VK9MA STORY

WHERE TO NEXT?

My 2015 Willis Island DXpedition partner, Hawk, SM5AQD, and I began plotting our next adventure together in early January 2017. After studying ClubLog's most-wanted list, we narrowed it down to Kiribati (T31) and Mellish Reef (VK9M). Having already worked with the Australian government as well as having an experienced charter boat and skipper, Mellish Reef was the obvious choice. This is the story of how we pulled the team together and were able to accomplish the VK9MA planning and execution of this expedition in under eleven months.

An azimuthal map with Mellish Reef in the center point shows U.S. and Europe roughly 90 degrees apart, NE and NW respectively. Japan is due north, with the rest of the world comprising the remaining directions. Based on ClubLogs most-wanted list, Mellish Reef was ranked number 22 on the most-wanted in Europe, while the US was number 58, meaning Mellish Reef was needed more in Europe than the USA.

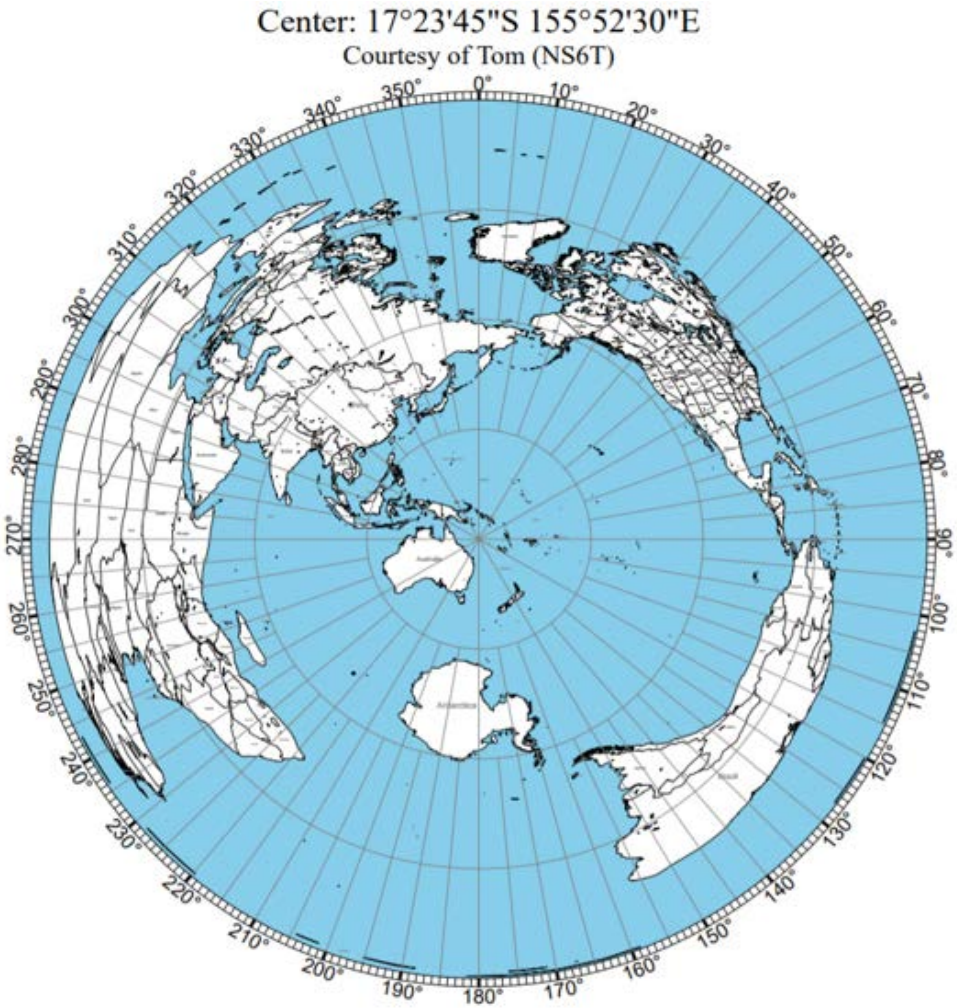

Figure 1 – Azimuthal map of Mellish Reef wrt the rest of the world.

