

# *TIGHAR TRACKS*

THE JOURNAL OF THE INTERNATIONAL GROUP FOR HISTORIC AIRCRAFT RECOVERY





## CONTENTS

Niku VI .....	3
Daily Reports .....	9



## ABOUT TIGHAR

TIGHAR (pronounced “tiger”) is the acronym for The International Group for Historic Aircraft Recovery, a non-profit foundation dedicated to promoting responsible aviation archeology and historic preservation. TIGHAR’s activities include:

- Compiling and verifying reports of rare and historic aircraft surviving in remote areas.
- Conducting investigations and recovery expeditions in co-operation with museums and collections worldwide.
- Serving as a voice for integrity, responsibility, and professionalism in the field of aviation historic preservation.

TIGHAR maintains no collection of its own, nor does it engage in the restoration or buying and selling of artifacts. The foundation devotes its resources to the saving of endangered historic aircraft wherever they may be found, and to the education of the international public in the need to preserve the relics of the history of flight.

*TIGHAR Tracks* is the official publication of The International Group for Historic Aircraft Recovery. A subscription to *TIGHAR Tracks* is included as part of membership in the foundation (minimum donation \$55.00 per year). The editors welcome contributions of written material and artwork. Materials should be addressed to: Editors, *TIGHAR Tracks*, 2812 Fawkes Drive, Wilmington, DE 19808 USA; telephone (302) 994-4410, fax (302) 994-7945; email tigharpat@mac.com. Photographs and artwork will be returned on request.

## ON THE COVER

*A large island on which to find small clues: Nikumaroro’s lagoon shore. TIGHAR photo by Janis Carty.*

## ON THE WEB

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# Niku VI



The Niku VI team. Back row: R/V Nai'a, Jesse Rodocker, Bill Carter, Leonid Sagalovsky, Tom Roberts, Walt Holm, Gerald, Tom King, Jon Overholt, Andrew McKenna, Gary Quigg, Art Carty, Graham Berwind, Megan Lickliter-Mundon, Mark Smith. Front row: Taylor Keen, Lonnie Schorer, Ric Gillespie, John Clauss, Dan Lann, Janis Carty, Karl Kern, Curtis Webster.



*R/V Nai'a on its fifth voyage to Nikumaoro as TIGHAR's primary expedition vessel. TIGHAR photo by Graham Berwind.*



*The second expedition ship M/Y VvS1. TIGHAR photo by Walt Holm.*



**MAY 19 – JUNE 14, 2010**



# THREE WEEKS, TWO SHIPS, TWENTY PEOPLE

It was the largest, longest, most complex, and most expensive TIGHAR expedition ever, and the most successful. The Niku VI expedition returned to the U.S. with over a hundred artifacts; several hundred bird, fish and turtle bones; and reams of new data, observations and measurements; all of which must now be cataloged, analyzed and interpreted.

## DIGGING FOR DNA

Under the direction of TIGHAR Senior Archaeologist Dr. Tom King, onshore archaeological work focused on the Seven Site, the remote spot on the island's southeast end that best matches the description of where the partial skeleton of a castaway was found in 1940. Each time we return we find that the dense bush we worked so hard to clear has grown back and we have to start over.



*TIGHAR Senior Archaeologist Dr. Tom King (center) with Gary Quigg (left) and Art Carty (right). TIGHAR photo by Ric Gillespie.*



*Team members Bill Carter (left) and Karl Kern with the tools of their trade. TIGHAR photo by Ric Gillespie.*

Whether or not the expedition found conclusive evidence that the castaway was Amelia Earhart remains to be seen, but the TIGHAR team accomplished its goal of finding objects from which it might be possible to recover the castaway's DNA. Among the many artifacts found were several which appear to have been handled by the castaway. These were collected using special sterile procedures designed to minimize the chance of contamination with the collector's own DNA. Ten of those artifacts, judged to be the most likely to yield DNA, are now at a laboratory in Canada where scientists will attempt to extract mitochondrial DNA (mtDNA) for comparison to a reference sample of Earhart mtDNA provided by the Earhart family. Results are expected some time later this summer.



*The Seven Site archaeological dig in 2010, re-cleared and expanded. TIGHAR photo.*





*Team Physician Dr. Jon Overholt helps Collections Manager Megan Lickliter-Mundon prepare to collect an artifact using sterile protocols. TIGHAR photo by Ric Gillespie.*

## BETTING AGAINST THE HOUSE

A word of caution: Although retrieving contact or “touch” DNA from handled objects is routine in present-day criminal investigations, the survival of usable DNA on items that have been subject to a harsh tropical environment for many decades is problematic in the extreme. By taking special collection precautions in the field and using scientists who are highly skilled and experienced in extracting “ancient” DNA, we’ve stacked the cards in our favor as much as we can. Nonetheless, we must accept that the odds are against us.



*TIGHAR cameraman Mark Smith of Oh Seven Films records DNA testing at Warnex Pro-DNA Services in Thunder Bay, Ontario. TIGHAR photo by Ric Gillespie.*



*TIGHAR Artifact 2-8-S-5 knife part found in 2007. TIGHAR photo.*

## MORE PIECES OF THE PUZZLE

Regardless of how the DNA gamble plays out, other discoveries, once identified and analyzed, should give us a better picture of how the castaway(s?) survived and for how long. Most importantly, the more precisely we can identify the artifacts that appear to have been used by the castaway, the more clues we’ll have as to the castaway’s identity.

Our historical research and archaeological work in 1996, 2001, and 2007 produced evidence that suggests three general types of activity at the Seven Site at different, and in some cases, probably overlapping times:

- ❖ **Not earlier than 1933 and not later than 1939**  
Pre-war habitation by a non-indigenous (not a Pacific Islander) female castaway.
- ❖ **Not earlier than 1940 and not later than 1963**  
Tree/brush clearing and coconut planting operations by Pacific Islander colonists under British administration.
- ❖ **Not earlier than 1944 and not later than 1946**  
Target shooting by men from U. S. Coast Guard Unit 92, the Loran radio station situated at the southeast tip of the atoll.

Preliminary interpretation of the results from this expedition’s work reinforces that characterization of the site’s history. In other words, we found more evidence of those same activities. In some cases, we found more of the same artifact. For example, in 2007 we found one small part of a pocket knife we were able to identify as an Easy-Open, bone handled, double bladed jackknife made by the Imperial Cutlery Company of Providence, RI between 1930 and 1945. This time we found the rest of the knife, except for the blades. It is now apparent that someone beat the knife apart with a blunt object, breaking it open for the express purpose of removing the blades. Why? To make spears for catching fish? We can only speculate, but at least we have a better understanding of what happened to the knife.



