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In This Issue

While many enjoy visiting a good seafood restaurant on special occasions, for hundreds of millions of people across the globe seafood is a dietary staple and a primary source of protein. Whether it's dining occasionally or consuming regularly, we all want to be confident that our meal is not only tasty, but safe. We want to know the various seafood products do not contain dangerous levels of substances that may accumulate in our own bodies, such as mercury, or toxins that may cause immediate reactions, such as skin rashes or even paralysis. In this edition of the Environment Laboratories newsletter we take a closer look at seafood safety and highlight the work of the IAEA to monitor and understand the fate of marine contaminants such as heavy metals, persistent organic pollutants, hydrocarbons and bio-toxins in marine biota.

We report on a vast variety of themes and activities, ranging from Mexican and Japanese seawater radioactivity and data quality monitoring, to promoting global cooperation in tackling the issues of ocean acidification and marine pollution with the collaboration of institutions such as MEDPOL and Global Ocean Acidification Observing Network (GOA-ON). In addition, we cover the diverse and cosmopolitan training opportunities given to ALMERA trainees, training course participants, fellows and interns that all contribute to the IAEA's values of diversity and transfer of knowledge.

For more information on the activities of the IAEA's Environment Laboratories please visit: http://www.iaea.org/nael/

David Osborn,

Director Environment Laboratories

(Photo: M-Y. Dechraoui Bottein/IAEA)

(Photo: J.L. Teyssie/IAEA)

In Focus: Seafood Safety

Dietary intake of contaminants is a major exposure pathway for humans and therefore monitoring the presence of hazardous elements and compounds in edible marine organisms is absolutely necessary to ensure safe consumption of seafood in view of protecting human health. **The IAEA Environment Laboratories (NAEL)** provide technical and scientific support to the Member States to accurately monitor toxic contaminants in seafood by developing and validating analytical methods for toxic components such as **Biotoxins** (Harmful Algal Bloom), **Heavy Metals** (mercury/methylmercury), **Persistent Organic Compounds** (POP/Organics) and **Radionuclides** in marine organisms. The laboratories have aimed at enhancing national capabilities for IAEA Member States in assessing four types of toxic contaminants and mitigating associated adverse impact on human health and seafood safety.

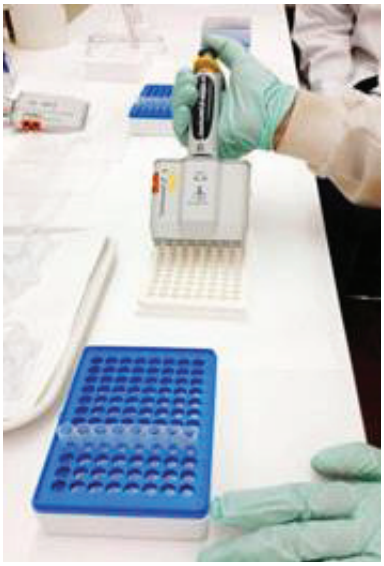
Biotoxins

Phytoplankton are plant like microorganisms at the foundation of the ocean food web, and produce more than half of the earth's oxygen. Phytoplankton blooms are generally seen as something positive, as they are correlated with increased fish population. However, in certain conditions, they may reach deleterious densities, causing oxygen depletion which are responsible for fish extinctions. Blooms of microalgae are also harmful when they involve species of phytoplankton capable of producing molecules toxic to certain marine organisms and to humans. When exposed to those toxins, through consumption of food containing toxins, human and marine animals can become severely ill. In human syndromes resulting from Harmful Algal Bloom (HABs) have been characterised, and named based on their symptoms, which can range from minor gastrointestinal disturbance to chronic neurological signs or even death (see Table below).

