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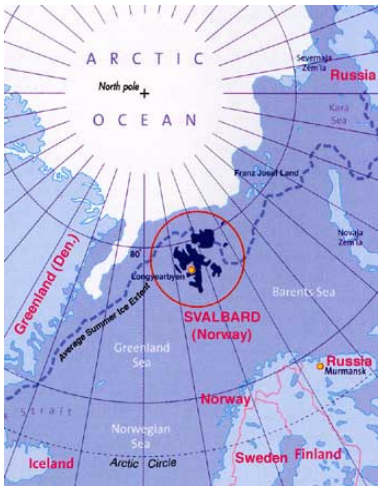
Arctic expedition of Prince Albert II

The Centenary of Prince Albert I's Arctic Expeditions was celebrated during July 2005 by retracing part of this expedition in the vicinity of Svalbard Island to be followed by dog-sledding over ice to the North Pole in April 2006. Other centenary events, including a conference on arctic science, will also be held in Monaco during May 2006. This expedition to Svalbard also provided opportunities for scientific organizations based in Monaco, including the IAEA Marine Environment Laboratory (MEL), to undertake research in a relatively remote location and in the sensitive Arctic environment. Svalbard Island is eminently suitable to observe the evolution of climate change and long-range pollutants transported from northern European countries by water currents and from North America by winds.

Roberto Cassi and myself dissecting Arctic molluscs on board M/V ORIGO



I was pleased to support and work with MEL's Roberto Cassi (pictured) on the following 2 projects which were proposed by MEL's radioecologist Ross Jeffree for the expedition;

Mollusc shells as biological archives

- Assessment of the shell laminations of a very long-lived marine bivalve mollusc- the Ocean Quahog- as an archive of long-range contaminants and changes in sea surface temperatures. This species was also collected in Norwegian waters by Prince Albert 1 in the early 1900's and retained in the Oceanographic Museum, Monaco. These specimens potentially provide an historical archive of climate change extending even further back in time for the Arctic.

Biomonitoring of pollutants in zooplankton

- Determination of current levels of radionuclides and other contaminants in bioconcentrating marine zooplankton in remote arctic environments for comparisons with other climatic regions.

I am looking forward to further interaction with IAEA's Marine Environment Laboratory in Monaco in relation to results from the Svalbard 2005 Expedition and towards longer collaboration.

Contributed by HSH Prince Albert II, Principality of Monaco.

Director's Message

Welcome to MEL's fifth Marine Environment News. Over the last 6 months MEL's programmes have been subjected to detailed evaluation first by an External Expert Panel that scrutinised our 5 year outputs and reported to the DG, then by IAEA's Standing Advisory Group on Nuclear Application (SAGNA) which looked at our future marine programmes and challenges. Overall, both panels commended MEL for the volume, quality and relevance of MEL's outputs including our research findings, peer reviewed publications, training expertise and services to Member States. They also welcomed our decision to integrate our studies and services on non-nuclear contaminants with nuclear and isotopic projects, thereby providing Member States with value-added information on sources, fluxes and fates of contaminants in the coastal environment. They re-iterated previous recommendations for regular budget support to stabilise and re-launch a strategy for new extrabudgetary partnerships. The reviews also welcomed the consolidation of MEL's carbon-based projects into a new Subprogramme H3 Ocean Climate Coupling and Carbon Cycling (OC4) for 2006-2007. (See our Website for New Subprogrammes).

Inauguration of the IAEA Collaborating Centre on HABs by Directors of MEL (Dr. F. Mantoura) and PNRI (Dr. A. dela Rosa) in the Philippines

We would like to welcome Mats Eriksson and Jan Scholten (see pages 6 and 7) to MEL. They bring exciting new marine isotope expertise and I would like to wish them productive and happy years at MEL. I am delighted to report that the Philippines Nuclear Research Institute (PNRI) was officially designated as an IAEA Collaborating Centre for their work on Harmful Algal Blooms (HABs). We plan joint research on tracking the food-chain mobility, impact and fate of HABs biotoxins using radiolabelled analogues.