*TIGHAR Artifact 2-9-S-16 knife body found in 2010 in sterile bag for DNA testing. TIGHAR photo.*



*Intact example of an Imperial Cutlery "Easy Open" bone handled, double-bladed jack knife like the one found at the Seven Site. TIGHAR photo.*

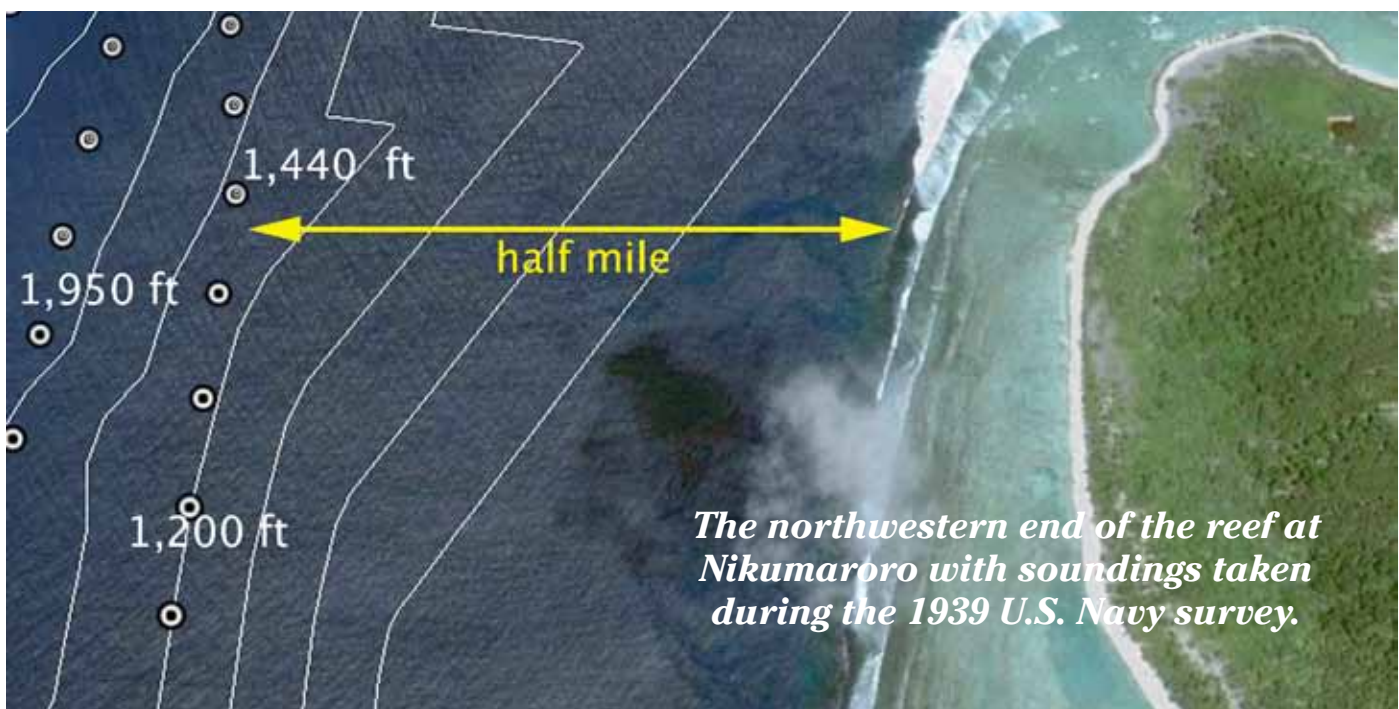
Like the glass pieces that match the mirror of a 1930s-vintage compact and the bits of cosmetic found in 2007, some of the "new" artifacts may prove to be specific to a female. We found more pieces of what appears to be the same cosmetic; a small glass jar (broken) that seems to have a distinctly feminine appearance; a broken bottle that had the "Mennen" trademark embossed on the side; and so on. Much more research is needed before we can say how or whether these pieces fit in the puzzle we're trying to solve.

## LOOKING FOR THE PLANE

The other major component of the NIKU VI expedition was the ability, for the first time, to explore the deep water off the western end of the island for possible aircraft wreckage. The only data anyone had about the underwater environment below scuba depth (about 100 feet) in that area were a few soundings taken during a U.S. Navy survey in 1939. The soundings indicated that the bottom was at 240 fathoms (1,440 feet) about half a mile out from the edge of the reef.



*GPR specialist Taylor Keen collecting data. TIGHAR photo by Andrew McKenna.*



*The northwest end of the reef at Nikumaroro with soundings taken during the 1939 U.S. Navy survey.*



The hypothesis to be tested was that the plane had gone over the reef edge at a point about 400 meters north of the *Norwich City* shipwreck. The plan was for Jesse Rodocker of SeaBotix, Inc. to use the company's LBV compact Remote Operated Vehicles (ROVs) equipped with high definition video to search the reef slope down to 300 meters (984 feet) which, we reasoned, should cover the area in which large, heavy pieces of wreckage might come to rest. Assisting Jesse were TIGHAR veterans John Clauss and Walt Holm.



*Jesse Rodocker of SeaBotix, Inc. with one of the LBV 300 HD ROV's used in the search. TIGHAR photo by John Clauss.*



*The Seabotix LBV 300. TIGHAR photo by Jesse Rodocker.*

## SETBACKS AND SURPRISES

The fiber-optic cable that carries the HD television signal through the ROV's umbilical tether is delicate and Jesse's long tether was damaged in transit to Samoa. Fortunately, our second ship was able to bring a replacement but for the first two weeks the team had to use a shorter back-up tether and could only search to a depth of 150 meters (492 feet).

Neither of the two expedition ships was ideally suited to supporting the ROV work but Jesse, John and Walt succeeded in searching a large portion of the reef slope. The reef was surprisingly clean. Other than some wreckage from the SS *Norwich City*, the only man-made objects found were two lengths of small diameter rope at about 200 meters (660 feet). An object that at first seemed to be a circle of wire was later judged to be more likely of natural origin.

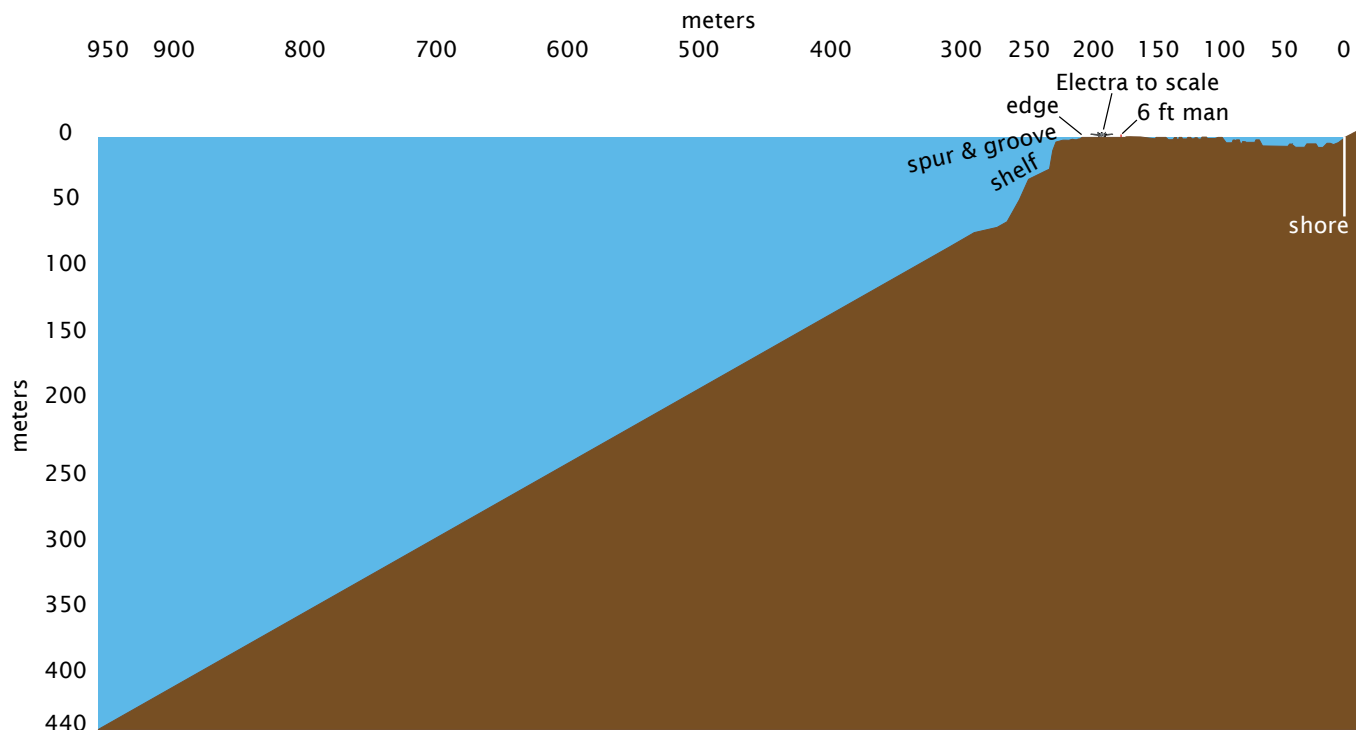
In addition to the ROV, we were fortunate to have an IVER2 Autonomous Underwater Vehicle (AUV) on loan to SeaBotix by OceanServer, Inc. The AUV, supplemented by a towed side-scan sonar, was used to map approximately 80% of the lagoon.



