

R.R.S. JAMES COOK

Cachalot Captain Robin Plumley is Master of this latest addition to the NERC fleet of research ships and he has given us this description of his vessel and of one of her first tasks.

Additional information, images and links for the science and the ship can be found at www.classroomatsea.net

The vessel is owned by the Natural Environment Research Council (NERC) who fund and manage research and training in environmental science in the UK. NERC funded research covers the full range of atmospheric, earth, terrestrial and aquatic sciences – from exploring the deep oceans to observing the earth from space. The vessel is managed and operated by the National Marine Facilities Division, based at the National Oceanography Centre, Southampton.



RRS James Cook replaces the RRS Charles Darwin, now with Gardline, and complements RRS Discovery and will play a significant role in delivering NERC's science priorities in the coming decades.

Substantially larger than its predecessor, it is fitted with some of the latest research equipment.

She houses eight science laboratories and can accommodate up to 31 scientists and 23 officers and crew. The deck area has specialised handling equipment which can deploy remotely operated underwater vehicles to explore the deep oceans and sea floor.

21st Century Science

Oceans are a key part of the Earth system. They cover almost three quarters of the Earth's surface and hold over nine-tenths of the planet's water. We use and exploit them for food, energy and materials, and they play a vital role in regulating global climate.

But the oceans are changing. Average temperatures are increasing, causing sea levels to rise and contributing to coral bleaching. By the end of the century, seas will be more acidic than at any time over the past 25 million years because they are absorbing more carbon dioxide from the atmosphere. Although many uncertainties surround the future state of our seas, such changes will inevitably affect marine productivity, the global carbon cycle, atmospheric composition, weather patterns and coastal landscapes, making the oceans a key focus for NERC research.

The *RRS James Cook* has been designed to enable scientists to carry out a wide range of research from the atmosphere above to the earth's crust beneath the ocean depths.

Mud Volcanoes and Canyons

Background and scientific rationale:

The major objective of the new EU-funded FP6 Integrated Project HERMES (Hotspot Ecosystem Research on the Margins of European Seas), coordinated by the National Oceanography Centre Southampton, is to understand how environmental variables affect the biodiversity, structure, function and dynamics of faunal communities on the continental slope. The overall aim is to provide the scientific context for the management for European continental margin systems. The work is important in habitat conservation, the potential disposal of carbon dioxide, hydrocarbon exploitation, fisheries management, and the long-term effect of pollutants reaching deep-sea ecosystems from land. As part of HERMES, the NOC is committed to work on 'hotspot' ecosystems including canyons, cold seeps, landslides and coral mounds, as well as the slope sedimentary environments surrounding each of these hotspot types.

The NOC ROV cruise on RRS James Cook was one of the key cruises outlined in the HERMES proposal. It is planned to bring together scientific experimentation and investigation in canyons, cold seeps and open slope areas with a major public outreach campaign that will advertise HERMES, NOC and NERC science.

To accomplish this, 3 legs of 2 weeks duration were undertaken from mid-May through to early July 2007.

Leg 1 - Gulf of Cadiz Mud Volcanoes.

Background information has been built up during a *RRS Charles Darwin* cruise in 2006 when bathymetric, video and high resolution seismic surveys were undertaken over a number of mud volcanoes at varying depths. On *RRS James Cook* in May 2007, the ROV has been used to image the mud volcanoes in detail and to identify fluid escape areas/features. Sampling has been carried out to identify the origin of the fluids and whether they are biogenic or thermogenic. Cold seep communities living on the mud volcanoes, identified on previous cruises have been sampled and the environmental conditions on which they depend established.

Various coring devices have been used to recover samples of sediment, with some successful cores up to 10 metres long.

Leg 2 - Canyons off Portugal.

Here, the ecosystems in the Nazare, Cascais and Setubal Canyons provide a considerably greater supply of organic material than on the adjacent continental slopes. Sedimentary processes can be dramatic. The ROV has been used to sample organisms seen during the dives and locate these precisely in relation to the canyon environments. Some of these appear to have become specialised for canyon environments. Another major objective will be to sample the deep channel (thalweg) that cuts into the canyon floor. We have made numerous attempts with a wide range of instruments to sample this feature but without success. The thalweg is however critical as this is where the fastest currents flow and the greatest sediment transport takes place.



Captain Robin Plumley welcoming HRH The Princess Royal on board RRS James Cook when she named the vessel at a ceremony at the National Oceanography Centre, Southampton, in February 2007.

Leg 3 - Whittard Canyon.

The HERMES partners have identified Whittard Canyon, on the northern margin of the Bay of Biscay, as an active system which has continued to transport sand to the deep ocean through the Holocene, when sand input to many canyons, including Nazare and Setubal, was cut off by rising sea levels. Although this canyon is less well studied than canyons on the Portuguese margin, bathymetry and backscatter maps allow the sand transport paths to be identified. The major objective in Whittard Canyon is to undertake a mapping and sampling transect down the canyon axis, in order to make a preliminary assessment of the similarities and differences in biological habitat between this canyon and the less active and less energetic Portuguese canyons. This will form the basis of a more extensive programme later in the HERMES project.

Outreach:

There have been 2 teachers participating on each of the 3 legs, 2 from the UK, the remainder from Spain and Portugal. They have fed information from the cruise directly to the classroom in each country and hopefully enthused young people in marine research. Media events have been undertaken at each port call in Cadiz and Lisbon. See www.classroomatsea.net

I hope Robin will forgive me for this little anecdote related to me by the Master of one of the Royal Research Ships when I was piloting in Southampton.

In earlier, less technological days, it was not unknown for the assorted scientists, boffins and researchers that were carried onboard to get so engrossed in their experiments that they would dangle all sorts of sampling equipment over the side without notifying the bridge first, with predictable results in the event of unexpected manoeuvring or a change in the weather. It became understood among the long suffering officers and crew that RRS really stood for Rope Round Screw! - Ed