We were pleased to offer support to HSH Prince Albert II's Centenary Expedition to Spitzbergen (see previous page) and so contribute in a modest but symbolic way to the Centenary legacy of Oceanography in Monaco. Finally, we are very honoured to have been part of the 2005 Nobel Peace Prize awarded to the IAEA and our Director General, Mr Mohamed ElBaradei.

Guest article: Isotopic research on a molecular scale

Carbon isotopes have been used in a variety of marine applications, such as to (1) trace the fate or source of various materials in the ocean, (2) determine the type and extent of biogeochemical reactions that have acted on these materials, and (3) assess past environmental conditions in the ocean. As a result, the relative abundances of the naturally occurring isotopes have provided very important information on the biogeochemistry of the oceans.

To date, however, the vast majority of carbon isotopic investigations have related to "bu1k" organic carbon. It is, however, important to recognise that organic carbon is not a single entity but is a complex mixture, probably comprising hundreds of thousands or millions of different compounds with a spectrum of diverse reactivities. By virtue of 4 electrons in its outer shell, carbon can form an infinite number of compounds that are the basis of life. "Molecular organic markers" (which are source or process specific organic compounds, such as those in the broad spectrum of lipidic classes) have also been extensively used to provide information on biogeochemical cycling. Through the development of new instrumental techniques (i.e. gas chromatographs-isotope ratio mass spectrometers and GC-peak trapping-accelerator mass spectrometry), marker techniques are now being integrated within isotopic studies. This offers substantial advantages through combining the two disciplines. ^{12}C:^{13}C ratios of molecular organic markers are becoming common place and are affording substantial advantages. If, however, we look at ^{14}C, this isotope is generated by collisions between cosmic ray derived neutrons and ^{14}N, then following its oxidation to $^{14}CO_2$, radiocarbon is incorporated into plants and thence into ecosystems, with a half-life of approximately 5700 years. Imagine if we could date individual organic molecules in coastal waters and the oceans with respect to their formation from initial photosynthetic production. This is unbelievably exciting because it affords the integration of time into biogeochemical assessments. It has started! For example, through employing such technology, it is possible to investigate the origin of combustion products such as carcinogenic polycyclic aromatic hydrocarbons (PAH). Research at Woods Hole Oceanographic Institution has revealed that it is possible to differentiate between PAH derived from wood, coal and oil combustion, and can isolate microbially generated molecules such as perylene from the combustion derived products. Also, a recent paper in *Science* has indicated that brominated flame retardant analogues, isolated from whale blubber, may not only be produced by synthetic industrial processes, but may occur naturally. Astounding! Our current research, in association with the Japan Society for the Promotion of Science and the National Institute for Environmental Studies (Ibariki, Japan), aims to extend these investigations to other biogenic and petroleum synthesised products.

In conclusion:

- Combining carbon isotopic studies with molecular organic markers substantially extend our knowledge.
- Molecular C-13 studies have allowed us to investigate carbon sources and turnover/transfers, paleo-environmental conditions, origins of petroleum, CO_2 fixation, and can distinguish between natural and synthetic products.
- Whilst technically challenging, C-14 offers the most exciting prospects to add the dimension of time to investigate carbon cycling in coastal waters and the oceans.

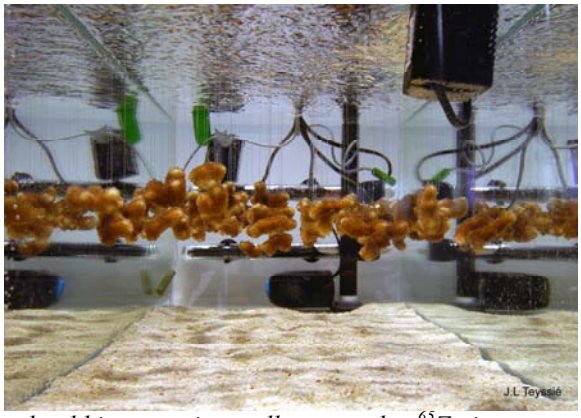
Contributed by Dr. James W. Readman, Plymouth, U.K., jwre@pml.ac.uk

This article represents a personal view and does not necessarily reflect the views of the IAEA..