Syndrome	Human illness	Toxin group	Action levels EU or US
Ciguatera Fish Poisoning (CFP)	Gastrointestinal, neurological and cardiovascular disturbances, and recovery often takes months or even years	Ciguatoxins (CTX)	N/A
Diarrheic Shellfish Poisoning (DSP)	Characterized by gastrointestinal and neurological disorders including loss of memory. This syndrome can be lethal.	Okadaic Acid (OA)	0.16mg/kg
Neurotoxic Shellfish Poisoning (NSP)	Gastrointestinal and neurological disturbances usually with recovery in a few days. Toxic aerosols formed by wave action may cause asthma-like symptoms.	Brevetoxins (BTX)	0.8mg/kg 5,000cell/L
Paralytic Shellfish Poisoning (PSP)	Lethal syndrome with neurological effects. There is no known antidote to PSP. The known global distribution has strongly increased over the last few decades. Each year about 2000 cases of PSP are reported with 15 % mortality	Saxitoxins (STX)	0.8mg/kg
Amnesic Shellfish Poisoning (ASP)	Characterized by gastrointestinal and neurological disorders including loss of memory. This syndrome can be lethal.	Domoc Acid (DA)	20mg/kg
Azaspiracid shellfish poisoning (AZP)	Severe acute symptoms that include nausea, vomiting, diarrhea and stomach cramps.	Azaspiracid (AZA)	0.16mg/kg

Coral reef fish market in South Pacific Island (Photo: M-Y. Dechraoui Bottein/IAEA)

To warrant seafood safety, certain countries have established regulatory monitoring of HAB presence in coastal waters and/or of biotoxins in seafood. Efforts remain to be developed to establish systematic monitoring in all coastal countries, particularly in those that heavily rely on seafood as a source of protein, such as small island developing states.



Above: Oyster sample dried for contaminant and biotoxin analyses. (Photo: IAEA)
On the right: the "Receptor Binding Assay" method. (Photo: IAEA)

HAB monitoring consists of routine seawater collection offshore, and at multiple depths for phytoplankton count and identification. This monitoring requires simple devices such as phytoplankton nets or Niskin Bottles, microscopes, and well trained scientists for organism identification.

On the left: Scientists preparing shellfish samples for analysis in the laboratories (Photo IAEA)

Toxin analysis methods for shellfish regulation are determined by national competent authorities, and exporting countries must comply with national importing regulations. Although widely used, living animals for testing are increasingly considered as undesirable and unacceptable. Alternative methods have been adopted as regulatory methods which include the Receptor Binding Assay (RBA) for Paralytic Shellfish Poisoning (PSP) toxin in selected shellfish (photo of RBA). The nuclear based RBA is also listed as an available method for Neurotoxic and Ciguatera Shellfish Poisoning toxins (NSP and CFP).
An important objective is to extend the adoption of the RBA to all commercialised shellfish for PSP measurement and to CFP toxins in fish. For this purpose the nuclear-Receptor binding assay for PSP, NSP and CFP toxin measurement in seafood is being simplified and tested on sample matrices from different parts of the world. With its state of the art facility including aquaria with an open seawater system and controlled environmental parameters, NAEL can mimic environmental scenarios and improve knowledge on marine biotoxin food web transfer and toxicological assessment. This research programme is strengthened through coordinated research approach (CRP on HABs).

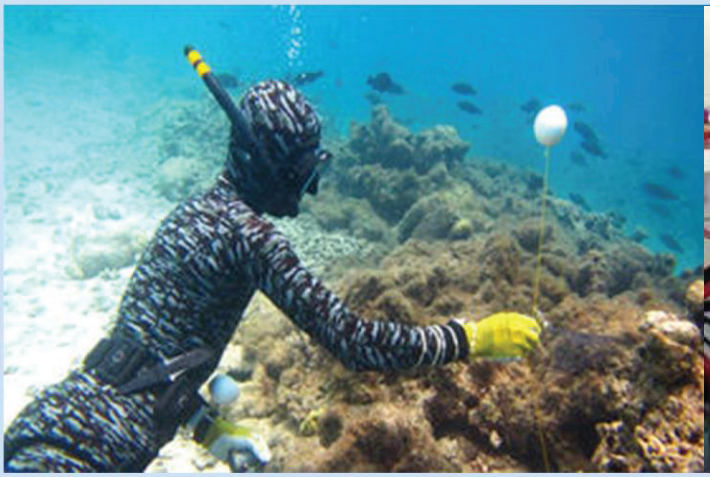
Spotlight: Supporting international efforts to prevent, control and mitigate Ciguatera Fish Poisoning using nuclear techniques

Ciguatera Fish Poisoning (CFP) is now regarded as a potential threat at a global scale, due to the rapid development of travel, tourism, and fish trade from the tropics, as well as the expansion of the bio-geographical range of the responsible microalgae *Gambierdiscus* and of toxic fish. This puts many IAEA Member States including Small Island Developing States under annual threat, of seafood HAB-related poisoning.