THE TEAM

Hawk and I determined we would assemble an international team to keep our operational focus worldwide during the expedition. Our only other requirement was that the team composition be such that we would all work well together, in light of the fact the team was going to spend almost one month together, and sometimes in very difficult working and living conditions. Therefore, our team was selected from operators we have worked with in the past, or operators highly recommended from someone we knew and respected.

Figure 2 Team Photo - David W5XU, Dave WJ2O, Rob N7QT, Morten LB8DC, Brian N9ADG, Dietmar DL3DXX, Lasse SM5GLC, Hawk SM5AQD, Eric SM1ALH

INITAL PLANNNG

Bianca Charters was selected to transport the team from Port Douglas, Australia, to Mellish Reef and back. The charter boat was the MV Phoenix, piloted by Captain Pete of Port Douglas.

The MV Phoenix was able to safely carry a maximum of nine members of our team. Nine operators could easily keep four stations running full-time, which determined the number of stations we would run while on the island.

One goal of this expedition was to provide near real-time reporting of QSOs made during the DXpedition to the ClubLog website. We believed the team could further reduce the number of duplicate contacts, if operators were able to quickly confirm their QSOs shortly after contacts were made. We were on a deserted island with no Internet connectivity and would have to rely on satellite-based communications to the outside world. An older Hughes 9201 SAT COM device was purchased for this purpose.

We used N1MM+ as our expedition logging software, with all four stations reporting into the central/master N1MM+ database.

To provide near real-time uploads to ClubLog, Brian N9ADG, wrote a software application to run on a $35 Raspberry Pi computer. The application checked the central N1MM+ master database at one-minute intervals to identify all changed QSO records since the previous check. Every new, updated, or deleted QSO was then placed into a compressed file and uploaded to the ClubLog website.

While working on our Raspberry Pi application, Brian discovered incoming text messages to our Hughes 9201 satellite device were free! Everyone loves free, right? We decided to utilize this feature to receive Internet spots on our laptops during the DXpedition, as well as regular news updates. Brian wrote a software application to run on Amazon's LightSail cloud service to gather any DX Cluster Spot containing the text "VK9MA". This software application would also grab news headline feeds and package them into text messages. The software application would then package the text messages—VK9MA cluster spots and news feeds— using our satellite provider's website to send the text messages to our Hughes 9201 satellite communications device. Brian also wrote a separate application for the Raspberry Pi which queried the Hughes 9201 device at regular intervals for incoming text messages, posting the incoming text message to the N1MM+ IRC chat window, allowing any N1MM+ client to view the incoming text messages in near real-time. Future DXpeditions should seriously consider using this feature to receive incoming information for no charge, reducing satellite data charges.

Our biggest concern planning this DXpedition was the approaching solar minimum of the current solar cycle. After experiencing many weeks of near-zero sunspots and dreadful propagation this past summer, we knew that keeping four stations active during the day was going to be problematic. Our biggest challenge was going to be keeping four stations busy during the day with no guarantee that 10m/12m/15m would be open to North America and Europe. We believed that 17m and 20m would most likely be open most days; therefore, our solution was to be prepared to simultaneously operate two stations on 20m and two on 17m.

During evening hours, however, we knew we could easily keep four stations operating, as the lower bands (30m/40m/80m/160m) would most likely be open. We determined operating from two locations would be necessary, with both locations separated by at least ten wavelengths on 20m (approximately 200m/660 feet). This was required to reduce any possible interference between the stations. After further investigation, it was also determined that stations operating on the same band could not both operate vertically polarized antennas. One station must select a vertically polarized antenna, while the other station uses a horizontally polarized antenna. With the exception of 17m/20m, the remaining bands would only support one station per band.

Operating from two locations introduced further complications, one of which was having to build two generator shelters, as well as separating our fuel storage into two locations. The other complication had to do with keeping all stations networked to achieve our goal of near real-time logging. Brian, N9ADG, and Bengt, K7ADD, designed a WiFi network providing all four stations a good WiFi signal, even though they were separated by approximately 700 feet.

Our operating schedule was originally formed with a rotating shift of four hours on, four hours off, for 32 hours—then eight hours off. This cycle would repeat for each operator, for the duration of the trip. About halfway through the operation the team decided to form SSB/CW/Digital teams to better respond to our pilot's requests to be on the air at certain times and modes.

