

Weekly pictorial – WEEK 1: The Challenge of the Challenger

The Chatham-Challenger Hydrographic, Biodiversity and Seabed Habitat project is the first Oceans Survey 20/20 (OS 2020) Project funded jointly by Land Information New Zealand, Ministry of Fisheries, NIWA and Department of Conservation. The first voyage of the Chatham-Challenger project was in August 2006 during which a series of multi-beam echo-sounder transects were completed across the Chatham Rise and Challenger Plateau. Based on the multi-beam results, two subsequent voyages were planned to collect information on the biodiversity and seafloor habitats of the Chatham Rise to the east and the Challenger Plateau to the west of New Zealand. The second voyage (TAN0705) was completed in April 2007 and the present voyage is the third and last of the series. Sampling on the Challenger Plateau is due to finish at the end of the first week in June at which point starts will be made to compare the biodiversity and habitats of the two regions.

Both the rise and plateau are elevated morphological features, rising up from the surrounding deep sea-floor at ~3 km water depth to 300-400 and 450-500 m on their respective crests. The Challenger Plateau is a large block of sea-floor real estate that abuts the western continental shelves of the North and South islands and is continuous with the Lord Howe Rise that extends to the north. In contrast, the Chatham Rise is an elongated ridge extending eastwards from the Canterbury shelf out past the Chatham Islands into the SW Pacific Ocean (Figure 1). Oceanographically, the Chatham Rise and the Challenger Plateau are very different with the dynamic and highly productive Subtropical Front sitting above the rise all year round while the Challenger Plateau is in the relative back-water of the Tasman Sea, bathed by warm, nutrient-poor subtropical surface waters. Interestingly, while the plateau has not been fished anywhere near as extensively as the Chatham Rise, both regions have seen action by deep-water fishing companies interested in capturing orange roughy, although the rise is also the scene of intensive fishing for other fish species, such as hoki.

