

Introduction

The BIOPEARL expedition to the Scotia Sea in 2006

The island chain of the Scotia Arc linking South America with the Antarctic continent is of particular importance for biologists and geologists interested in the evolutionary history of Antarctica and its marine fauna. In February 2006 an interdisciplinary research team of marine biologists, microbiologists and geologists sailed aboard RRS *James Clark Ross* to study the faunal assemblages, to investigate molecular phylogenetic relationships in selected species groups and to examine the Holocene sediment records over a wide area of the Scotia Sea.

The mega- and macrobenthic assemblages along seven vertical depth transects in the Scotia Sea (Falkland Trough, Livingston Island, Elephant Island, northern Powell Basin, Southern Thule, South Georgia and Shag Rocks) were analysed at phylum and class levels and their taxon richness, abundance and wet mass compared between locations and in relation to depth (Griffiths *et al.*). The next step was to identify the comprehensive samples to species levels for detailed studies on local biodiversity and on species richness, biogeography and molecular phylogenetics. The echinoids, octopuses and fishes were the first taxa with completed analyses. Linse *et al.* found 23 species of regular and irregular echinoids (some of them being first records for the localities) and described the epibiont fauna associated especially with cidaroids. The multi-gene study of the deep-sea octopod genus *Thaumeledone* revealed (Strugnell *et al.*) the phylogenetic relationships of its species and found notable intraspecific sequence variability in specimens from adjacent islands. The DNA bar coding of 35 putative fish species from the Scotia Sea using the mitochondrial COI gene locus showed high congruence between morphological and molecular classifications (Rock *et al.*). These results will also contribute to the bar coding campaign within the SCAR CAML (Census of Antarctic Marine Life) project.

Detailed species inventories are presented from two sample locations. A first study of the cryptic benthos associated with boulders was carried out by Barnes who discovered a remarkably rich fauna at Shag Rocks. The sublittoral marine richness of the volcanic Deception Island was assessed by SCUBA surveys from the entrance to the back of the caldera and a revised species list of the marine species of this island is presented (Barnes *et al.*).

The second island of volcanic origin visited during the expedition, Southern Thule, the southernmost of the South Sandwich Islands, became of special scientific interest. As one of the youngest island groups in the Southern Ocean, the South Sandwich Islands are ideal for studying biological colonization and geological formation processes. The composition of the benthic macrofauna was assessed across the bathymetric gradient and the present fauna analysed with respect to their dispersal abilities to reach these remote islands for colonization (Kaiser *et al.*). For the first time the biodiversity of the bacterioplankton from an Antarctic island marine habitat was investigated using 16S rRNA clone libraries (Pearce). The results showed that the majority of the clones were related to previously described marine, often polar, microorganisms and suggested the presence of a small number of common dominant species and a high richness of rarer species. The study by Allen & Smellie resulted in the first high-resolution bathymetric image of the Douglas Strain caldera between Southern Thule and Cook Island, revealing cone-like structures in the caldera that may relate to post-caldera volcanism. The oceanographic data taken within the caldera do not show any evidence of hydrothermal venting.

This Special Issue of Antarctic Science contains papers based on the research carried out during this BIOPEARL expedition and is dedicated to the memory of Dr Helen R. Wilcock. Helen enthusiastically planned the project on fish population genetics within this Antarctic expedition and was due to

participate but was sadly unable to join us. We decided on board that we would dedicate our first papers resulting from the cruise to her memory. Her obituary is written by BILL HUTCHINSON:

Helen developed her love of the natural environment during childhood holidays in the English Lake District and Scotland. She was a keen conservationist, working on restoration projects with the National Trust and with other voluntary organisations in Switzerland and Africa. After completing a BA in Geography at Oxford, she undertook a PhD at Queen Mary's College, University of London, presenting one of the first large scale genetic studies of dispersal and kinship in an aquatic insect, the caddisfly (*Plectrocnemia conspersa*). She subsequently completed a postdoctoral project at Newcastle University, investigating mating habits in barnacles, before returning to Queen Mary's to continue her study of the caddis fly in collaboration with Cardiff University. At a time when the integration of environmental and genetic data (*landscape genetics*) was first emerging, her work highlighted the influence of habitat heterogeneity on dispersal, showing that the lack of surface water in chalk downlands acted as an important barrier to geneflow. When the opportunity arose to work on a pilot project at Hull University, investigating genetic structuring in *Notothenia rossii* and *Champocephalus gunnari* around the Scotia Arc, it offered her the possibility of pursuing a dream of going to Antarctica. Her pilot study revealed evidence of significant barriers to geneflow between the more distant islands and provided the basis for a large-scale collaboration with the British Antarctic Survey to investigate the influence of oceanographic features on larval drift and recruitment. Helen helped to develop and co-write the successful AFI grant proposal, and was due to join her colleagues Jenny Rock and Tony North on the BIOPEARL cruise.

Helen highly valued the collaborative spirit of Antarctic research, and enjoyed the opportunity of building a network of colleagues through her search for samples. She possessed many of the characteristics of the early polar explorers, whom she greatly admired: resoluteness, integrity, team spirit, and a love of the wilderness. Although still early in her research career, she had already contributed much, and her passing is a loss to science. She will be much missed by colleagues and friends alike.

KATRIN LINSE
PRINCIPAL SCIENTIST BIOPEARL EXPEDITION