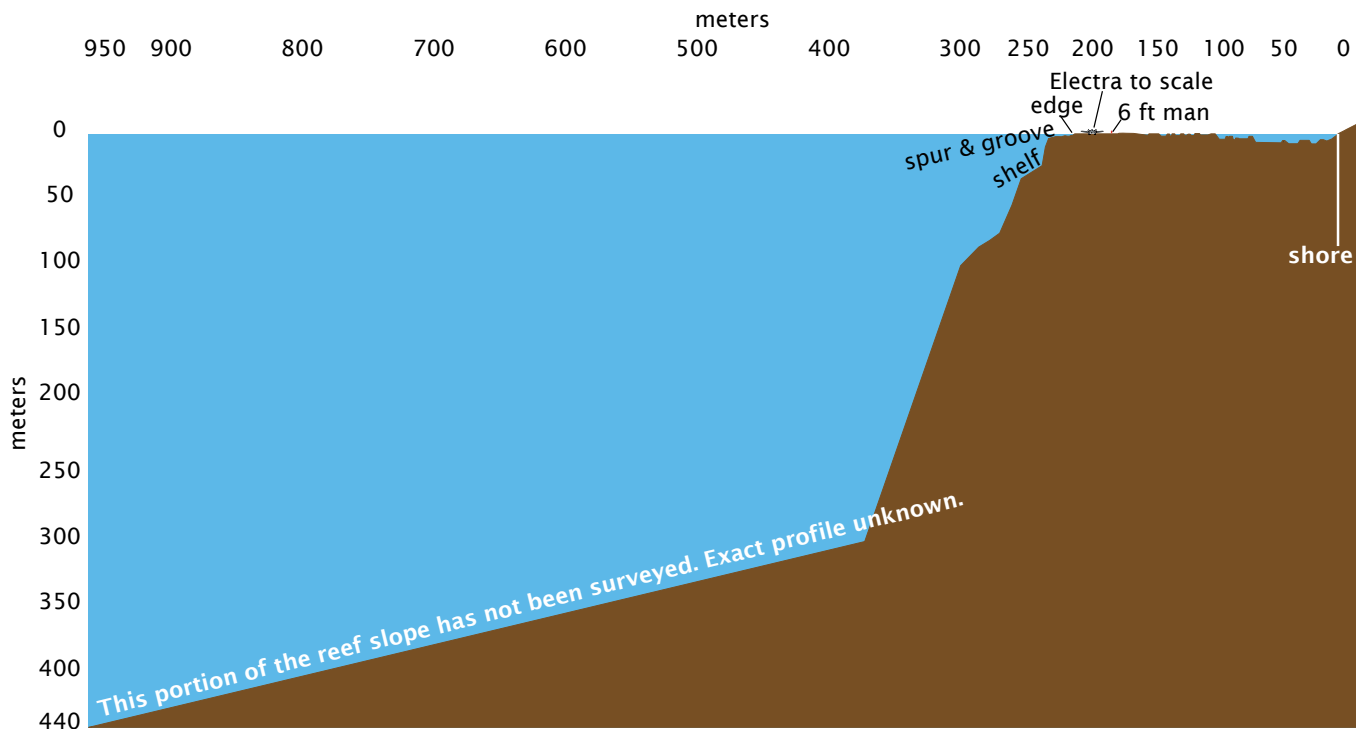
*Jesse Rodocker (left) and Walt Holm prepare to launch the IVER2 AUV. TIGHAR photo by John Clauss.*

The biggest surprise, and the biggest factor limiting our search, was the unexpected steepness of the reef face at Nikumaroro. Instead of a fairly even slope from the base of the previously explored area out to the first deep water sounding half a mile off shore, the slope plunges almost immediately to a depth of 300 meters (984 feet) before the bottom begins to level out enough to have reasonably caught aircraft wreckage. In other words, we discovered that the prime search area begins where our capability to search ended.

To search for the plane we'll need to be able to work down to 1,000 meters (3,280 feet). That's still relatively shallow and well within the capabilities of available technology (the searches for the Electra in the area near Howland were conducted at depths five times greater) but to search where we need to search we'll need a vessel with "dynamic positioning" – the ability to maintain a stationary position at sea within a tolerance of a few meters. That's going to be expensive.



*The reef slope at the west end of Nikumaroro based on the best data available prior to the Niku VI expedition.*



*The reef slope at the west end of Nikumaroro based on current data.*



# Daily Reports



These are not the voyages of the starship Enterprise and this is not the Captain's Log – but the idea is the same. These are the voyages of the TIGHAR Squadron – R/V *Nai'a* and M/Y *VuSI* – and this is TIGHAR president Pat Thrasher's log of daily reports of the Niku VI Expedition as posted on the TIGHAR website during the trip.

Nikumaroro is one of the most remote places on the planet. The only communication with the outside world is via satellite telephone – and even that is spotty. Dropped calls are the rule, not the exception. The transmission of digital photos is really not practical. Forget video.

At 5:30 each morning during the expedition, TIGHAR executive director Ric Gillespie (Pat's husband) made a satellite telephone call to Pat back home at TIGHAR Central in Wilmington, Delaware where the time was 12:30 PM. Ric reported on the previous day's

activities, discoveries and adventures and described the plan for the coming day. Pat took notes and then wrote up a narrative illustrated with photos from previous expeditions (carefully noted as such). By late afternoon the reports were uploaded to the TIGHAR website and an anxiously awaiting international audience.

The Daily Logs reproduced here are not a detailed journal of the expedition. That need is met by the field notes each team member submitted at the end of each day's work. The Daily Logs are Pat's written renderings of Ric's verbal summaries, aided by her own experiences on the island during four previous expeditions and colored by the fact that neither she, nor anyone else, knew what would happen next.

Now that the expedition has returned we can present the Daily Logs illustrated with actual photos of the events described. Enjoy.



