



Fact Sheet - Sampling and Permitting

Expedition Route 2003-2005

After its launch in Halifax, Nova Scotia in August 2003, the Sorcerer II sailed south into the Gulf of Maine, then along the U.S. east coast sampling in the ecologically important Narragansett, Delaware and Chesapeake Bays. The vessel then passed Cape Hatteras and traveled around Florida into the Gulf of Mexico, through the Panama Canal and to Cocos Island and then onto the Galapagos Islands. The Sorcerer II then sampled across the central and south Pacific through French Polynesia, the Cook Islands, Tonga, Fiji, Vanuatu, New Caledonia, and in Australia, where the Sorcerer was based for approximately six months. From there, the Sorcerer II sampled across the Indian Ocean, toward Madagascar and around South Africa. The final leg of the Expedition included sampling across the South Atlantic and ended with a trip through the Eastern Caribbean and back to the East Coast of the United States.

Number of Samples Obtained

Scientists took a 200 liter seawater sample approximately every 200 miles as the vessel circumnavigated the globe. In certain coastal areas, additional samples were taken to complement the ongoing studies of regional scientists. Close to 150 samples were taken as part of the circumnavigation by the Expedition. While many of these were in international waters, samples were collected from 17 nations, including the United States.

Samples Analyzed as part of *PLoS Biology* GOS Publication

This publication includes samples taken from 41 sites. The first four sites are in the Sargasso Sea near Bermuda and were first analyzed and published in 2004 in *Science* magazine. Data collected from nine nations' territorial waters (including the U.S.) is included in this publication.

General Information on Permits and MOUs

The J. Craig Venter Institute (JCVI) developed cooperative relationships with leading international researchers located in each sampling region. The collaborators consisted of representatives from 12 separate countries, as well as 36 different institutes, organizations, and universities. Additionally, the JCVI worked with collaborators or their governments to develop memoranda of understanding (MOU). These MOUs are obtained in addition to research permits and sample export permits issued by the countries where sampling takes place and specify how the genetic resources may be used.

During the first phase of the Expedition (the segment covered in the *PLoS Biology* paper), three agreements that specifically address access to genetic resources were signed by the JCVI and these countries (Mexico, Ecuador, and French Polynesia). Four remaining countries (Australia, New Caledonia, Seychelles, and Vanuatu) asked the JCVI to sign agreements that refer to genetic resources, though some (e.g., Vanuatu), only in the most general way. All of these MOUs are posted on the Sorcerer II Expedition web site, at www.sorcerer2expedition.org.

Specific Requirements for Permitting/Agreements

The Sorcerer II Expedition is governed by two international regimes, Law of the Sea and The Convention on Biological Diversity.

The Law of the Sea (LOS) applies to all marine research (physical, chemical, and biological oceanography) in a foreign country. These are the “standard” agreements that the Sorcerer II routinely applied for during the circumnavigation. Procedures under this regime are quite clear in that requests to conduct research are submitted through the U.S. Department of State in a standard format. The State Department works with the other country’s Ministry of Foreign Affairs to obtain permission for the U.S. vessel to conduct the desired research. Requests for permission must be submitted several months in advance. Here are some background points on the LOS:

- United Nations Law of the Sea Conference was convened in 1973 with the Convention adopted 9 years later, in 1982. As part of this convention a 12 mile territorial sea and a 200 mile Exclusive Economic Zone (EEZ) were established.
- LOS established a system of “prior consent” for marine research within the waters of another country, but the norm is for consent to be granted.
- Consent for research for peaceful purposes is to be granted “in normal circumstances” and “shall not be delayed or denied unreasonably”, except under certain specific circumstances identified in the Convention

The Convention on Biological Diversity (CBD) applies to “genetic resources” obtained from a foreign country, i.e., research using any organism obtained on land, from freshwater, or from the oceans. The Sorcerer II Expedition signed seven MOUs under this regime with countries of Australia, Ecuador, French Polynesia, Mexico, New Caledonia, Vanuatu and Seychelles (posted at www.sorcerer2expedition.org). Here are some additional points of interest on the CBD:

