Weekly pictorial – WEEK 1: Getting deep-sea beasties to say "Cheese!"

The Chatham-Challenger Hydrographic, Biodiversity and Seabed Habitat project is the first Oceans Survey 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, the main aim of the present voyage is to collect information on the biodiversity and seafloor habitats on Chatham Rise with a view to then comparing these data to a similar data-set that will be collected on a subsequent voyage in May-June 2007 to the Challenger Plateau.

One of the principal tools we are using to estimate deep ocean biodiversity and to determine the characteristics of seafloor habitats is a newly developed camera system called the "Deep Towed Imaging System" or DTIS for short. Peter Hill at NIWA has been responsible for designing, constructing and implementing DTIS over the last 2 years with assistance from workshop staff at NIWA Vessels Management who manufactured the DTIS frame (Figure 1). The system already has an impressive track record by displaying its incredible versatility and potential during previous voyages investigating NZ seamount and fluid and gas-seep faunas.

Figure 1: Peter Hill and DTIS after another successful deployment on the OS 20/20 voyage

DTIS comprises high-definition still and video cameras, lights and batteries which are mounted in a rectangular frame (Figures 1 and 2). The whole DTIS instrument package is suspended via a conducting wire attached to a winch on the ship.

Figure 2: DTIS being deployed on the Chatham Rise OS 20/20 voyage from RV *Tangaroa*.

Image collection by DTIS can be controlled by pre-programming the instrument or by sending electronic signals up and down the conducting cable. Importantly, low resolution video images are also relayed up this cable to the controller on the vessel so that biologists onboard can make real-time observations of the seabed creatures and their habitats (Figure 3).

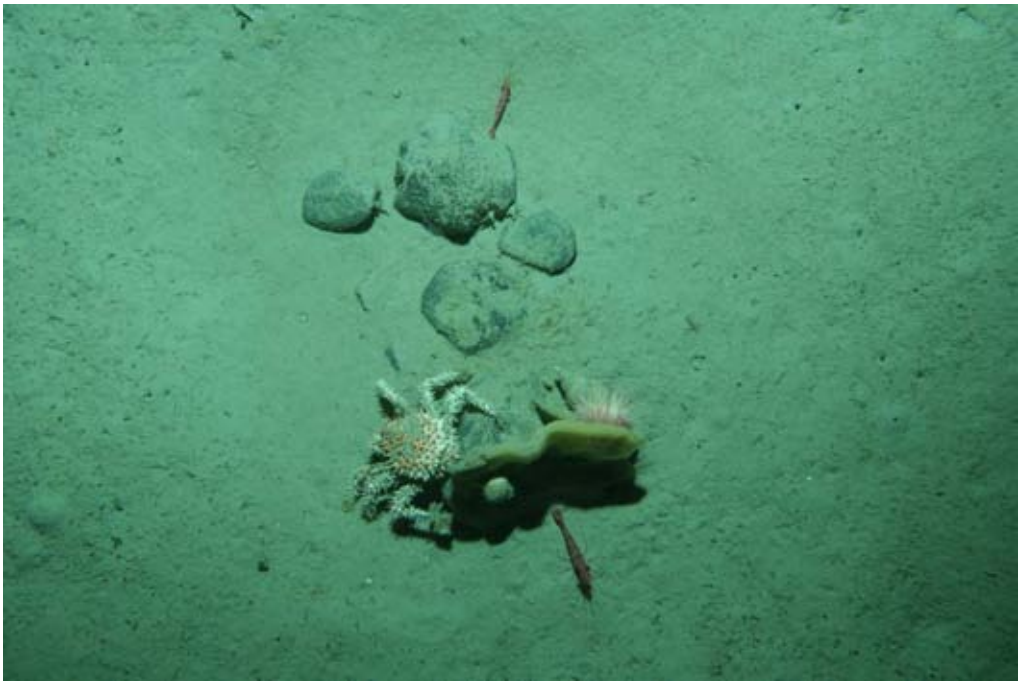

Figure 3: “Reef” fauna! Crab and friends on soft muddy sediments at 700 m water depth on southern Chatham Rise.

This information is also relayed to video and computer screens on the bridge of the ship to help the ship's officers steer the vessel in the right direction. Furthermore, the images are transmitted to the all-important winch driver who is vital in controlling how high off the seafloor DTIS is towed. Ideally, good images are obtained with DTIS "flying" at only 2-3 m off the bottom, which is extremely difficult to do when there is a 2-3 m swell and/or you are trying to operate DTIS in rough and steep terrain (Figure 4).