Another goal was to distribute the overall QSO counts evenly between the big three (NA/SA, EU, Asia). African (AF) and Oceana(OC) operators make up a very small percentage of worldwide operators but were just as important to the success of the DXpedition, so it was decided that we would work those regions of the world at any time, regardless of what region of the world we were calling.

Another key goal of the VK9MA DXpedition was to provide the amateur radio community a minimum of 1,500 to 2,000 160m contacts. The team had access to a 90-foot Titanex vertical which would provide a great transmit signal throughout the world. We also were in need of a dedicated 160m RX antenna. Our go-to RX antenna for 80m-160m was the DHDL designed by Harry/George for the TX3A expedition. Brian and I created an improved version of this antenna, allowing the ability to switch its RX direction by 180 degrees, with the flip of a switch. The DHDL has a relative directivity factor (RDF) of approximately ten dB.

To further improve our 160m RX antenna systems, DX Engineering (DXE) supplied us with a Hi-Z 80m/160m 4-square RX array which has RDF of 13 dB. As built, the array would not work for us out of the box because we planned to have stations on both 80m as well as 160m at the same time. We quickly realized that further work was needed to allow the RX array to operate, even if we operated on both 80m and 160m bands at the same time. Thankfully, Tim Duffy, the president of DXE pointed us to the solution—an article written by Charles, W8JI, and another written by both Joel Harrison, W5ZN, and Bob McGwier, N4HY. The articles explained how to resonate the 4-square to either 80m *or* the 160m band with a custom matching network. Over the few months we had, the team focused on designing, building, and testing the 4-square, improving on Frank's design, specifically allowing us the ability to tune/match each vertical to within 1Hz of the desired frequency, with an SWR of 1:1, in less than two minutes. We obtained a 30 dB front-to-back in the 160m band and about a 20 dB front-to-back when listening to AM stations in the AM band. Many thanks to the following individuals for their help in making this 4-square design a resounding success—Grant, KZ1W; Justin K5EM; Brian N9ADG; and myself Rob, N7QT.

November was chosen as the safest time to schedule the expedition, as it was the start of the cyclone season as well as the summer season, yet late enough into the calendar year for a concerted 160m effort.

EXECUTING TO PLAN

With confirmation of our dates from Bianca Charters we decided to move forward with the DXpedition. I started working with the Wireless Institute of Australia (WIA) and Australian Communications and Media Authority (ACMA) to obtain the appropriate amateur radio license. I also contacted the Coral Sea Management Reserve in order to obtain landing rights to Mellish Reef. It was truly a pleasure working with such a professional group of individuals and government agencies. They were helpful in every aspect of the word.

Our next challenge was to get the majority of our radio equipment delivered before the departure date to Port Douglas, Australia, where the MV Phoenix was docked. The Laguna DX Club in Germany was kind enough to supply us with a majority of our low-band transmit antennas, including 4-square from 20m-80m, as well as the 90-foot Titanex 160m vertical. Hawk, SM5AQD, volunteered to take responsibility for getting this equipment delivered to Port Douglas from Germany. Hawk drove from Stockholm, Sweden with a trailer in tow, returning the gear back to Sweden. He made the arrangement for shipment by freighter to and from Port Douglas. I made the arrangements to get the rest of our station equipment to Cairns via air freight.

No sooner had we decided to put this expedition together, did the departure day arrive. Brian, N9ADG, and I arrived in Cairns, Australia seven days before the rest of the team. We spent that time purchasing the bulk of our support equipment, spanning multiple written pages of “stuff”. These included the purchase of four 2kW Honda EU20i generators, as well as a 3.5 kW Trade Tested (Chinese generator), canvas tents, plywood tent flooring, tables, chairs, pens, paper, etc. All of our gear was temporarily stored at the home of Paul Newman,VK4APN—not the actor— who graciously volunteered his basement for this purpose. With the entire team in Cairns, we spent the next four days assembling, testing, and organizing the gear to insure it all arrived safely and worked properly. Some of the equipment, like the SteppIR two-element Yagis, we assembled, tested, then partially disassembled to make installation on Mellish Reef quicker. Our Yagis were supported by 27-foot extension ladders purchased in Cairns. The remaining antennas were verticals on the beach.