Aquatic products are essential to developing countries, both because they are a major source of protein and are the most highly traded food internationally. Thus, these regulated biotoxins affect public health as well as socioeconomic development. Considering the major impacts of CFP on the health and economy of many countries all over the world and the need for capacity building in CFP field monitoring, the International Atomic Energy Agency (IAEA) Technical Cooperation Department organized a regional workshop at the Institut Louis Malardé (ILM), Tahiti (French Polynesia) from March 2-13, 2015 within the framework of the regional project RAS 7/026 project on "Supporting the use of Receptor binding Assay (RBA) to reduce the adverse impacts of Harmful Algae on seafood safety". This event was attended by 17 participants from China, Indonesia, Malaysia, Marshall Islands, Oman, Pakistan, Philippines, Thailand, Viet Nam, and Wallis & Futuna (sponsored by IOC-UNESCO).

The programme included a series of lectures in addition to laboratory and field training. Demonstrations on HAB species sample collection using novel passive monitoring devices, algae identification and isolation using light microscopy techniques, toxin extraction and analysis in fish and algal samples and Receptor Binding Assay (RBA) also took place. Project counterparts, IAEA officials, and experts from National and International partner Agencies (NOAA-USA, IOC-UNESCO and the ILM, French Polynesia) met to update the RAS7026 project work plan, to design a pilot monitoring strategy for coastal management application, and develop a plan for compilation and sharing of HAB event and HAB species distribution data in the IOC-UNESCO database HAEDAT and OBIS, which became the basis for a first ever Global HAB Status.