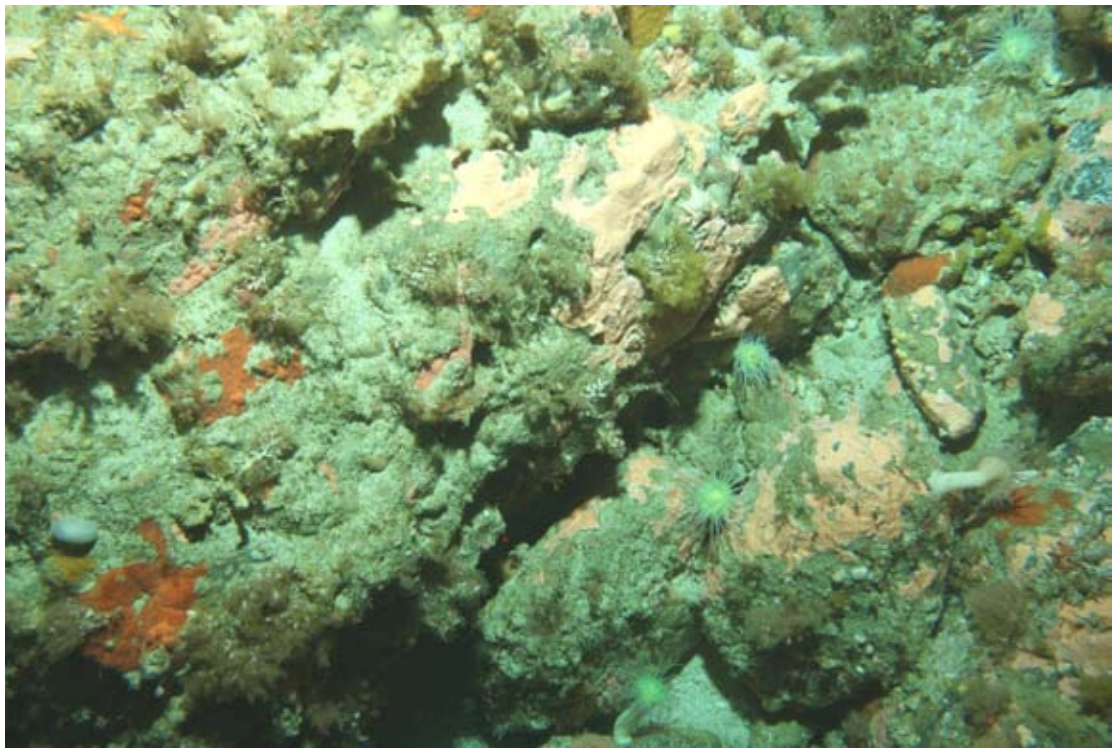

Figure 4: DTIS image from a deep seamount west of Veryan Bank, showing a diverse community of corals, sponges and anemones.

A variety of other instruments can be mounted on the DTIS frame, including an altimeter to tell us how high off the seafloor DTIS is, sound transducers that let us know where DTIS is relative to the vessel and temperature loggers which provide us with information on the water overlying the seafloor. A new software package provided by Jens Greinert (Marie Curie Fellow) called OFOP (Ocean Floor Observation Protocol) takes the ship's position, compares it to the signal from the sound transducer on DTIS, and plots the actual position of DTIS on a screen. OFOP also allows the biologists to click on a button menu to record their observations of animals and habitat changes shown by DTIS in real-time. Typically a DTIS tow takes 1-2 hours (Figure 5).