Relationship between reef corals and zinc: Collaboration between IAEA and the Scientific Centre of Monaco

Reef corals are organisms living in symbiosis with microalgae called zooxanthellae which supply to the animal essential elements for its metabolic needs. Corals construct their structure by acquiring bicarbonate from seawater mainly through photosynthesis and calcification. Zinc (Zn) is included in the structure of an enzyme synthesized by corals that facilitate different steps of the transport of bicarbonate throughout the coral tissue. Thus, bicarbonate uptake by corals may be affected by zinc availability in the marine environment.

In the nutrient-poor tropical environment, concentrations of zinc might be low enough to limit photosynthesis and calcification in corals. On the contrary, in coastal areas with intense anthropogenic activities, corals might be exposed to toxic levels of metals. The primary objective of this collaboration was to assess the ability of corals to accumulate and retain *in situ* amounts of zinc, by using ^{65}Zn as a radiotracer of zinc.



Coral nubbins experimentally exposed to ^{65}Zn in seawater

Coral colonies of *Stylophora*, collected by the Scientific Centre of Monaco in the Gulf of Aqaba (Jordan), were prepared by cutting terminal portions of branches to obtain branch tips 2 cm long, 1 cm wide (nubbins). They were then suspended with a nylon mesh in an aquarium supplied with Mediterranean seawater containing the radiotracer ^{65}Zn. Radioactive zinc content was periodically evaluated in live coral nubbins.

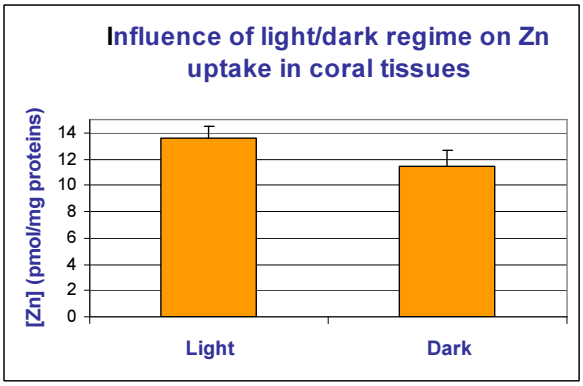
It was observed that zinc uptake by corals was enhanced during the day when photosynthesis is active. This is an indication that zooxanthellae (located in the tissue of the corals) play a significant role in the incorporation of this metabolically essential metal. As a consequence, the transfer of zinc into corals results from the uptake process of both animal and algal partners.

The major part of zinc accumulated by corals is located in the tissues with a minor fraction transferred into the skeleton (3%) for long term storage.

Reef coral Stylophora pistillata

This accumulation of Zn into the skeleton does not seem to be a detoxification mechanism of tissues, by trapping the metal in the coral structure, but might highlight a potential role of Zn in the construction of the coral skeleton through the calcification process.

The study of zinc uptake kinetics by the coral tissues showed that, at low concentrations, Zn is actively taken up by corals for their metabolic needs, indicating a good adaptation of the corals to low levels of Zn found in tropical environments preventing corals from being limited in bicarbonate supply. However, when Zn concentrations reach high levels corresponding to marine coastal environments with significant anthropogenic input, then Zn enters the organism by simple diffusion. Therefore, under these conditions, this essential trace metal is potentially able to reach toxic levels in corals.