## NIKUMARORO, 0530 LOCAL TIME, 24 MAY 2010.

*Nai'a* arrived off Nikumaroro at around day break yesterday, and by 9 a.m. everyone was ashore on a low tide. Most of the gang began clearing the "Gallagher Highway" – the trail across the island to the lagoon shore – while Ric took three of the new people, Curtis, Leonid, and Karl, to look at the village for orientation. They walked around on the beach, looking for signs of storm damage and washup.

There was a lot more trash on the beach than in the past – flip flops, plastic bottles, fishing floats, all the debris of civilization washed up on one of the most remote islands on earth. There were two big storm berms along the north side of the village, by Tatiman Passage, which completely covered the concrete pad of the radio shack and also the excavations done in 2007. The Rest House site was still intact, and Gallagher's grave as well, although they did remove a fallen tree from it.

After a break, during which they became objects of extreme interest to a gaggle of frigate birds, they continued around to Club Fred on the lagoon shore where they met the rest of the group emerging from the jungle. By then it was high tide, so it was time to bring a boat into the lagoon. The tide was high enough to load the boat with all the heavy equipment for the Seven Site, which was a great relief to all as it's no fun to carry hundreds of pounds of gear across the island. A small team took the boat down the lagoon to the Seven Site, marking coral heads as they went. They reported back that the trail was still

quite clear, although the site itself has grown up to ten foot tall scaevola.

While this excursion was taking place, Jesse and Walt were testing the Autonomous Underwater Vehicle (AUV). It's rather like a torpedo in appearance, and its function is to map the lagoon floor with high quality side scan sonar. You program it, put it in the water, and away it goes, coming back and parking itself at a site you designate. That's the theory, anyway, and in fact that's just what happened, which pleased Jesse. The equipment is borrowed, you see ....

The plan for today is simple: go to the Seven Site and begin clearing scaevola. The lagoon survey will also be started. A small team will be looking for a fire feature in the village to excavate as a control against the fire features at the Seven Site.

Morale is very high and everyone is ready to get to work.



*First boat away. TIGHAR photo by Walt Holm.*



*The AUV "torpedo." TIGHAR photo by John Clauss.*



During the day yesterday a group visited the pig taphonomy experiment site from Niku V in 2007. It was a very interesting experience. By the end of the trip last time, all edible material had been stripped from the bones of the pig, and the crabs seemed to have lost interest in the dry bones. The visit yesterday confirmed that thought: the bones were still there, right where they've been for three years. They had been washed somewhat inland by a storm, but otherwise were undisturbed.



*Pig bones. TIGHAR photo by Ric Gillespie.*

The other thing about them that was very interesting is that they looked old. Much older than three years. As old, in fact, as Gallagher reported “his” bones looking: gray, pitted, dry. The bones will be collected and used for comparison and visual training.



*A trail to the sea. TIGHAR photo by Curtis McGraw.*

The Seven Site crew opened trails straight through from lagoon to ocean yesterday, moved in all the gear, and assembled and tested those things which needed to be assembled and tested. Everything works. Lonnie, Megan, Gary, and Ric searched for fire features in the village without much success; apparently the ground has just been too much disturbed by repeated storms for fire remains to be readily apparent. One possibility was found and will be looked at more closely.

Jesse began the lagoon survey with the AUV and completed about 10% of the area in the first day. Last night, he put the ROV over the side of *Nai'a* for testing. They had two large flat screen monitors set up where everyone could watch as he “flew” the ROV under



*The Seabotix ROV. TIGHAR photo by Jesse Rodocker.*

the boat, around the reef, coming nose to nose with various fish. Today they will begin familiarization with the wreckage of the *Norwich City* and start “tuning” their eyes to the environment. A cable was damaged in transit, so they are using a shorter cable until the new one can arrive on the second boat.

Otherwise, it's a scaevola-whacking day. The Seven Site must be cleared completely in order to begin to execute the plan for excavation. Not just cut down, but all debris carried (not dragged!) away, leaves picked up, surface litter removed, all in 110° heat. This is not fun.



*Scaevola frutescens, with a ren (Tournefortia argentea) in the background. All to be cleared. TIGHAR photo by John Clauss.*



## NIKUMARORO, 0630 LOCAL TIME, 26 MAY 2010.

Serious clearing work began at the Seven Site yesterday – and was finished. The gang was able to do in two days what took a week in 2007, in part because the scaevola is young and easier to cut, but also because everyone worked like six horses. The clearing is done and today the actual digging will commence, according to Tom's plan. Everything is being filmed and photographed continuously. Mark even has a still camera mounted to shoot infrared in order to see what goes on there at night.



Mark on his shooting platform. TIGHAR photo by Lonnie Schorer.

The ROV worked around the *Norwich City*, looking at the debris field there and also at the slope and ledges to get a feel for the topography. There is a ledge at about 50 meters, and another at about 100 meters. After that, it drops off very smoothly at around 80° as far as the cameras could see. Possibly the longer cable, which will arrive with the second boat, will allow them to find a bottom; but it seems likely that anything that does not hang up on one of those two ledges is very deep indeed.

Ric and one other person will begin laying out a perimeter search in the buka forest with the objective of finding any bones that may have been taken by crabs. Bill and Leonid will run an exploratory line from the ocean shore in towards the main site in order to pick up any wandering artifacts that may have been separated from the known site by water or critters.

Meanwhile, the main walk-in cooler on *Nai'a* has developed a problem, causing a good bit of food to spoil. It is indeed a Good Thing that *VuSI*, the second boat, will be arriving at the halfway point, because otherwise they'd be down to fish and coconuts for the trip home. As it is, stores, the new ROV cable, and some odds and ends of equipment will arrive with the fresh troops.

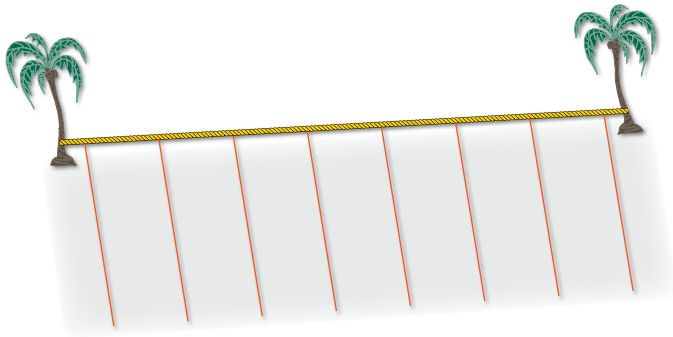
Everyone is feeling great and is in good spirits.

### THE PLAN.





Yesterday was the first day of digging at the Seven Site. Tom's plan involves stretching a line between two defined points, with the line divided into seven segments or lanes, each bordered by a brightly colored string. Beginning at the north end, the workers will trowel down to the 10 cm level, closely inspecting everything they move for anything anomalous. Yesterday the concept was proved by finds of additional turtle and bird bone.



Meanwhile, Ric was metal detecting the area. It's been done before, and will be done again, and we always find new things. In this case, besides another nail (a common find), he found the remains of a pencil: the little metal band which goes around the eraser, and the stick of graphite from the middle. The wood was completely gone except for a very small amount inside the eraser clamp.

The ROV began working about 600 meters north of the wreck of the *Norwich City*, and confirmed the underwater topography: aside from the two ledges at 50 and 100 meters, they went to 900 feet without being able to see any bottom. If the aircraft wreckage did not land on one of those two ledges, it may well be gone for good.