Departure day quickly arrived. The early morning of November 4, half the team met at Paul’s house to load up a rental delivery van with all the gear stored in Paul’s basement. The van then stopped by a storage locker in Port Douglas to pick up the rest of our equipment shipped from Sweden and deliver it to the loading dock where the MV Phoenix was fueling.

Figure 3 MV Phoenix – First view of the Phoenix fueling up at the loading dock.

The other half of the crew took a charter bus the 1.5-hour trip north to Port Douglas. Their job was to meet the rental delivery van at the loading dock, and start unloading the van and start the loading process onto the MV Phoenix as it was fueling. Captain Pete directed his crew and our team in the loading process. The MV Phoenix took over six hours to fuel, giving us enough time to load our equipment onto the boat. The temperature was hovering around 90F with 75 percent humidity, so it was extremely important to keep the team hydrated with water. The job was completed shortly after 4 p.m. that afternoon. The MV Phoenix arrived into her berth at the Port Douglas marina around 4:30 p.m., at which point the team spent the final hours prior to departure, cleaning up from the hard day's work, resting, with some touring the marina. The MV Phoenix departed for Mellish Reef around 6 p.m. the evening of Oct 31.

Figure 4 Heading out to sea – followed by two tenders loaded with four 55-gallon fuel drums.

The trip was mostly uneventful with only one or two rough days at sea. Those rough days made it impossible to stay comfortable. Several of us had to hang on for dear life, anchored to whatever we could find when sleeping or walking around, or we would find ourselves flung to the ground or into furniture multiple times during the day or night. Despite using patches for seasickness, some team members still got sick from the severe motion of the boat. We spent a significant part of the four-day voyage prioritizing our unloading and build-out strategy, as well as reviewing individual operating schedules.

We arrived at Mellish Island in pitch darkness early morning on November 4. Just after daybreak, an expeditionary team landed on the island to mark our operating locations and antenna placements while the rest of the crew began off-loading our 2.5 tons of gear into the two tenders. Over the 30 round-trips it took to off-load all our gear, the team started building out our tent shelters, followed by the installation of our generator shelters, radio gear and antenna systems. We were able to get three of the four stations operational that evening and were on the air by darkness.

Figure 5 Main camp - Generator shelter located at the main camp.

The next 2-3 days were spent building out our antenna systems. The SteppIR CrankIRs and 2-element Yagis were the first to go up, followed by the 30m 4-square array, and 160m 90-foot Titanex vertical transmit antenna. During the install of the 160m we were extremely dismayed to find out the Titanex base used to elevate/isolate the vertical from ground was nowhere to be found, and most likely was still in Germany. Captain Pete was a “MacGyver” sort of fellow, coming to the rescue by building a support mechanism using a couple of our wooden saw horses, winch straps, and four wooden pieces of two-by-fours. All who worked us on 160m owe Captain Pete a big round of applause! It was all-hands on deck when raising this 90-foot behemoth.

