

Rīko Rīko Cave, New Zealand—World’s Largest Sea Cave?

Dave Bunnell

I first heard of Riko Riko Cave through a series of e-mail correspondence with Aussie Malcolm, who runs a dive shop operation focusing on the Poor Knight Islands, 24 km off the east coast of New Zealand’s North Island. The impressive sea cave is a popular destination for visitors to the Poor Knights, both divers and now sightseers, using Dive Tutakaka’s new jet tour boat, the “Cave Rider.”

What led Aussie to write to me was that he had helped surveying student Jeremy Elrick undertake a volumetric survey of Riko, providing one of his boats as a platform for a sophisticated laser survey of the cave. Aussie wrote and posed the question to me of how we determine the world’s largest sea cave. He’d seen the World Long List of Sea Caves I’d compiled (www.pipeline.com/%7Ecaverbob/seacave.html), the first two spots held by Painted Cave (1227 feet long, Santa Cruz Island) and Waiahuakua (1155 feet on Kauai). * Based solely on length measurements, his candidate cave, Riko, wouldn’t fare well on that list. At 153 meters (501 feet) in length, it places at number 30 (Bob, please revise list accordingly). But at 96 meters (315 feet) wide at its widest point, and up to 38 meters high (124 feet, but about 40 of it underwater), the cave is quite an impressive chamber. I told him I’d always felt that volume would be a better indicator of size for many sea caves, which often comprise single large rooms with short radiating tunnels, but that we simply don’t have the data to address that accurately.

Evidently that was the right answer, because he soon extended an invitation to come visit him in New Zealand, see Riko, and explore a bit of the Poor Knights. He even offered a possible deal on airfare with Air NZ. As it turned out, I’d been thinking of joining some friends for a caving trip to NZ, and I was able to combine the two trips this



The Poor Knights viewed from the mainland

past January. I didn’t score free airfare after all, but in the end got a sizeable “journalist’s discount” to offset the astronomical high season airfare. After two great weeks of caving on the North Island, my caver friends had to leave but I headed up to “Northlands” afterwards with a newfound caving friend, Marcus Firth from Auckland, who’d been helping guide us those two weeks.

SCOUTING TRIP

After the 3-hour drive from Auckland and finally tearing Aussie away from his shop, Marcus and I were offered a quick scouting trip out to the islands, with Aussie at the wheel of his new jet boat. The newly christened Cave Rider (once used in the America’s Cup Race) is an open-deck, 40-foot speedboat with seats for about two dozen people. Aussie had just purchased it and was now offering two-hour eco-tours to view the islands, with a trip to Riko the grand finale. Because of exposure to open sea conditions, all passengers must don waterproof, blue plastic oversuits.

It took only a little over half an hour to reach the islands, with the swell running in our direction. Since one of Aussie’s other boats had divers in the water inside Riko, we began by circumnavigating the islands, noting a dozen prominent cave entrances in the rugged volcanics—not nearly so many as in the California Channel Islands, my home sea caving turf, and also in volcanics.

When we finally entered Riko, we had it to ourselves. It is a beautiful place, its walls covered in a patina of pink rock and green mosses and algae, and floored with beautiful blue water. At first, I thought it not to be nearly so big or impressive as Painted Cave, but then realized the size of the thing, all lit up with entrance light, is deceptive. We studied it for awhile, and I noted a series of joints crossing

along the width of it that might account for its broad width, which adds so much to the volume. We made no serious attempts at photography, that being reserved for the next day’s excursion.

The trip back was head into the swells, which had apparently picked up after weeks of calm seas, just in time for our visit. As we were sprayed and splashed, and slammed up and down in our seats, we were thankful for our blue bunny suits.

PHOTOGRAPHY IN THE BIG CAVE

Next day, we donned our bunny suits for an earlier departure on Cave Rider, along with some other folks from the dive shop to assist. I had along with me a secret weapon for photographing the cave, two of Willie Hunt’s super flashes. The plan was to rendezvous with one of Aussie’s other big boats, which would serve as scale for some photos. Unfortunately we only had use of the other boat for a half hour while the divers aboard it had their lunch break. Well, cave photo karma was not with me that day, for I couldn’t get more than a faint pop out of Willie’s gun in that time period and we didn’t have time to rig the second, the camera (digital) began to flip out, etc. Perhaps it was the salt air. So off they went without my getting the picture I wanted, looking out at them in the entrance with the walls and ceiling illuminated—a shot almost impossible without something like the super flash.