The pig bones from 2007 were collected for use as comparison with coral rubble. It's very important that the group has mammal bones from three years ago for this purpose, as that is the time frame Gerald Gallagher would have been looking at if he did, indeed, find the bones of Amelia Earhart. The pig bones look very old and weathered, and also distressingly like coral rubble. But they are much lighter in weight than the coral, which is helpful.

During lunch a large centipede came to investigate the smells? ... who knows what a centipede senses. But large he was, and when Tom Roberts touched him with his boot, the critter ran up his leg. Luckily outside his pants, because they leave a terrible chemical weal if they touch your skin. Lonnie was able to flip it off with an implement, and Karl ushered Mr. Centipede out of the area. Team work is very important on our expeditions. So is learning a basic rule first-hand: Don't pet the bunnies and squirrels. Some of them bite.

Today the work at the Seven Site will continue. During the first half of the day, Gary, Mark and Ric will be landed on the north side of Taziman Passage, and they will walk around the north side of the island to investigate the site of "Nessie" out on the reef. Today promises good weather and a very low tide, so it's a good day to make this excursion. We don't really think there's anything still there, but we have to look.



*"Nessie" – man-made object seen in a photo taken in 1937 by Eric Bevington.*

## NIKUMARORO, 0545 LOCAL TIME, 28 MAY 2010.

Ric, Gary, and Mark went to look at the “Nessie” location, which involves a sloggng hike around the end of the island, and then out onto the reef. Using GPS and the spot marked by our forensic imaging specialist, they arrived at the correct area at dead low tide.

That part of the reef is shaped somewhat like a crowned road, a higher area with a lower swale inshore, and a gradual slope towards the surf line as well. The higher area is perfectly landable, but is bordered by jagged, pitted coral rock inland, and the slope and spurs and grooves seaward. Insofar as they were able to pinpoint their location accurately (and there is some slop in the coordinates), there appears to be a groove just a few meters from the spot where Nessie was photographed. If you stand there and look back towards the *Norwich City*, it's just about the right place to have approached over the wreck of the ship, land, and roll out.



Each roller coming in carries sharks surfing along, which would be somewhat disquieting to anyone trying to walk around out there, getting in and out of an airplane.

At the Seven Site the excavation continued, a little faster now as people's eyes get tuned to the terrain and the debris. They continue to find bird and fish bones, but so far nothing else. The team is using trowels to pull surface into gray dustpans, then with the tip of the trowel pushing it back out, and watching for anything interesting as each piece exits. Very painstaking work, but we can't sacrifice thoroughness for speed: teeth are small.

Meanwhile, a team of four (Bill Carter, Karl Kern, and two crew members, Moses and Kuroi) have cut in from the ocean side about 60 meters, making a path about 2 meters wide, and will turn north today to connect with the main area in about 30 meter. This will give a sampling of the area outside the search site for comparison, and of course if anything is found will justify expanding the search area.

The ROV worked a few hundred meters north of the *Norwich City* yesterday, but the wind kicked up until *Nai'a* could no longer hold station safely that close to the reef, so they had to knock off at about a 100 meter depth. The weather is forecast to be much calmer today and tomorrow, so they should be able to get a lot done. Walt and Jesse went around and tried snorkeling on some of the sonar targets in the lagoon, but the wind had so disturbed the sediment and water that visibility was almost zero. They'll have to wait for a day without whitecaps on the lagoon to get much done there.

Today: More of the same. Rinse and repeat.



*Megan and Jon digging. TIGHAR photo by Andrew McKenna.*



## NIKUMARORO, 0500 LOCAL TIME, 29 MAY 2010.

The Dynamic Duo, a.k.a. Bill Carter and Karl Kern, have completed their trail in from the ocean side to the main Seven Site. It was very rough work, and they will now stand down for a day or two to recuperate. The cleared trail will be gone over with metal detectors and subjected to a visual survey to see if there is any scattering of artifacts or interesting things that would justify further expansion of the clearing.

At the Seven Site, Megan found a new fire feature under the big ren tree. This is very exciting as it adds another layer of evidence to our hypothesis that the castaway spent quite a bit of time in the area. The excavation continues to turn up bird and fish bones, as well.

Andrew found a very small man-made artifact. It is a plastic (?) threaded knob-like object, very small, which seems to possibly be some sort of cover for an opening in something. It appears to have a "1" or a lower case "L" stamped on the inside. The cameraman says he hasn't dropped anything.

The ROV team used the short cable to cover the reef slope north of *Norwich City* down to 150 meters. Today they will continue to the south of the wreck. The slope is very steep, and there were no ledges, and no man-made objects (although they did see a hammerhead shark). When the long cable arrives again, down to 300 meters (almost 1,000 feet). They are



*Kids! Don't try this at home! Bill and Karl finish clearing. TIGHAR photo by Ric Gillespie.*

working very intensively as long as the wind and weather hold, because it can easily get too rough to be able to hold station safely.

Clearing at the Seven Site is done for now, and the digging continues apace.



*Megan digs it. TIGHAR photo by Ric Gillespie.*

*Seven site "base camp." The canopies provide much-needed shade. Collapsing shaker screens are in the foreground to the right, and a solar suitcase power unit extreme foreground to the left. TIGHAR photo by Karl Kern.*





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## NIKUMARORO, 0530 LOCAL TIME, 30 MAY 2010.

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Excavation continued at the Seven Site. Bill Carter found yet another fire feature, and it seems possible that the features are in a rough ring around the big Ren tree, although more data points are needed. Did the castaway construct a ring of fire to keep away the crabs at night? We can't know yet, but it's an interesting speculation.

Megan found a shark tooth which may have a hole drilled through it. This could have been dropped by a colonist, or it could be prehistoric. Another piece of Tiny Technology, like that found Thursday, was also found. Did some sort of instrument or machine get disassembled or broken here?

The Seven Site is now defined northward. Enough work has been done towards the Buka forest that a boundary can be set. Today, the lane cut by Bill and Karl will be surveyed and metal detected in hopes of finding a similar "edge" to the south.



*Approximate locations of the Seven Site fires around the big ren.*



*Campfire on the beach at sunset. TIGHAR photo by Andrew McKenna.*

The ROV, aboard *Nai'a*, had a tough time yesterday getting close enough to the reef to provide a stable platform for operations. When the wind kicks up there's a lot of surface area to catch it. Then a two knot current developed and the ROV was unable to stem it. So Jesse and Walt went over to the lagoon and did another chunk of AUV side-scan sonar work there.

Mark and Andrew stayed overnight on the island at the Seven Site, so Mark could get some particular shots he wanted. When Ric called they hadn't heard anything yet, but presumably the campers didn't get eaten by the crabs.

Morale is good. Digging, while not terribly exciting most of the time, is at least less brutal physically than hacking scaevola.

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## NIKUMARORO, 0530 LOCAL TIME, 31 MAY 2010.

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A very straightforward day yesterday, with operations continuing at the Seven Site in an orderly fashion. Ric found yet another fire feature, with some metal stuff in it. They don't know what the metal stuff is yet, or what it might be,



*Strawberry hermit crabs in a frenzy over some small piece of food. TIGHAR photo by Tom Roberts.*

but it's there. There is some speculation that all of these fire features may show a "Clean cup move down" point of view on the part of our castaway, with a different fire for every meal. Not surprising if there are dozens, even hundreds of crabs crawling over the remains of your last meal!

