed except the ones in use by the remaining HF station. At 15 UTC the last contact of TI9X was made on 20 meter SSB with N7QCN.

While hauling the equipment back to the kiosk, we policed the area to make sure that not a scrap of paper or a piece of plastic was left to mark our passing. Loose string, pieces of the burst balloons, and tape were all put into the trash bag to be carried back to the mainland.

By noon (1800 UTC) all the equipment was at the kiosk ready to be taken back out through the surf. Parks personnel helped load the boat for the return to the "Zarpe."

Before heading for Puntarenas, the captain took us for a tour around the island. Once again dolphins accompanied us. Surrounding the island are a number of smaller islands and rocks. Some are without vegetation and used only for rookeries by the seabirds.



Yuki JH1NBN getting ready to raise the 160-meter antenna with the help of two hydrogen-filled balloons.

Because of the tides we had to delay our departure to make our arrival in Puntarenas coincide with high tide.

While the captain and first mate secured the equipment for the return voyage, we decided to take in some of the sights of Chatham and dive off the boat. After viewing the rocks where the names of people and boats along with ham call signs are chiseled, we headed back to the boat and donned snorkeling equipment. The water was calm and on the bottom we could see large fish and sharks. Visibility was about 50 feet in the bay.

As the island faded behind us in the twilight, I recalled what the head ranger said to me during our trip around the island. He told me, as often as he left and went back to the mainland, he still felt the pull of the island calling for his return. I could see why. I, too, experienced the magnetism of the island.

On the trip back the seas and the wind were in our favor and the trip was uneventful. Again we saw birds, dolphins, and flying fish, but they did not have the impact they had on the way out. We were exhausted from the lack of sleep, the camp tear-down, and the portage of the equipment back to our starting point at the kiosk. The rain did not leave us, however, and my last dry clothes were made as wet as the rest in my bag.

A number of lessons were learned in the operations from Cocos. Most of all we needed at least one more member in the group. Five would have been the best number so we would not have been so tired and also we could have taken more advantage of the band openings we had.

Our most successful antenna for the low bands needed just a little more gas in order to keep the wire taut and fully extended.

Also, we could have used one or two more antennas for the higher bands. This would have improved operations during the day.

The six-meter operation needed height and a better time of the sunspot cycle.

In spite of the failures, we were grateful for the service of the one generator we had. Once we settled down to a routine, the generator needed little maintenance other than a little oil every five hours and the spark plug cleaned after two or three days of use.

These lessons will remain challenges for future operations from the Isla del Coco!

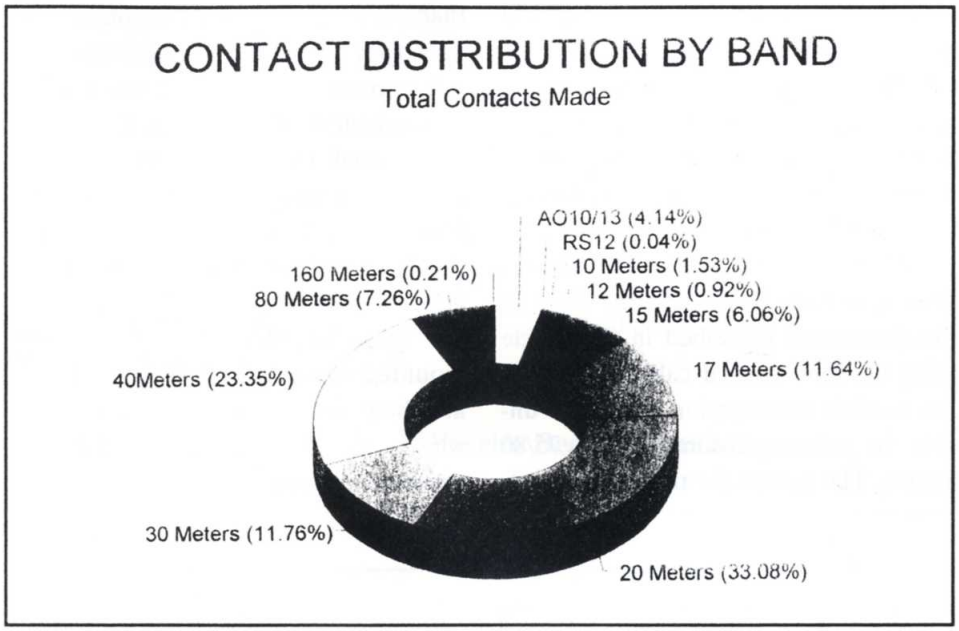
As with all endeavors of any size, thanks are due to a number of people and organizations.

We are grateful to Park Department Personnel including the director of Cocos Island, Juaquin Alvarado. On the island we were especially thankful for the help of the head ranger, Freddy Salazar and several of the other rangers: Diego Quesada, Walter Madriz, and Marco Padilla.

The director and personnel of the Radio Control office were extremely helpful in licensing the expedition.

Persons who helped in the planning and execution of the DXpedition included, Dr. Pardo, who came through on short notice with a boat; Ricardo Mendieta TI2MEN, who lent us the backup generator; and Carlos Diez TI5KD, who at the last minute couldn't go.

Several organizations also were extremely helpful. "Sea Hunter" and "Undersea Hunter" helped with fuel and carrying the backup generator as well as the late luggage of Aki. NASDX and the National Capital DX Association contributed financially. Yaesu and Adventist World Radio loaned equipment. JA1ELY contributed to the success of the operation.



Unfortunately during our stay on Cocos, propagation on the high bands was poor, as well as on top band. The zero sunspots and the walls to Europe, South America, Africa, and parts of Asia made for many missed contacts. Thank you for your participation in the pileups. See you on the next one!