They did leave us a small boat, which proved to be a tiny, unstable sea kayak. We could only get one volunteer to ride in the boat, to serve as scale, and had only time for a few more shots before the increasing



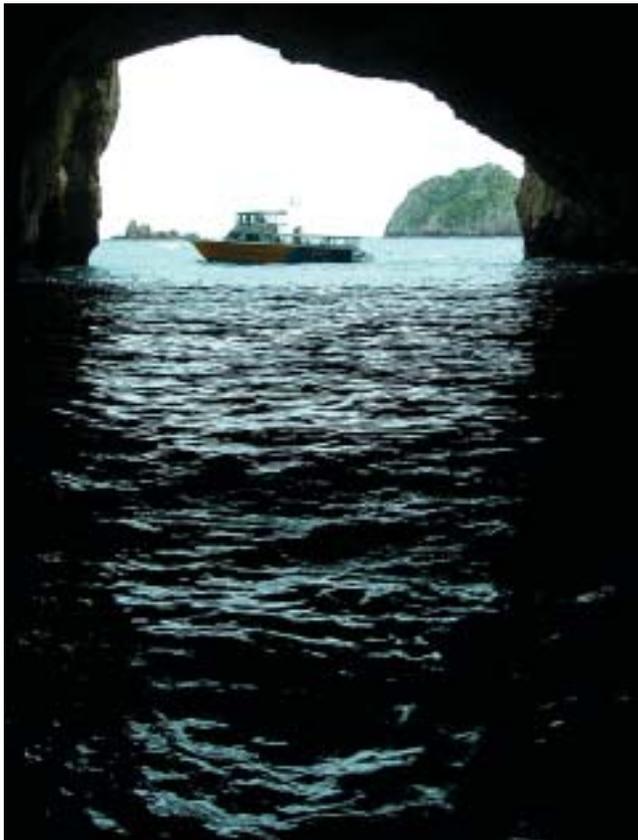
Dive boats inside the Riko Riko entrance; largest is 60 feet.



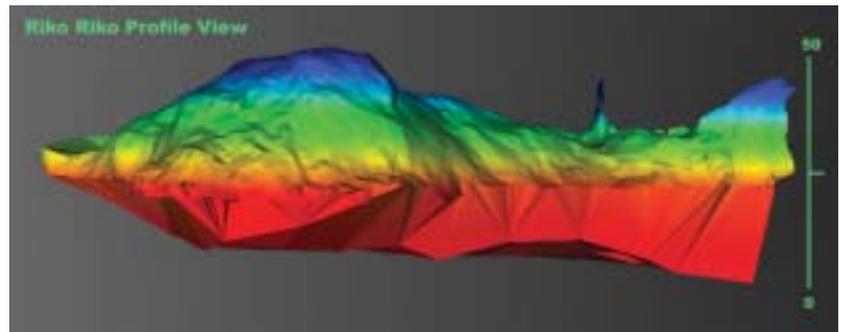
Rugged volcanics of the Poor Knights



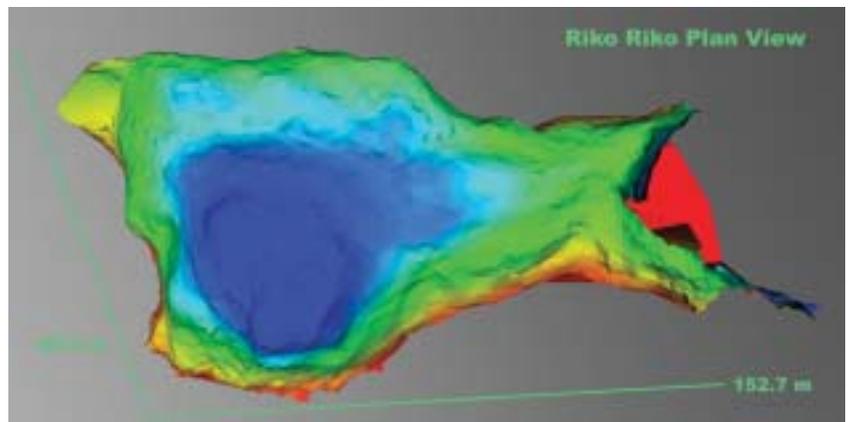
View towards the back of Riko Riko. Note blue-clad figure on orange kayak near back wall, center.