This new feature is on the ocean (east) side of the Seven Site. Boundaries have now been fixed to the north, south, and west; the eastern edge is still unknown but (again, speculation) the castaway's camp does seem to be confined fairly closely to

the original Seven Site delineated in 2007. What they are finding is that the use was more intensive than original thought, perhaps indicating that the castaway was there for quite a while.

Today the team will stand down from formal operations. Those who wish to will go ashore on jaunts of their own, others will stay aboard and rest, catch up on notes, and the like. The ROV may work if seas and currents permit.



*Gary and Curtis dig lanes. TIGHAR photo by Ric Gillespie.*



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## NIKUMARORO, 0530 LOCAL TIME, 1 JUNE 2010.

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There was no excavation at the Seven Site yesterday as it was a rest day. As usual on rest days, everyone went ashore and did something strenuous, mostly walking long stretches of beach to see the Coast Guard site, the *Norwich City* wreck, and other points of interest on the island.

Jesse, on his only day ashore so far, went out to the *Norwich City*. The memorial plaque we installed in 2001 had come off, which says quite a lot about the violence windward weather can wreak on the island: the plaque is bronze, weighs approximately 30 pounds, and was affixed to the steel structure of the engine with industrial epoxy. Jesse found it well up on the reef in the debris of the ship, and recovered it. There is a tiny museum in England which will give it a good home. The engine itself is within one more good blow of collapsing entirely. Soon there will be no visible sign of the once-imposing wreck.

Some general observations about work at the Seven Site: the atmosphere is one of serious concentration, with little chatter. The steady “clink clink clink” of trowels on coral rubble is almost the only sound. (Ric says it reminds him of the opening scene in *Spartacus*.) Every now and then someone will sit back and call for Tom or Andrew to come and look at something. (Andrew grew up accompanying his father on dinosaur digs in the Gobi Desert and can spot a bone at 50 paces.) Otherwise, each person sticks to the assigned lane, stretching occasionally but with eyes still on the ground.

When clearing, they find they are using the chain saws more than the loppers this trip. It's very dangerous, and only one saw is operated at a time. Only Bill and Karl use saws, with Ric and sometimes a member or two of the crew to clear debris. The injury most feared is one involving massive loss of blood. With definitive medical care easily 36 hours away, there isn't a lot of room for carelessness or complacency.



*Ric on the base of the Norwich City engine in 2001, with the plaque.  
TIGHAR photo.*

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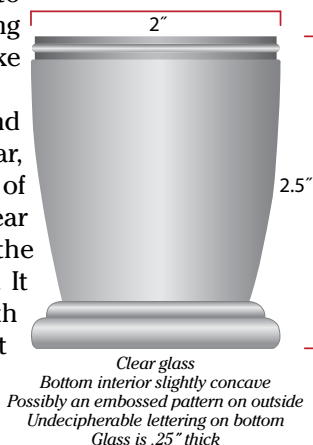
## NIKUMARORO, 0540 LOCAL TIME, 2 JUNE 2010.

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An exciting day at the Seven Site yesterday. During Niku V (2007) a piece of a pocketknife was found at the site. The piece found is known as the “side scale” – a pocket knife of this type has two side scales and a center scale, and also has “bolsters” (the end cap) on both ends. Ordinarily the covering of bone or plastic would be attached to the side scales, and the center scale would separate the two blades.

Ric was metal detecting at the extreme south edge of the site and found the rest of the broken side scale; the center scale; and the other side scale (see photos page 5). The loop end bolsters are gone, but the other end bolsters are there. No blades, though. He speculates that both blades got snapped off in use, so the possessor of the knife pounded it apart to get at the scales, they still being useful for prying at things like clams.

Meanwhile, Megan found the top of a broken glass jar, and Karl found a side and part of the bottom. It's a small jar, clear glass, with rounded interior on the bottom rather than 90° angles. It is 3 inches high, and the mouth diameter is 1.75 inches. It has some sort of pattern on the outside sides, and some



sort of embossing on the base, letters or numbers. The embossing cannot be read (too dirty) but they are going to try to get a rubbing through the plastic bag it is in this evening (artifacts are not handled or cleaned as a matter of routine until it can be done in a really controlled setting). This is very likely another gender-specific item, perhaps a cosmetic jar.

Ric also found a small clip, brass or copper, with a complex shape. It would screw onto a flat surface and hold a cylindrical object. It has numbers on it: 336 or 346, and beneath that 260. No letters. They are going with the idea of this being related to Coast Guard activity, but it was still collected and will be investigated fully.

One experiment they ran was to take the pig bones recovered from the taphonomy experiment to the Seven Site, drop them on the coral rubble, and film the ensuing search. The bones did indeed “disappear” into the coral rubble; in fact, Ric had trouble finding them again.

Today, they will clear additional area to the south (all archeological finds are made just outside of the defined search area, usually at the junction of two or more maps of different scale) and continue to work the lanes in that direction and find more Good Stuff.

The ROV is finished with the work they can do until the long cable arrives at the end of the week, so that team will finish the side-scan sonar of the lagoon.

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## NIKUMARORO, 0530 LOCAL TIME, 3 JUNE 2010.

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The team found more new things yesterday. First, another piece of the knife, which brings the inventory to three out of four bolsters and all three scales. Having studied what we have so far, they think that the knife was broken open for the explicit purpose of removing the two blades. To make a fishing spear? To get at strong parts for prying open clams? We don't know, of course. Interestingly, in the process of digging out the piece found yesterday they discovered they were on the edge of yet another fire feature. Today they will excavate that in an orderly fashion and see what else might be lurking in the charcoal.

Another thing was found, and right now they are thinking that it may be part of a vacuum tube used for target practice by the Coasties. They're calling it the "dragonfly." In total it measures about one inch by one inch, and is made of brass or copper. The center portion is a rod, too thick to be called a wire. It has serrations

on one side – not threads, but regular indentations. The "wings" are flat and thin, with holes as shown. An interesting piece.

They tried doing a rubbing on the glass jar to pull up the letters or numbers, but were unsuccessful, so that will have to wait upon getting home and into a controlled lab environment.

One challenge in working around the Seven Site this trip is that the giant centipedes are more numerous than they used to be. And they are extremely fast. One ran up Gary's back yesterday while he was excavating and was flipped off just before it got to his head. They leave a nasty blister and burn, so people are not lying around on the

ground to rest. Some are eight to ten inches long

The underwater group got a big section of the lagoon done yesterday with the AUV and the towed sonar. Today and tomorrow they'll finish up the sonar work and then begin diving on targets.



*Karl demonstrates centipede evasion technique. TIGHAR photo by Lonnie Schorer.*

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## NIKUMARORO, 0530 LOCAL TIME, 4 JUNE 2010.

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No exciting news today, alas! But that's the way things go in the field. The hours of slogging to hours of excitement ratio is usually pretty poor.

The new fire feature yielded a lot of turtle bone, perhaps as much as a quarter of a turtle – carapace, bones, and so on. There are some fish bones as well, a couple of them quite large. Again, this tells us that the use of this site may have been pretty intensive and long-lasting.

The AUV and side scan sonar survey of the lagoon is about 80% done. Walt and John stayed up late looking at sonar read-outs and planning today's work, which will be diving on the most interesting targets. The examination of the targets will probably be done mostly by touch as the lagoon water is very murky.

When the day's work is less exciting, the group compensates by laughing and joking even more in the evening. Ric says everyone is doing a great job, keeping spirits high and the work going strong in spite of the heat and the disappointments. Interestingly, everyone is reporting having very vivid, crazy, brightly-colored dreams. Is Nei Manganibuka (the spirit of the island) sending them messages?