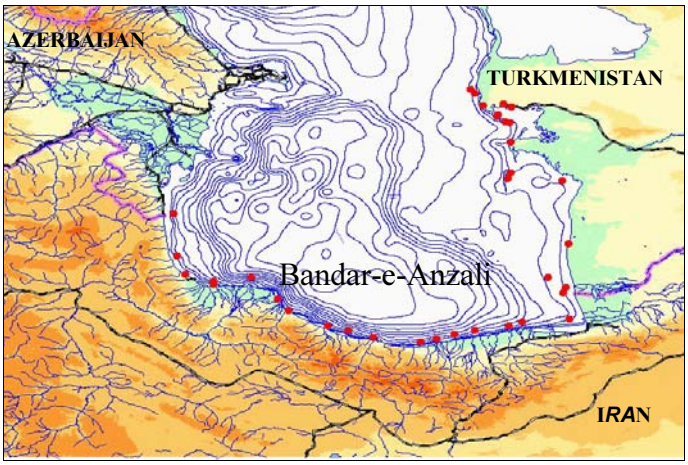


From this study, it appears that the physiology of corals may be affected by human activities in coastal tropical areas. Case studies are required to assess the anthropogenic impact on coral reefs present in critical coastal areas, especially when exposed to mining activities.

For further information, please contact F.Boisson@iaea.org or ferrier@centrescientifique.mc

MESL - CEP collaboration continues in the Caspian Sea - New Missions in 2005

The Caspian Environment Programme (CEP) is an intergovernmental programme of the five Caspian littoral states, namely Azerbaijan, Islamic Republic of Iran, Turkmenistan, Kazakhstan, and the Russian Federation. MESL collaborated with CEP on a GEF UNDP-UNOPS Project in the Caspian Sea. During Phase I, an assessment of marine pollution was completed based on sediment samples collected in the coastal zone. The results from this survey were published in *Marine Pollution Bulletin* (January 2004).



Bathymetric map showing the location of sampling sites

With the commencement of Phase II, MESL continues to assist CEP with the implementation of the project, particularly through the provision of expert advice and continued technical support in establishing a regional monitoring programme.

During the last two weeks of August, MESL participated in the first of four oceanographic expeditions planned to take place in 2005. A total of 40 stations were sampled in the southern part of Caspian Sea to assess the organic and trace metal pollution.

A training course in sediment sampling and storage was conducted by Dr. J.-P. Villeneuve in the harbour of Bandar-e-Anzali (Iran). Dr. C. Guitart participated on the subsequent sampling mission, together with the scientific group comprising Dr. E. Makarova (Russia), A. Karaeva (Turkmenistan), N. Ismailov (Azerbaijan), Dr. A. Mashinchian and Y. Ghodoosi (Islamic Republic of Iran).

The Iranian vessel *R/V Gilan* left Bandar-e-Anzali and crossed the Caspian Sea to commence the sampling programme in the northern part of Turkmenistan. The Turkmenistan coast was sampled for the first time as part of the contaminant-screening programme. The coastal area was relatively shallow, with depths between 10 and 25 m at approximately 5 km from the coast, rendering navigation difficult. The sediment fraction collected at the first stations visited was not suitable for contaminant analysis. Here, only suspended particulate matter was collected by filtration of seawater (GF/F, ∅ 90 mm). At the rest of the southern stations, a suitable sediment fraction between fine sand (<250 μm) and clay (<4 μm) was collected.

Scientific team in front of the R/V Gilan

The vessel entered the Iranian waters and sediment samples were collected in the coastal zone all the way to Azerbaijan. This region includes several urban centres and is important for both agriculture and tourism.

During this expedition, a total of 19 and 21 sediment and suspended particulate matter samples were collected in the Iranian and Turkmenistan coastal areas, respectively. The samples for organic contaminants and trace metals were packed in metal and plastic containers, respectively, and stored at –20°C in the ship's freezer. They will be analysed in Monaco for petroleum hydrocarbons, pesticides and trace metals, as well as a range of other environmental parameters.

Recently, two new expeditions took place in the central (Azerbaijan) and northern (Russia Federation and Kazakhstan) Caspian Sea during October 2005. Dr. C. Guitart participated as NAML staff on the mission to Azerbaijan.

Prepared by Carlos Guitart. For further information please contact S.de-Mora@iaea.org

Hot particles: what are they and do they have any environmental importance?