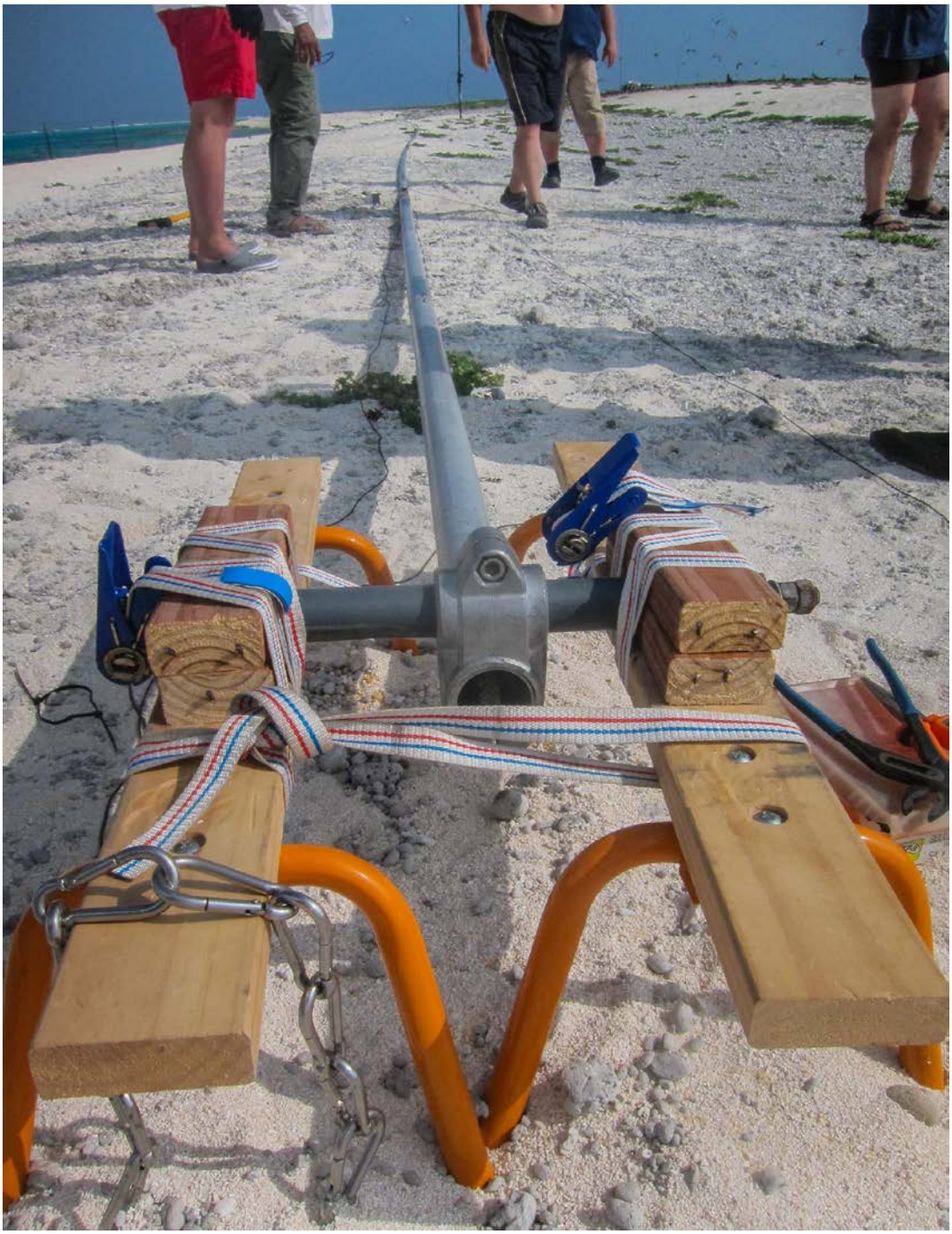

Figure 6 Titanex vertical - Homemade 160m base constructed from two sawhorses, straps, and 2X4 boards.

The next antenna to go up was the 80m, 60-foot Spider beam vertical, followed by the custom designed 160m Hi-Z RX 4-square. By the end of the third day, our team was fully operational from 10m-160m. Dietmar, DL3DXX, who provided most of our 160m contacts, went from logging 6-10 QSOs per hour using just the 90-foot Titanex vertical, to more than 50-60 QSOs per hour with the addition of our custom Hi-Z RX 4-square array.

Even with the use of LBS band-pass filters, we immediately experienced some cross-station interference from the 80m vertical which was installed 150 feet from our two stations operating at our mid-island location. The following day, we decided to move the 80m vertical 300 feet away to the southernmost tip of the island, which solved the problem.

