INVESTIGATING DEEP-SEA BIODIVERSITY FROM ROV VIDEO IMAGERY

ONC has gathered video imagery of North East Pacific deep-sea environments from more than 350 ROV dives spanning the last 12 years. Thousands of hours of video footage, which include seafloor transects for studying benthic megafauna and mid-water vertical surveys for studying pelagic organisms and gelatinous plankton, are all open access and freely available through ONC’s SeaTube video database system, accessible at data.oceannetworks.ca/SeaTube

ONC has generated more than 200 peer-reviewed publications. Each year 15-20% of the scientific output from ONC currently comes from video data of a variety of seafloor habitats.
Understanding whether fish communicate using sound is of growing interest and importance. Although many fish species are soniferous—they naturally produce sounds—we know very little about how and why this happens. Among the approximately 400 known marine fish species swimming in British Columbia waters, only 22 have been reported to be soniferous, although many more species are suspected to produce sound.

Combining video and passive acoustics (e.g., hydrophones) with acoustic imaging, the “Fish Acoustic Experiment” aims to better understand fish behaviours through fish-emitting sounds, and to explore how human-made sounds—such as shipping noise—affects those behaviours.

To listen to fish and background noise, a hydrophone is positioned within the field of view of both the video and acoustic cameras so that sounds generated by fish will be easily associated with camera images. The acoustic camera is particularly useful at this location in the Strait of Georgia where waters often get “murky” due to the suspended sediments from the dynamic Fraser River delta.

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Barkley Canyon is a highly sinuous, shelf-incising submarine canyon located ~100 km offshore Vancouver Island in the North East Pacific. Barkley Canyon harbors a mosaic of benthic habitats and biological communities, combining methane seeps with hydrate outcrops and patches of deep-water corals with flat sedimented seafloor, all bathed in hypoxic waters within the upper and lower boundaries of the North East Pacific oxygen minimum zone (OMZ).

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The Internet-operated vehicle Wally (left) monitors a 15,000 m2 area of a cold-seep habitat in Barkley Canyon. The site also harbours extensive and patchy methane hydrate outcrops. Scientists are interested in the temporal dynamics of methane hydrates as well as in the benthic diversity (including microbes) and its relation to ecosystem function in the area.
Hydrothermal vents host some very unique ecological communities. While most of the deep sea depends on near-surface productivity with photosynthesis as its fundamental energy source, vent communities are completely independent from the surface and sunlight. Bacteria are able to use reduced compounds from the vent effluent as an energy source (chemosynthesis). These bacteria can be free-living or symbiotic and are the base of the food web of these communities where 90% of the species are endemic to this special environment. The tubeworm Ridgeia piscesae grows in large colonies in diffuse venting areas, supported by the symbiotic chemosynthetic bacteria developing in their cells. These worms have no mouth and rely on their internal symbiotic bacteria to survive. Other species living within hydrothermal communities include limpets, worms (scale and sulphide), fish, and sea spiders.

Left: A digital stills NIKON-D70 camera was installed at ONC’s Main Endeavour Field site in 2014. Several autonomous temperature loggers are deployed in the camera’s field of view. 24-Mpx photographs are captured in a time-lapse mode at four-hour intervals. Scientists from ONC, Ifremer, and Washington State University are interested in how hydrothermal diffusive flows affect the spatial and temporal distribution of vent fauna.

Below: Tempo-Mini is a custom-designed instrument package for real-time monitoring of hydrothermal vent communities and their environment. Tempo-Mini is equipped with 4 x 20 W LED lights and a Sony Axis Q1755 video camera recording videos with a resolution of 1440 x 1080 pixels and a frame rate of 24 fps. A localized micro-chlorination system protects sensor optical parts and projectors from biofouling.

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