The word ”hot” in hot particle (HP), reflects the capability of some radioactive particles to give a high localized absorbed dose to the surrounding medium. A strict definition of HP does not exist, though several alternatives are present in the literature. In recent time it has been shown that the HP plays an important role in the assessment of total inventory of the contamination. It has been shown that after accidents, involving explosions and fire, the material will be dispersed in a particulate form. In a release of such kind, the particle size will be lognormal distributed, i.e. the relatively few large (hot) particles will carry the majority of the mass (activity). A consequence of such a release will be that the activity distribution will be very heterogeneous and also that it is very difficult to do representative sampling. There is a clear lack of the understanding of hot particles formation, migration, bioavailability and health hazards. Parameters describing radioactive elements mobility in the environment are the Kd (distribution coefficients) and CF (concentration factors). They are used in models for prediction of environmental fate of the contamination. These parameters refer to a mass, however it should be more correct to use surface areas as dissolution and corrosion only occurs on the surface of the particles. A HP has a much smaller surface to mass ratio than the small particles, which means that elements in HP have lower Kd and Cf than in small particles. As the tabulated mobility parameters usually are determined on bulk samples not including the HP, they are not representative for the majority of the contamination where the release scenarios include HP. In past years not much attention has been given to HP, most probably because they are too difficult to find and study.

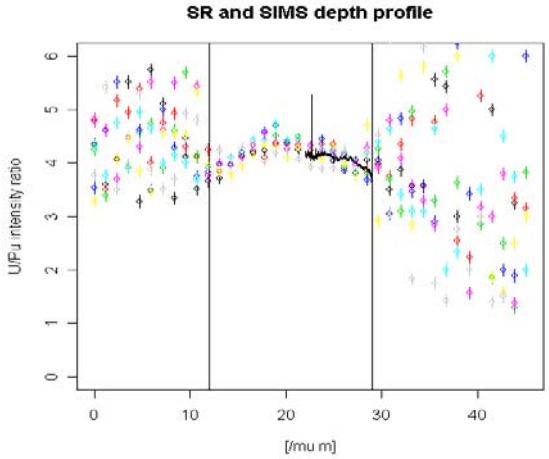


Fig. 1. SR µ-XRF line scans (colour dots) and the SIMS U/Pu depth profile (black line). The particle borders are within the vertical black lines. The particle can be seen in Fig. 2.

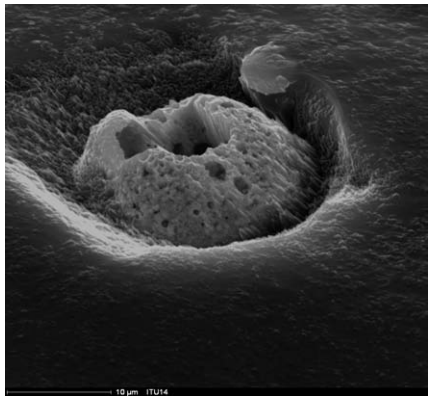


Fig. 2. SEM image a HP in backscatter mode, the “crater” on top of the particle is a result of the SIMS depth profile measurement.

In a time series case study of mixed U/Pu HP originating from the Thule accident (N.W. Greenland, 1968) it has been shown that U has a higher leaching rate than Pu. This has been confirmed in recent studies by the use of Synchrotron Radiations (SR) micro-X-Ray Fluorescence (µ-XRF) spectroscopy and Secondary Ion Mass Spectrometry (SIMS) depth profile studies on single hot particles (Fig. 1). It can be seen that the U/Pu ratio is lower in the surface of the particle and that the µ-XRF line scans are in agreement with the SIMS results. In Figure 2 a Scanning Electron Microscopy (SEM) image of the analysed particle can be seen. The SEM used had an Energy Dispersive X-Ray Spectrometer (EDX) which enables study of the elemental composition on the surface of the sample. The studied particles showed a homogeneous U/Pu ratio all over the surface of the particles, indicating a homogeneous mixture of U and Pu in the particles. The “crater” on the particle is the result of the SIMS depth profile analysis. The SIMS was also used to determine the Pu and U isotopic ratios. The determination of the U isotopic composition within HP by ordinary radiochemistry methods is very difficult because of the small quantities (~ ng of U per particle) and the risk of cross-contamination. This has also been confirmed when two different SR techniques have been used on single HP, viz. 3D combined transmission and µ-XRF tomography and 3D confocal µ-XRF. At MEL we will perform HP leaching experiments using equivalent pore water solutions to determine the leaching rates and Kd’s. These studies will be combined with SR Micro-X-ray Absorption Near Edge Structure (µ-XANES) determination of elemental oxidation states.