At this point, all seemed to be going well, until our first attempt to work EU at gray line on 80m. Our pilots were reporting most EU stations hearing us super well, but we were experiencing S9 noise levels, and only on 80m. The following day, a few of us decided to determine if the 80m noise was atmospheric or man-made. Our first attempt in the investigation process was to turn off every piece of electrical equipment at the station, with the exception of the 80m station's Honda generator, the switching PS and K3 radio, only to find out that we still had S9 noise levels. Brian, N9ADG, had a brilliant idea of powering the K3S on battery power to see if it was indeed man-made noise. But, we hadn't brought a 12V battery. We had, on the other hand, brought headlamps with rechargeable 1.5V lithium batteries. We taped several of these batteries together in series—enough to power the K3S—and we were elated to find out we had S0 noise levels on 80m. Therefore, the noise was being generated by our newly purchased Honda EU20i generators. After trying our best to remove the generator noise to no avail, we swapped out the Honda, with a Trade Tested (Chinese) generator. To our amazement, we still had S0 noise level. We used the Trade Tested generator to power the 80m station for the duration of the expedition. That night we were able to work dozens of EU stations at gray line and continued doing so for the remainder of the DXpedition. In an effort to further improve our 80m/160m RX antennas, we installed several DHDL loop antennas, (www.TX3A.com), to take advantage of Diversity mode of the K3S radios. Diversity mode uses both K3S phased locked receivers, allowing the operator to "simultaneously hear" signals from two independent RX antennas. Those on the team who have never experienced the use of the Diversity mode, were truly shocked how well it improved RX over using either antenna independently.

Otherwise, our remaining twelve days on the island was uneventful. Operating twelve hours per day with eight hours off every 1.5 days, took its toll, as we all were tired and sometimes a bit cranky. Evening temperatures were in the mid 70s, making sleeping at night comfortable, but daytime temperatures in the lower 90s with high humidity, created sleeping difficulties for those who were up working the night shifts. There was work to be done at all times, including the regular generator and antenna maintenance.

After a major rainstorm one night, we awoke to find our 160m Titanex vertical had nearly folded over, with its tip only 30 feet off the ground. All hands were required to re-tighten the guy-wires and straighten the antenna back up.

We were fed by the crew of the MV Phoenix, delivering to us three meals a day—breakfast, lunch and dinner—as well as bringing over plenty of liquid refreshments.

During operator down times, we would often swim in the reef, and rinse off the salt, in an impromptu shower made for us by Captain Pete. The shower head was a two-liter coke bottle which we would fill with warm water, from a fresh-water bassinet, heated up to about 100F by the sun.

Figure 7 Island Life - Off hours L-R, Morten LB8DC and Brian N9ADG

Operating conditions were a major challenge as we experienced a major solar flare while on the island, disrupting operations on the upper bands, making them nearly useless with very deep and rapid QSB. We predicted between 40k-50k QSOs at the start of the DXpedition and ended up with just over 45k QSOs. We averaged just over 4,000 QSOs per day, meeting our QSO goals. I was also very pleased with our 160m effort, which ended up with about 1,700 QSOs.

Most surprising was the non-stop noisy, chattering bird life on the island. They never seemed to sleep during our entire stay, constantly flying about. Commonly seen species of birds were terns, noddy, and Masked and Brown Booby birds.

Figure 8 Wildlife - Noddy bird in flight

PACKING UP

The night of November 15, our last night of operation on the island, we decided to take down two of our four stations. We dismantled the 30m and 160m stations, operating only on 40m and 80m the last night. Four members of the team stayed on the island, while the rest spent the night on the boat.

We signed off the radios the morning of the 16th around 7 a.m., and started the long process of tearing down the tents and packing up all our gear. Half the team remained on the island, loading the tenders with our gear and garbage for transport to the MV Phoenix, anchored a half mile offshore. The other half of the team helped the crew off-load our equipment from tenders, onto the MV Phoenix prior to our journey home.

Figure 9 Packing up and still smiling!

One of my promises to the Australian Marine Reserve was to leave Mellish Reef a cleaner place than how we found it. During the expedition many of us picked up man-made debris which floated onto the island from everywhere around the world. What surprised us was how much of this debris made it up to the very top of the island. We picked up debris around the edge of the island and rarely strayed into the major nesting areas as not to disturb the wildlife or bird nesting areas. We collected about 160 pounds of garbage which had found its way onto the reef. A lot of the garbage was typical of what was found on Willis Reef in 2015. Common items included flip-flops, empty liquor, water and pop bottles, lots of plastic sandals, a hard hat, bottle caps, pop cans, and the like.

Figure 10 Island cleanup - Dietmar (DL3DXX) foreground

We departed Mellish Reef on November 16 around 1 p.m., starting our four-day journey back to Port Douglas. All a bit exhausted, all a bit sunburned, but all were happy to have provided those lucky enough with “all-time-new-ones” (ATNOs) and many band fills.