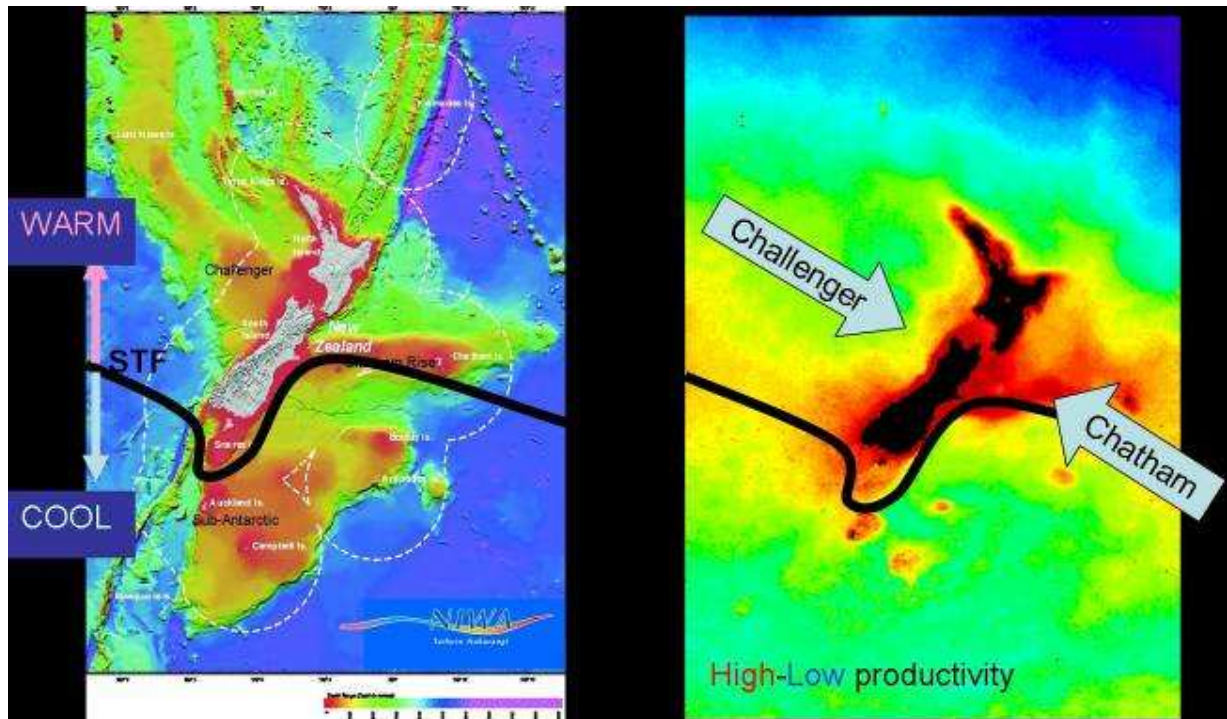


Figure 1: Location of the Chatham Rise and Challenger Plateau, showing main oceanographic features (left) including the Subtropical Front (STF), and biological productivity (right) of the two regions. New Zealand's 200 nautical mile Exclusive Economic Zone (EEZ) is shown in the left panel as a white dashed line.

Our first week out to the west of New Zealand on the Challenger Plateau has seen us continuing the type of work we started in the east on the Chatham Rise in April (see previous reports from voyage TAN0705). We have been using a combination of cameras to spy on the deep-water creatures as they go about their daily business in the cold, dark environment of the deep-sea (Figure 2) while sleds and corers are used to abduct these beasts and bring them to the surface for identification by biological specialists, known as taxonomists (Figure 3). In some respects, if the deep ocean animals could really comprehend what was happening, we would probably be regarded as alien abductors who blind them with light and then steal them away from their loved ones - just like in the X-files.



Figure 2: (left) A scrum of scientists, paw over samples from a beam trawl; (right) Steve George (NIWA) gets the Deep-Towed Imaging System (DTIS) ready for deployment.



Figure 3: (left) Catch of the Day – sponges, hermit crabs, gastropods, anemones, salps and asteroids (photo courtesy of Helen Kettles, DoC); (right) Keith Probert (Otago University) and Sadie Mills (NIWA) debate the finer points of invertebrate identification.

It is perhaps fitting that we are out here on the Challenger Plateau, swath mapping new areas of the sea-floor (Figure 4) and sampling the animals that inhabit the deep-sea (Figure 5), since the plateau is named after the forerunner of all oceanography, namely the HMS *Challenger* expedition led by Captain John Murray. This pioneering voyage of discovery involved a 3 and a half year circumnavigation of the world from 1872-75, collecting all manner of creatures from previously untouched regions of the planet, including New Zealand. In some respects, the OS 2020 project is continuing on this tradition, by adding information to our knowledge of life on Earth by undertaking intensive sampling of the marine biodiversity in New Zealand's EEZ, the fifth largest in the world.

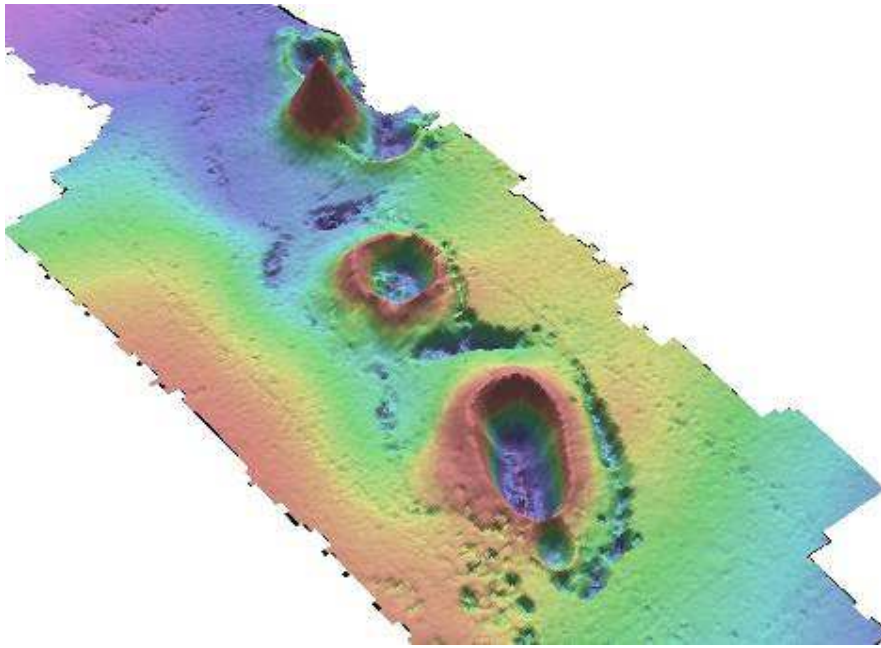


Figure 4: New detailed bathymetric map of volcanic features in the Westpac Hills complex, SW Challenger Plateau from multi-beam mapping (compiled by Kevin Mackay (NIWA) and Claire Biggs (LINZ/Otago University)).