For more information, please contact: M.Eriksson@iaea.org

Development of a submarine gamma spectrometer

The purpose of my work at IAEA MEL Electronics Engineering Support Service is to update and bring the SEABED gamma spectrometer system back into service and design a new underwater system, as well as support the MEL in the field of electronics.

Underwater gamma spectrometry allows real time detection of radionuclides relevant to Submarine Groundwater Discharges (SGDs). Preliminary data obtained in Sicily show the suitability of the technique to estimate groundwater fluxes in a marine environment and a model is being developed to quantify fluxes and estimate underground water reserves.

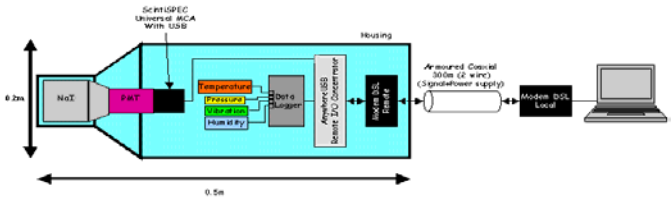
SEABED gamma spectrometer system

The work started with the study of the theory supporting gamma spectrometry followed by a thorough study of the electronics of the probe to detail the electronics architecture of the gamma spectrometer.

After testing all the different parts of the gamma spectrometer, the damages became clear. First of all, the NaI crystal was cleaved, due to shocks on the probe during the different field missions, leading to a shift of the peaks. The second problem came from the electronic board. There is no physical solution to resolve these problems. A new electronic board needed to be programmed and a new NaI crystal had to be ordered. I also plan to optimize this SEABED gamma spectrometer and adapt it for use with a laptop, through a USB port and Windows 2000/XP.

New underwater gamma spectrometer

In view of new missions planned for the near future and considering the real time detection requirements of natural radionuclides, I have also been assigned to design a new gamma spectrometer system. The new system will be composed of a universal MCA with USB port and a data logger for the sensor. It will allow managing and monitoring the detector and sensors (temperature, depth, vibrations, humidity, video camera …) from the remote PC via an IP address and changing gain, high voltage, calibration of the detector and sensor without opening the probe.



New Underwater Gamma Detector

This work enabled me to discover IAEA-MEL studies on the behaviour and distribution of radioactivity in the ocean and more particularly, to learn spectrometry. But this work would not have been possible if it was not in such a good working environment and research team. I would like to thank the MEL who gave me this opportunity and specially my Supervisor Mr J.F. Comanducci and Ms I. Levy.

Prepared by Adel Hassan, Electronics Engineer, Trainee at MEL. For further information, please contact J.F.Comanducci@iaea.org

Distinguished Service Award for Head of MESL

Dr. Stephen de Mora, Head of the Marine Environmental Studies Laboratory (MESL), received on November 29th the Agency's Distinguished Service Award. Mr. De Mora has played a major role in planning and implementing MESL activities, including the design and implementation of the UNDP and ROPME (Regional Organization for the Protection of the Marine Environment) environmental survey of shipwrecks in the waterways of Kuwait and Iraq. He has also arranged new collaboration with several Global Environmental Facility projects in the Caspian Sea, Black Sea, Red Sea/Gulf of Aden and Western Indian Ocean, including work on securing the necessary extrabudgetary funding and partners to implement the projects.

New Staff at MEL

Dr Mats Eriksson has previously been employed at the Department of Radiation Physics, Lund University, Sweden, at the Department of Radiation Research, Risø National Laboratory, Denmark, and at the European Commission (EC) Joint Research Centre (JRC) Institute for Transuranium Elements (ITU), Germany. Mats' research has involved aquatic radioecology, sediment modelling and dating with the focus on the arctic and sub arctic regions. The most recent research has been dedicated to developing and implementing novel methods in hot particle speciation studies (see separate article in this newsletter). Synchrotron Radiation Techniques like µ-focused XRF and XANES have been used as well as Secondary Ion Mass Spectrometry (SIMS) on single hot particles. Mats is planning, among other issues, to implement these techniques within the MEL marine research programmes.