- The CBD was adopted in 1992 at the Rio “Earth Summit”, the popular name for the U.N. Conference on Environment and Development, held in Rio de Janeiro. Preliminary guidelines for “access and benefit sharing” were agreed to in 2002 under the Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Benefit Sharing from Their Utilization. Member countries have set 2010 as their goal for a fully fleshed out international regime.
- Under Law of the Sea rules governing research access are clear and routine however, these same standardized procedures do not exist for access to genetic resources under the CBD.
- A complicated situation exists under CBD in that individual researchers/research institutions must directly contact the relevant authorities in each country in which they hope to do research. Some countries have adopted rules, others have not. In 2004, when we were doing this research, most countries did not have their procedures worked out.
- Some countries do have in place procedures for dealing with commercial firms (e.g. pharmaceutical companies) that wish to undertake bioprospecting in the hopes of developing commercial products. These types of activities are contemplated under the access and sharing rules. Basic science research such as that the Sorcerer II Expedition conducts is quite different from this and therefore some countries see no need to ask for anything other than a marine science research permit. Others are not sure where basic research falls, making for a difficult situation given this ambiguity.

Access to Data/Public Databases

Genomic DNA sequence data from samples generated from the Sorcerer II Expedition are publicly available to researchers worldwide through two sources on the internet-- GenBank, a data repository at the U.S. National Institutes of Health, and a new database for metagenomic data, CAMERA (Community Cyberinfrastructure for Advanced Marine Microbial Ecology Researcher and Analysis). CAMERA, funded through a grant of \$24.5 million over seven years from the Gordon and Betty Moore Foundation, is a state-of-the-art computational resource with software tools to decipher the genetic code of communities of microbial life in the world’s oceans. The new resource will help scientists understand how microbes function in their natural ecosystems, enable studies on the effect humans are having on the environment, as well as permit insight into the evolution of life on Earth. CAMERA

has been developed by UC San Diego Division of the California Institute for Telecommunications and Information Technology (Calit2) in partnership with JCVI and UCSD's Center for Earth Observations and Applications (CEOA) at Scripps Institution of Oceanography.

No patents or other intellectual property rights will be sought by the JCVI on genomic DNA sequence data.

Collaborators

The Sorcerer II Expedition research team, led by Dr. Venter, is a multidisciplinary team of microbiologists, bioinformatics specialist, and DNA sequencing staff at the JCVI. Host country collaborators were also important in each region to complement the expertise for sampling. Work was also performed in collaboration with researchers at various academic centers including: four campuses of the University of California--San Diego, Los Angeles, Davis, and Berkeley; University of Southern California, Salk Institute for Biological Studies, Burnham Institute, University of Hawaii, Brown University, Universidad Nacional Autonoma de Mexico, Bedford Institute of Oceanography, Smithsonian Tropical Research Institute, Universidad de Concepcion, Universidad de Costa Rica, and Rutgers University a of the JCVI.

Methodology for Water Sampling

The collected water then passes through a series of progressively smaller filters to capture microorganisms of various sizes onto filter paper. The filtered samples are immediately frozen and are shipped to the JCVI laboratories in Rockville, MD., where scientists extract the microorganisms' genomic DNA, analyze it and store the information in computer databases. Using precise mathematical algorithms, researchers are able to reassemble by computer the DNA code of whole genomes and major sections of genomes from the diverse microbial communities found in the ocean.

Funding

The Gordon and Betty Moore Foundation granted \$4.25 million to the Expedition specifically to sequence the DNA collected along the coast of North America. The Department of Energy Office of Science has awarded the Expedition approximately \$12 million for sequencing associated with the Expedition as well as for other projects within the JCVI's environmental genomics, synthetic biology and biological energy groups. The JCVI is funding the majority of expenses associated with the voyage itself.