We arrived into Port Douglas on November 19 and started the process of unloading the MV Phoenix the following morning. We repacked all the gear headed back to Germany via Sweden, as well as repacking the equipment destined back to Redmond, WA via airfreight. The remainder of all the equipment purchased in Australia was donated to charity.

On November 21-22, we all departed Cairns, heading to our homes, after spending almost a month at sea.

SUMMARY

The VK9MA team's QSO statistics can be found here on the ClubLog website. (https://clublog.org/charts/?c=VK9MA#r).

With so many to thank, there is no better time to thank our pilots—Mike, K4PI; Andre, V51B; Bjorn, ON9CFG; and John, G3XHZ—who provided us with valuable feedback from the amateur radio community before and during the DXpedition.

Also, a very big thank you to all our sponsors—both club and equipment manufacturers—who without their help, this DXpedition would not have been possible. A very special thanks to our hardware suppliers Elecraft, Expert Linear, DX Engineering, and SteppIR for their incredible support in helping us obtain the necessary consulting and specialty hardware support.

The entire VK9MA team would also like to personally thank *ALL* of our sponsors who provided generous donations which made this expedition possible. There are listed below in Figure 11.

Figure 11 Special thanks to our sponsors who made VK9MA possible.

Those of you who were fortunate to work us will be happy to receive our VK9MA QSL card. The cards can be ordered by going to www.vk9ma.com/QSL or ClubLog website to place your request for a card.

Figure 11 Cover of the VK9MA QSL card

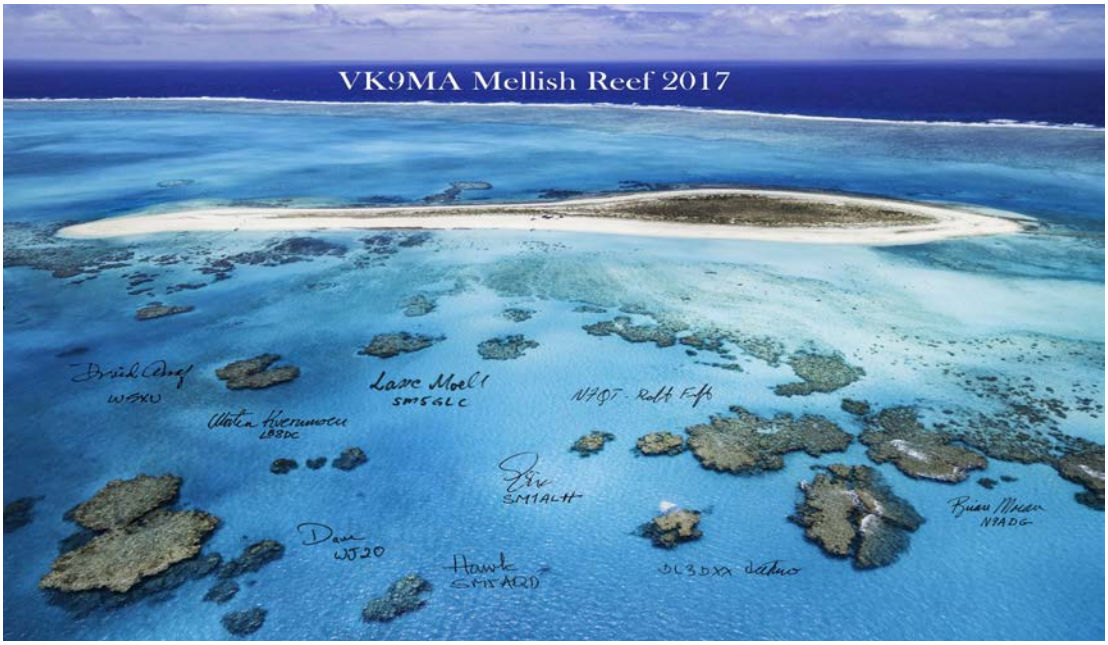

Figure 12 Platinum donor signed photograph

Platinum donors will be happy to note that we are in the process of ordering and sending out a beautiful digitally-signed team photograph of Mellish Reef as shown in Figure 12.

Wishing you all the very best and looking forward to the next activation! Warm regards from the entire VK9MA team.

Sincerely, Rob Fanfant (N7QT)