Dr Jan Scholten previously worked at the Institute of Geosciences University of Kiel, Germany, as a senior research scientist. He has over 15 years of experience in marine research. His scientific interests are focused on the application of natural radionuclides as tracers for marine processes. This interest is fuelled by the ubiquitous difficulty in marine science to quantitatively determine sources and sinks of oceanic matter and how it is cycled within the water column. At RML Jan is planning to keep contact with the international GEOTRACES programme, which focuses, among other issues, on the distribution of anthropogenic and natural radionuclides in the oceans and on the establishment of sampling protocols and procedures for the measurement of radionuclides in seawater. In this framework he participated last October in a pre-pilot GEOTRACES cruise to the East Atlantic on board of RV POLARSTERN. He will further contribute to studies related to coastal zone management like the investigations of ground-water discharges.

Regional Training Course

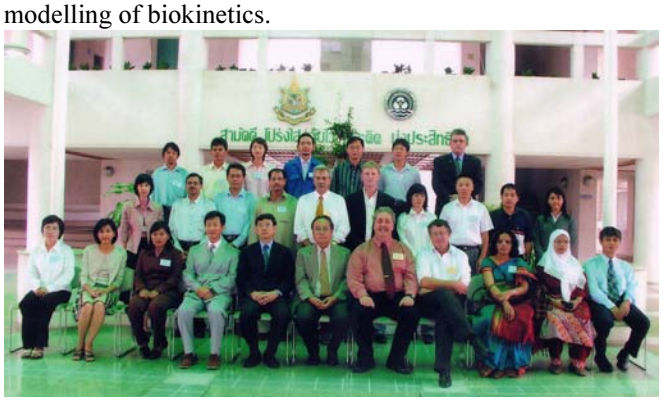
Application of Nuclear Techniques to Studies of Bioaccumulation and Contamination Analyses for the Development of Emergency Response Strategies for Aquatic Environments

As part of the TC Project "Improving Regional Capacity for Assessment, Planning, and Response to Aquatic Environmental Emergencies", a regional training course was organized which consisted of theoretical background, practical applications and interpretation of state-of-the-art radio-analytical and radio-ecological methodologies for environmental measurements and bioaccumulation studies in aquatic biota. The course was held in Bangkok, Thailand from 5 to 16 September 2005 under the local direction of Ms. Kanitha Srisuksawad from the Office of Atoms for Peace.

The training was attended by 17 participants from 12 Member States (Bangladesh, China, India, Indonesia, Malaysia, Mongolia, Myanmar, Pakistan, Republic of Korea, Thailand, Vietnam) who very actively participated in lecture sessions, fieldwork (sampling of river water in two stations close to the future nuclear power plant), and laboratory sessions.

Lectures encompassing a broad range of fields (e.g., marine biogeochemistry, radioecology, and radiochemistry, environmental risk management, radioecological risk assessment, radiotracer techniques for studying contaminant bioaccumulation, radioecology data interpretation and modelling, sampling strategies and methodologies, sample preparation and radioanalytical techniques) were given by experts from the Australian Nuclear Science and Technology Organisation (R. Szymczak and J. Twining), the Lund University, Sweden (E. Holm), and from the IAEA (S.-H. Lee and M. Warnau). Additional guest lectures were also kindly provided by local experts from the Asian Disaster Preparedness Centre (S. Bank), the Department of Marine and Coastal Research (V. Janekarn), and the Chulaongkorn University (S. Tungjaitrong).