*Excavation of turtle bones. TIGHAR photo by Andrew McKenna.*



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## NIKUMARORO, 0525 LOCAL TIME, 5 JUNE 2010.

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Yesterday the group working on the fire feature where the rest of the knife was found also found another major part of the glass jar. They now have the entire mouth of the jar, and can connect the three pieces found together to reconstruct the shape and size completely. The puzzling thing is that this piece was 30 meters away from the other pieces. Was there some sort of residue in the jar that was attractive enough to a crab to make him drag it away? Or was the jar broken deliberately to obtain a sharp piece of glass as a tool? The edges are still sharp enough that they have to be careful the plastic bag doesn't split around it.

Karl has observed that the glass we have found at the Seven Site, in 2007 and this trip, seems to be all castaway glass. There are no Coke bottles, and only one beer bottle. It is those bottles that would show a major presence by the Coasties. The Coast Guard visits may have been confined to one target practice day, rather than repeat visits.

Another question: Why so many fires? Yes, there is a ring of fire around the ren tree, but there are also other fire features scattered about, each with its collection of bird, fish, and/or turtle bones. Why not have one fire location? Did the crabs invade each campfire in search of scraps?

Curtis and Lonnie got wonderful KAP (Kite Aerial Photography) yesterday. Ric will be working today on logging in artifact locations on some shots.

The AUV finished mapping the lagoon with sonar, and both yesterday and today they are diving on things that look like promising targets. Visibility is just about



zero, so they are working by feel, and hoping they're not feeling up a shark. So far all the targets have turned out to be coral heads.

Our Customs observer on this trip is Takirua Taabu (he was on the 2007 trip too). Yesterday was his birthday, and Suli found out through some sort of devious chat. She surprised him with a cake and candles, and everyone sang Happy Birthday – a nice touch of home!

Tomorrow the second boat arrives early in the morning. There will be a brief familiarization tour of the village and Seven Site, then right to work; there is still a lot to do.

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## NIKUMARORO, 0520 LOCAL TIME, 6 JUNE 2010.

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This team is working so well, and so efficiently, that Tom King decided to re-open a few of the features excavated during Niku V to see if more could be found. The answer was a definite yes. In the SL feature they found two more pieces of rouge – small, roughly square. They also got a start on re-opening the WR unit, where the bottles were found, and immediately found another piece of green glass. Work will continue on that unit today.

Megan found a strange little artifact, plastic (Lucite?), rather like three teeth from a comb, but the teeth weren't quite right for a regular comb, heavier and with some kind of reinforcing ridge. A woman's hair clip or old fashioned comb for keeping hair in place? This will be an interesting one to look into.

The work is going quickly, so much so that they will be able to expand the area and do more than originally planned, especially with the extra hands arriving today. When Ric called, dawn was just breaking, and he was going to go up to the bridge and see if there was any sign of *VuSI* on the radar or horizon. The new arrivals are Graham, Art, Janis, Dan, another cameraman, and the observer from PIPA, Temoai Ioneba. It is hoped that the ROV work can shift to *VuSI* which has bow thrusters and

will be a more stable platform, so that current, seas, and wind will not be as much of a factor while they deploy the ROV on the long cable.

There was an adventure yesterday. Keep in mind that Adventure is what happens when things go wrong, and wrong they did go. The whole gang, 18 people, were in the skiff on the way from *Nai'a* to the landing channel when the outboard started making odd noises, knocking and banging, and then quit. They were dead in the water, drifting toward the reef edge with big rollers taking them closer to catastrophe by the minute. After what seemed like hours, but was probably more like 10 minutes, the crew was able to coax the engine into starting and running at idle, giving them just enough steerage-way to get into the channel. Half way up the channel it quit for good; the bearing welded itself to the prop shaft turning the engine into an anchor. But they got in on a wing and a prayer, *Nai'a* came 'round and close in, they got the skiff back to *Nai'a* by paddling, and a replacement engine was fitted and tested. Not a good feeling, though, to be heaved ever closer and closer to that reef, with the bones of *Norwich City* to remind you of the consequences of sudden impact!

## NIKUMARORO, 0530 LOCAL TIME, 7 JUNE 2010.

The first day with the group from *VvS1* went very well. Ric took them walkabout in the village, then down to the Seven Site for a tour with Tom King and finally an introduction to the buka forest. After that, they went to work, with Dan on a metal detector and everyone else digging hits in the blazing sun. They found another batch of .22 and M-1 carbine shells, which helps a lot in rounding out our understanding of how the site was used by the Coast Guard, and also possibly by Gallagher.

*VvS1* is happy to serve as a platform for the ROV. All the gear was transferred, and with the long cable they went right to work north of the *Norwich City*. The first major discovery is that there is a big, wide shelf at around 900 feet. It has coral boulders on it, so it could easily have airplane wreckage on it. They'll be working that level very intensively with high definition video over the next few days.



*VvS1 at daybreak. TIGHAR photo by Janis Carty.*

and we couldn't be more grateful for the wonderful people who are working so hard.

The crew of *Nai'a* cooked dinner ashore for the *Nai'a* folks. It was a traditional Fijian firepit dinner and was quite wonderful. The food was brought back aboard to eat, because otherwise you just end up covered in crabs. A great treat!

After dinner, a skiff went to *VvS1* and brought those folks over for the team meeting. We're glad this works, there was some concern over transferring from skiffs to boats in the dark, but both boats are equipped with excellent lights and all went well.



*The ROV station aboard VvS1. TIGHAR photo by Jesse Rodocker.*

There was a small accident involving the ROV equipment – a transducer went through the propeller. They have another one, but it's always a bit embarrassing to break equipment.

At the Seven Site, yet another piece of rouge was found and more glass came out of the SL unit. The work is so interesting, although slow of course,



*First day tour. Ric, Graham, Temoai, and Dan, with Taylor in the background. TIGHAR photo by Janis Carty.*



## DATELINE: NIKUMARORO, 0535 LOCAL TIME, 8 JUNE 2010.

A long and dirty (in the most literal sense of the word) day, but ultimately very successful.

With *VuSI* on station, there are too many people to get everyone to the Seven Site in one boat load, especially when there is a lot of gear to be transported. Yesterday all the Ground Penetrating Radar equipment had to go from *VuSI* to the site, which was accomplished. Taylor (now known as Radar) Keen assembled everything, set it up, calibrated the system, and tested it successfully, so today will be the first full day of actual survey work with the unit. The biggest concern he has is that the ground is full of fresh-cut roots from the scaevola, which will interfere somewhat with the signal, but he was able to discriminate between that background and test artifacts. The other problem was that the day was somewhat rainy, so the equipment had to be covered up periodically. But that's working on Niku.



*Taylor guides the GPR unit through a lane.  
TIGHAR photo by Andrew McKenna.*

The second load was about halfway down the lagoon in the boat when the engine quit, leaving them two miles from everything with one paddle. As it turned out, the exhaust hole for the cooling water was blocked; once the engine cooled enough to restart, they were able to meet a

*Nai'a* engineer at Club Fred and get it unplugged. But as Ric says, when you're dead in the water on Niku you are really dead in the water.

At the Seven Site, they found more rouge, more glass, and – very surprisingly – a small piece of one of the exterior bone handles of the knife. The map to the right shows where some of the units from 2007 are; GL is where the compact glass was found, WR is where the bottle glass was found, and SL is where the rouge was found. The trees are numbered merely for our convenience.