Figure 5: (left) Spirals, Stars and Snail trails (or acorn worm "poo", brittlestars and gastropod trails to the uninitiated), 1800 m water depth, north Challenger Plateau; (right) Catching a sediment wave – echinoid and sea-floor ripples, 800 m, north Challenger Plateau (DTIS photograph, Peter Hill, NIWA).

Admittedly we are probably not doing it as “hard” as our scientific ancestors, (Figure 6) several of whom on the *Challenger* expedition grew disillusioned with the thought of yet another sampling deployment in waters they didn’t know the depth of and either jumped ship or went mad. Certainly, back before the turn of the last century the effort involved in sea-floor sampling was more painstaking with water depths determined manually using lead lines and navvies physically having to deploy and recover sampling gear using rudimentary mechanical turnstiles and sometimes hand-over-hand. We now have the luxury of fast winches for winding cables and wires in and out and automatic means of measuring the depth to the sea-floor using echo-sounders that have metre-scale accuracies and can give us depth information over large areas of the sea-floor with one pass of the ship (for example, see Figure 4). Navigation and positioning is also far removed from the earliest days of oceanography with Global Positioning Satellites and radar replacing the sextant and dead reckoning, while powerful diesel engines now mean that progress between sampling locations is swift and not reliant on the wind or the coal supply in the engine room. Perhaps more importantly, without a doubt, the food served onboard modern research vessels has also improved out of sight from the *Challenger* days!



Figure 6: RV *Tangaroa* in Wellington Harbour (photo by Alan Blacklock, NIWA) (left); depiction of HMS *Challenger* on the old NZ Oceanographic Institute logo (right).

On this voyage, we are lucky enough to have the same officers and crew from RV *Tangaroa* as we had for the Chatham Rise voyage, but we have an almost entirely new set of scientists onboard. This includes people from NIWA, MFish, DoC, LINZ, several NZ universities and one visitor from the sunny Gold Coast. Everyone has got into the swing of things, with routines becoming quickly ingrained when the cameras or sleds are in operation or biological samples are being processed. A typical 12-hour shift (or “watch” in nautical terms) involves 5 or 6 stations where a camera and sled are deployed one after the other at different sites on the Challenger Plateau. These sites are positioned between ½ an hour to 2-3 hours apart. On a “lucky” day we also have single stations where more detailed sampling is undertaken. At these stations, it can take 10-12 hours to work through all of the samples depending on what water depths we are working in because deeper water means that it takes longer to deploy and recover the gear from their sampling of the sea-floor. Here, we do multiple deployments of the cameras, sleds and corers and throw in additional sleds and beam trawls for good measure. This means that everyone on the watch (11 or 12 people) is kept busy until the decks are cleared of mud and the biological samples are sorted, counted, weighed and preserved (Figure 8).



Figure 7: Working late (left) and early morning rise and shine (right). Work onboard RV *Tangaroa* goes on 24-hours a day (photos courtesy of Helen Kettles, DoC).

Some images of the animals we have seen on this voyage are shown below.



Figure 8: Black coral and starfish on volcanic rocks, ~900 m water depth, Westpac Hills, SW Challenger Plateau (DTIS photograph, Peter Hill, NIWA; enhanced by Chazz Marriott, NIWA).



Figure 9: Anemones in Action. (left) Showing off and (right) Household Decoration for a hermit (photos by Chazz Marriott, NIWA).



Figure 10: Punky pycnogonid – Spikey Sid the Sea-Spider (photo by Chazz Marriott, NIWA).



Figure 11: Strangers in the night, all flashed up and nowhere to go. Prawn meets swimming sea cucumber (holothurian) and fan worm, 1200 m water depth, north Challenger Plateau. (DTIS photograph, Peter Hill, NIWA; enhanced by Chazz Marriott, NIWA).



Figure 121: Deep-sea Sole (Size 8), 1800 m water depth, SW Challenger Plateau (photo by Chazz Marriott, NIWA).

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