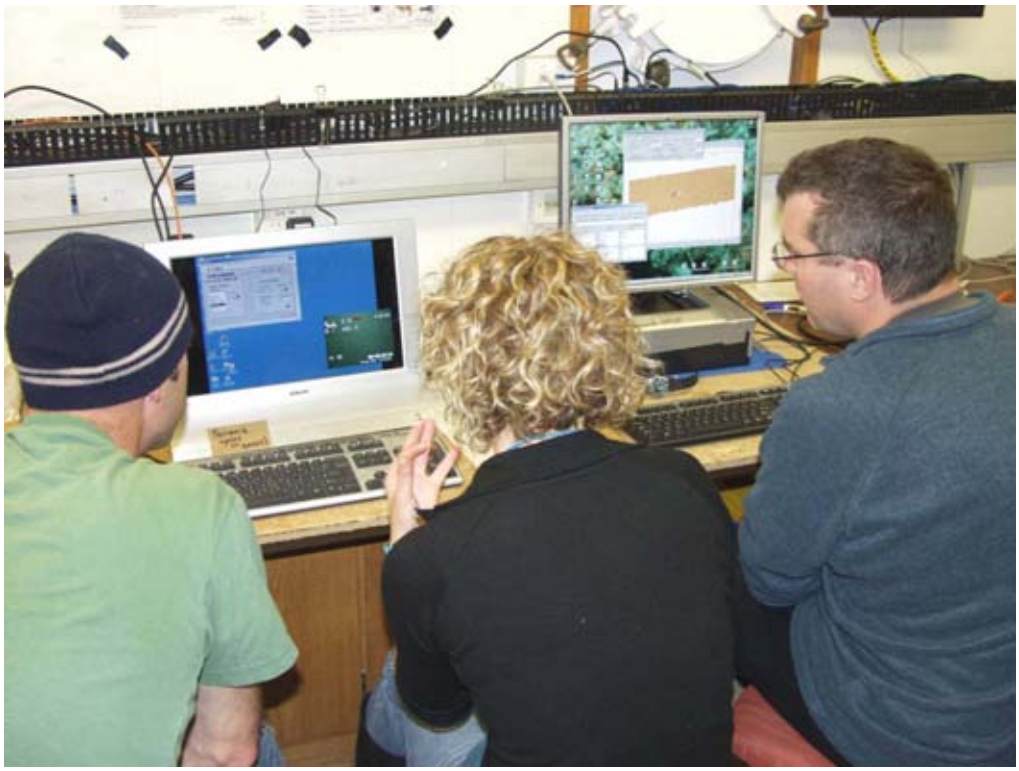

Figure 5: Owen Anderson, Kareen Schnabel (both NIWA) and Seb Holmes (MFish) at the DTIS and OFOP control centre on *Tangaroa*.

Despite operating DTIS across the relatively "boring" muddy sediments of Chatham Rise, we have already obtained some impressive footage of animals that live in such environments. These soft-sediment habitats cover the largest proportion of the world's seafloor and are therefore important for maintaining marine biodiversity. So far, after just one week of surveying the southwestern end of the Chatham Rise, we have accumulated 34 hours of video footage and ~8200 still images, and have begun a catalogue of photographs depicting the fascinating life of the deep. Other examples of DTIS imagery are shown below (Figures 6 and 7).

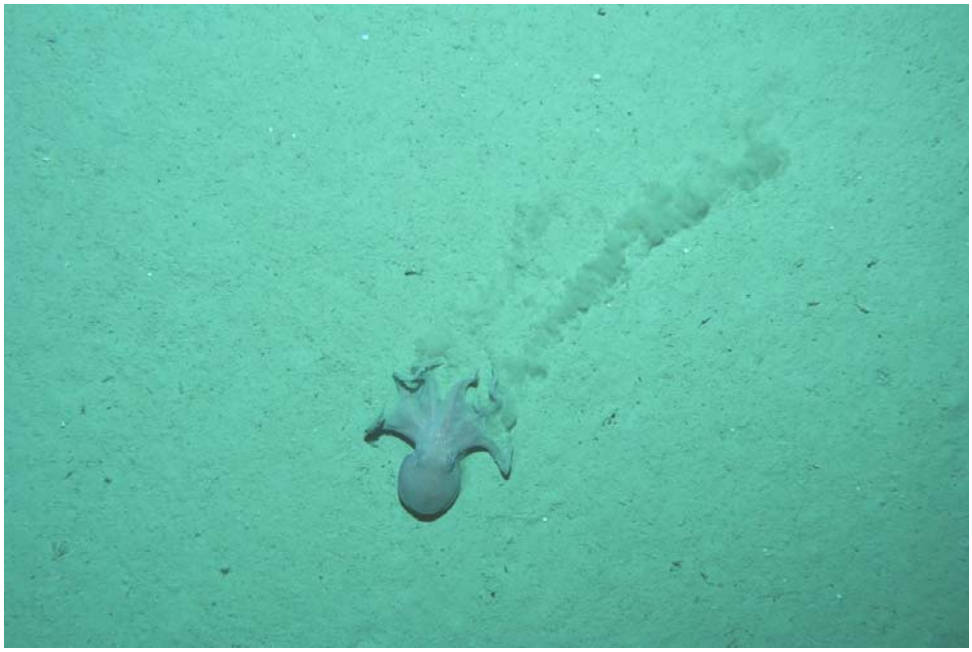

Figure 6: Octopus at 1 km water depth, southwest Chatham Rise.

Figure 7: Deep-water eel and urchin on the Ophiuroid Highway (brittlestars) at 1.2 km water depth, southwest Chatham Rise.