While this work was going on, Ric, Art, Dan, Janis, and Graham were in the buka forest finding more shells – enough to support a fire fight. Abandoning metal detecting for now, they decided to look for crab burrows to see if the large coconut crabs carry off bones to their lairs. One large crab has been visiting them at lunch time, and they found his burrow. Ric looked inside, and the crab lunged at him. Ric managed to grab him by the front legs and Graham dove into the open trunk of the buka tree to rake out the burrow. They didn't find any bones, and have since decided that perhaps another approach would be safer. Art spent most of the day lying on his stomach in the forest fishing down burrows and hoping nothing was

going to grab him. Days like that make you really grateful for that fresh water shower and laundry service aboard.



*Art fishes for artifacts in a crab burrow. TIGHAR photo  
by Janis Carty.*

One thing they did notice: the rain showers that passed, sometimes with heavy downpours, left the bowl-shaped hollows in the buka trees filled with fresh water. Even the large leaves had a few ounces in them. The forest would be an excellent source of water for a castaway.

Aboard *VuSI*, the ROV found the first underwater man-made objects seen on this trip. On the ledge right off the “Nessie” location at about 265 meters they spotted a length of rope or line, and a semi-circular piece of wire. The wire is two to three millimeters in diameter, and light enough that the ROV's thrusters made it stir. But this is very exciting: the reef slope and ledge are not littered with debris and to find something right off the location where we have a photograph of something is huge. They are planning to retrieve the wire today.

There are three days of work left, then a break-down day.



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## NIKUMARORO, 0530 LOCAL TIME, 9 JUNE 2010.

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The weather gods did not smile on the ROV team yesterday. Currents and waves were both too strong for the boat to work in close enough to the reef to get good results; so instead of trashing the cable and possibly the ROV, they decided to fight another day.

Ric, Art, Janis, Graham, and Curtis walked around the Nuziran beach to look at the “Nessie” area again. For those of you with grid maps, this is at WB-6. Art and Ric went out to the exact spot with the GPS to look in the groove again. It’s pretty hairy doing that with the waves breaking all around you on the slippery reef, but everything worked out fine.

The afternoon was spent at the Seven Site continuing the excavations, where the team found two buttons. A button was also found in 1996 (see left). These new ones are both, Ric thinks, slightly smaller than that one, and one of them is smaller than the other. They are ordinary four-hole buttons, with a dimple on the back from the injection mold, more domed on the back and flatter on the face than the first button found. They were both in the SL feature.

Now, anyone can lose a button off a shirt or pair of shorts. One button. But three? Of different sizes? This begins to smell very seriously like an entire garment, with the cloth long since reduced to dust. Was the garment laid aside? On a body? Thrown away? Dragged away by a crab?

A major activity at the Seven Site today and tomorrow will be KAP, especially tomorrow. They’ll pull all the canopies, outline all the units with bright surveyor’s tape, and shoot the entire site. Friday will be break-down day, then head for home with nightfall.



*Ric and Art on the reef flat at the Nessie site. TIGHAR photo by Janis Carty.*

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## NIKUMARORO, 0530 LOCAL TIME, 10 JUNE 2010.

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Home stretch. Today is the last full day of work.

Finds yesterday:

- ❖ A small red bead, looks like ceramic, with a hole through the middle. The bead is perhaps 3 or 4 mm in diameter. Decoration on a makeup something-or-other?
- ❖ Pieces of a small, fairly delicate bottle, on which Megan thought she could discern a letter N in an ornate Art Deco style.
- ❖ A small metallic object, fairly robust, obviously a piece of something somewhat larger, reminds people of the part of a key you hold while you busily wring off the machined part in the lock.

Two days ago Taylor Keen surveyed the Seven Site with the GPR. Since then he’s been crunching data, filtering out the noise from tree roots and so on. This morning he laid out a number of hits that are apparently metal, somewhat deeper than they’ve been digging – maybe 30 to 50 cm (12 to 20 inches) below the surface. Today they will investigate those hits and see... well, see.

The KAP team flew the entire site and on down all the way to the Coast Guard installation and got great imagery. Today the team will strike all the tarps and covers and sunshades so that the site can be photographed again for accurate placement of artifacts.

The ROV team did much more searching, and will continue to work the deeper areas. They couldn’t find the wire again, but as it would not be diagnostic they are not going to use up any more precious time looking for it. The morphology of the reef indicates that the slope becomes gradual at about 350 meters, which is, of course, just beyond the range of the technology they have with them which goes only to 1,000 feet or just over 300 meters. However, there are smaller shelves, and places where things could easily be hung up, so they will work down towards the *Norwich City* today.

The degree of recording of data on this trip is several orders of magnitude beyond all previous trips. They are able to keep much closer track of what came from where, and will be able to plot the locations quite exactly. And they’ve found so much stuff! Far, far more than we anticipated. This is a huge and complex body of information and we are looking forward to getting our teeth into it.



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## NIKUMARORO, 0530 LOCAL TIME, 11 JUNE 2010.

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Last day at the island. At 4 p.m. the lagoon boat will go back out the main passage and the island will be left in peace once more.

The GPR work turned out to be quite interesting. They dug three of the places that Taylor felt were strong metal hits and found nothing at all. Nothing as in, no explanation of why there would be a strong return, no metal, no water, no tree roots, nothing. For whatever reason, this technology in this form doesn't seem to return good results in this environment. In a way it was a relief: the "hits" were so much deeper than anything they've found, it raised the specter of an entire sub-layer to the site that would need to be excavated.

The ROV team got in some good work yesterday in the morning before the current set too strong to hold the unit. They didn't find anything and were able to get almost all the way to the Norwich City. At least we've defined the problem with the underwater search: the reef slope is mapped, and the area where debris would end up, while deep, is not out of reach of currently available technology. We will need a larger unit, much more cable, probably a boat designed for the purpose of underwater search, but it's perfectly do-able with sufficient funding.

We've never had such a successful expedition. We have confirmed earlier results, extended our understanding of the site and the reef, found much new material, and have enough work coming home in plastic zip-close bags to keep us and the labs busy for months. Research requests will flow out, information will flow in, and we'll know what to do next soon.

Almost everyone involved in the Earhart Project eventually has what we call an "Amelia Moment" – a point at which it all becomes real, no longer just an interesting theory, but a human story of courage, suffering, death, and discovery. For some, it comes in an archive; for others, from a book. For many it comes on the island. Standing on the reef with the sun like a hammer, feeling what it might be like to watch your plane go over the edge ... Sitting on the ground at the Seven Site, watching the crabs come closer, imagining not being able to move ... Walking through the buka forest, hearing an airplane go over, knowing – knowing – you could not possibly make it to the beach in time to signal an observer ...

We may be 72 years and 11 months too late, but we owe it to her to find the truth.





**Graham Berwind**



**Bill Carter**



**Art Carty**



**Janis Carty**



**John Clauss**



**Ric Gillespie**



**Walt Holm**



**Taylor Keen**



**Karl Kern**



**Tom King**



**Dan Lann**



**Megan Lickliter-Mundon**



**Andrew McKenna**



**Jon Overholt**



**Gary Quigg**



**Tom Roberts**



**Jesse Rodocker**



**Leonid Sagalovsky**



**Lonnie Schorer**



**Mark Smith**



**Curtis Webster**



**Gerald**



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