Laboratory sessions focused on radiochemistry and bioaccumulation experiments. Radio-chemistry training was organized by Drs. Szymczak and Holm and intended to prepare, analyse and interpret data from the River water samples collected near the location of the future Thai nuclear power plant. This training included preparation, chemical separation and gamma spectrometry measurement techniques of important radionuclides (^{137}Cs, ^{131}I, U isotopes). Radio-ecological training was organized by Drs. Warnau and Twining. Laboratory experiments were designed to study bioaccumulation and biodistribution of radionuclides in key local invertebrates. Blood cockles were exposed to specific isotopes (^{137}Cs and ^{65}Zn) via seawater and cultured for a few days. Experiments consisted in the determination of uptake and loss kinetics of the radioisotopes as well as body distribution, computation of concentration factor and modelling of biokinetics.



Participants to the Training Course

Beside the experimental aspects, these laboratory sessions allowed training the participants in the practical aspects of safe handling of radioisotopes, radio-labelled organisms and supplies, and basic application of radioprotection safety rules.

Hospitality of the Office of Atom for Peace and the Environmental Research & Training Centre in Thailand and active participation of the attendants allowed the training course to successfully achieve its objectives, viz. knowledge transfer to participants on sampling techniques, sample treatment, radio-analytical techniques and a bioaccumulation study. This transfer of knowledge is expected to provide both theoretical and practical background that will help Southeast Asian Member States to substantially improve their capacity in management of aquatic radiological and environmental risks.

For further information, please contact M.Warnau@iaea.org or S.Lee@kriss.re.kr

Training Courses

MEL has a long history of organizing training courses for Member States, regional organizations and other UN organizations. They cover a range of topics related to the application of radionuclides in marine studies and the analysis of non-radioactive pollutants. Applications should be made up to six months in advance through Governmental official channels. Recent courses in 2005 are listed below.

For further information, please contact S.Henry@iaea.org.

HOST/LOCATION	COURSE TITLE	DATE
Bandar-e-Anzali, Islamic Republic of Iran	Training course on sediment sampling procedures (participants from Azerbaijan, Islamic Republic of Iran, Russian Federation and Turkmenistan)	August 2005
MEL Monaco	MEDPOL-sponsored training on measurement of chlorinated pesticides and PCBs in marine samples (participants from Croatia, Israel, Libyan Arab Jamahiriya and Tunisia)	September 2005
MEL Monaco	MEDPOL-sponsored course for the analysis of trace metals in fish and marine sediment samples (participants from Egypt, Libyan Arab Jamahiriya, Morocco, Montenegro, Syrian Arab Republic and Cyprus)	September 2005
Bangkok, Thailand	RCA Regional training course on application of nuclear techniques to studies of bioaccumulation and contamination analyses (participants from Bangladesh, China, India, Indonesia, Malaysia, Mongolia, Myanmar, Pakistan, Republic of Korea, Thailand and Vietnam)	September 2005

Current Intercomparison Exercises

MEL has a long experience in running programmes of intercomparison (IC) exercises and proficiency tests for the analysis of radionuclides, organic contaminants and metals in various marine media. IC exercises allow laboratories to evaluate their performance and improve the quality of their data. The IC exercises range from the global scale, with typically 150 laboratories taking part, to regional scale, involving dozens of laboratories, and to project-dedicated exercises, involving on the order of 10 participants. Intercomparison materials are distributed free of charge to participating laboratories. MEL is also one of the few producers of marine reference materials in the world.

For further information, please contact S.Henry@iaea.org.

SAMPLE	MATRIX	STATUS
IAEA-384	Radionuclides in Fangataufa sediment	Certified process done. Certificate paper submitted
IAEA-385	Radionuclides in Irish Sea sediment	Report issued July 2005
IAEA-414	Radionuclides in Irish and North Sea fish	Certified process done. Certificate paper submitted
IAEA-415	Radionuclides in North Atlantic fish	Sample distributed in 2006
IAEA-418	Iodine-129 in Mediterranean seawater	Data under evaluation
IAEA-435	Petroleum hydrocarbons and organochlorinated compounds in tuna	Exercise completed end October 2005
IAEA-436	Trace elements and methylmercury in tuna	Exercise finished. Report in preparation
IAEA-437	Radionuclides in Mediterranean mussel	Sample distributed in November 2004. Data under evaluation
IAEA-xxx	Trace elements and methylmercury in marine sediment	To be distributed in 2006

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