View out the Riko entrance of 60-foot dive boat



3D model of Riko Riko from combined laser and bathymetric data. Red shows underwater portion. Maximum height is 38.1 meters.



3D plan model of Riko Riko showing maximum dimensions

swell dumped him in the water. The bunny suits weren't meant for this type of activity, so we recovered him wet and cold, and called an end to the day's photo attempts.

I did bag one semi-decent shot as seen on the previous page. It was shot at full aperture (f/2.8, 1/30 sec, at ISO 400) and is a mixture of daylight and the super flash.

By this point the word had come through that bad weather was on its way, and we set off without delay for the mainland through intermittent showers and rougher seas than the day before.

Although Aussie offered a return trip the following day, conditions were expected to be choppy again inside the cave and I had no guarantee of better results with the super flash and my camera.

POOR KNIGHTS GEOLOGY

The Poor Knights are basically the remnant inner core of a now (considerably) eroded volcano, formed some 9 million years ago. The material is a rhyolitic breccia and tuff, deposited in the late Miocene. Later that material was riven with hydrothermal fluids, with silicification occurring in fractures. There is evidence of uplift as well (e.g., marine terraces). Sea caves appear to be carved into joints and fractures resulting from the uplift. Local speculation concerning Riko Riko has suggested it to be some sort of gas bubble in the cooling lava. My examination of the ceiling and walls of the chamber showed at

least four distinct joints spanning the width of the room, two of them visible in the large color photo on the opposite page. The one in the rear clearly shows an upwards erosion on the landward side of the crack, perhaps acting as a zone which concentrates the force of the surf along the plane of the joint. Elsewhere in the Poor Knights, this mechanism has apparently produced a 180m shaft at the back of a sea cave in Cave Bay that leads to a surface sinkhole. If so, this would certainly be the world's *deepest* known sea cave!

THE SURVEY

Jeremy Elrick's survey was conducted in two separate visits. The first used an Isite 3D laser scanner to model the portion above water. The second used an echo sounder to model the portions below water. Both were referenced to a GPS station established outside the cave on a rock, since the measurement platform was a boat.

With this data a volume of 221, 494 cubic meters (7,808,771 cubic feet) was determined for the cave, with 4.5% uncertainly level. Of this total, about 42.5% is below water. Jeremy's 3D models are shown on the facing page.

Using Bob Richard's map of Painted Cave from our 1982 survey, which includes water depth, Aussie estimated a volume of roughly 4,417,200 cubic feet, or about 56% that of Riko. For other contenders, like

Waiahuakua, water depth wasn't measured. Unfortunately, we no longer had the survey data for either cave to work with, so for now Aussie's estimate and Jeremy's very accurate data suggest that Riko Riko is indeed the world's largest sea cave by volume. In the world of large cave chambers in general, though, it is a lightweight. The Sarawak chamber, the world's largest room by surface area, has a volume of about 12 million cubic meters.

ACKNOWLEDGMENTS

I'd like to thank Aussie for his wonderful hospitality, good food, and good company during my visit. Riko is a real experience to see for an old sea caver and I suspect impressive to most anyone. And thanks also to Willie Hunt who loaned me two super flashes for such a perilous mission (and they worked great in other caves I used them in). Thanks also to Jeremy Elrick for providing the map images.

FOOTNOTES

*Sea Lion Caves in Oregon claims a length of 1315 feet for their cave, which if true would make it the world's longest. However, they were unable to produce any sort of map on request so this figure cannot be verified.