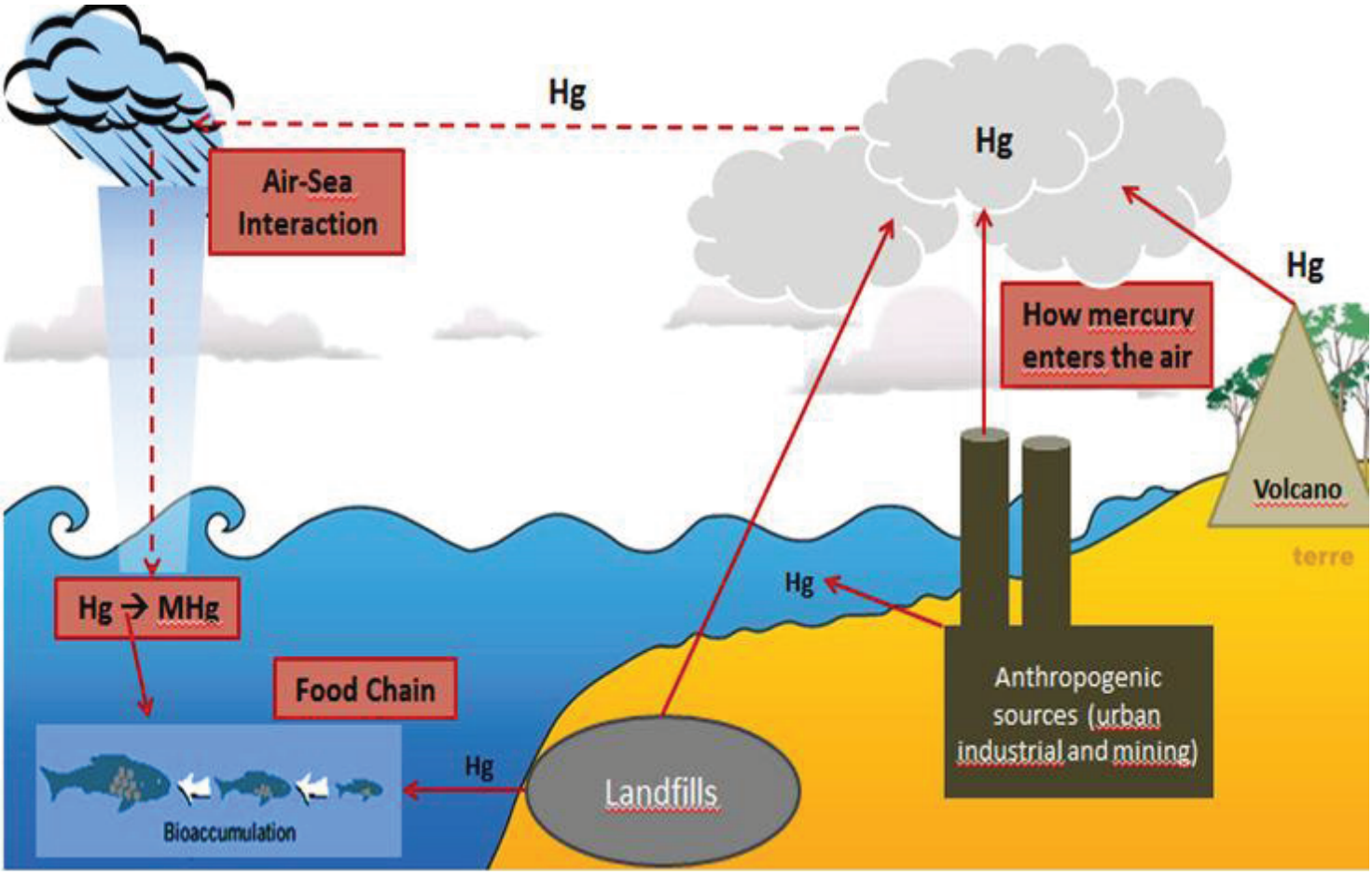
This regional Asia Pacific project and similar technical cooperation projects using nuclear techniques for biotoxin monitoring in the Latin America and Africa, will lead to the provision of global HAB data, to enhance member states capacity in preventing, controlling and mitigating HABs, and promote a sustainable socioeconomic development of IAEA member states.



Demonstrations on benthic (ocean floor dwelling) harmful algal bloom (HAB) species sample collection, using novel passive monitoring devices. (Photo: C. Gatti)

Workshop participants receiving laboratory training on extracting toxins from collected samples. (Photo: C. Gatti)

Heavy Metals



The Mercury Cycle: In the ocean, mercury is converted to monomethyl mercury, a neurotoxin that moves up the food chain and becomes highly concentrated in top predator seafish such as tuna, shark and swordfish. (Figure: K. Nehr/IAEA intern)

Toxic Risks on you plate are not limited to naturally occurring toxins. Contaminants of human origin, including chemicals such as heavy metals, pesticides, petroleum hydrocarbons, polychlorinated biphenyls, pharmaceuticals residues and other toxic substances, are also transferred to seafood.

Indeed, the **NAEL**-Environment Laboratories produces Certified Reference Materials for mercury and methyl mercury in marine matrices (including biota) and organises Interlaboratory Comparisons, Proficiency Tests and Training Courses on the analysis of contaminants in edible marine biota, such as bivalves and fish. To assist Member States to enhance seafood safety in relation to **mercury** and the highly toxic **methyl mercury**, constituting a major concern for the safety of seafood consumers, NAEL-EL recently (2014-2015) produced three new Certified Reference Materials for trace elements and Methyl Mercury in Clam (IAEA-461), Oyster (IAEA-470) and marine sediment (IAEA-456), published 4 relevant analytical methods in scientific journals and made 3 presentations in International Conferences. These outputs will help Member States to accurately monitor mercury and methyl mercury in seafood and environmental samples in order to protect human health and fulfil the requirements of the Minamata Convention on mercury. Recognising the priority of the work on mercury analysis, the USA Government is financing for two years a Junior Professional Officer (JPO) position at NAEL-EL in the framework of the PUI Programme of IAEA concerning seafood safety in relation to organic toxic and persistent substances. The JPO joined the laboratory on 23 June 2015.

Persistent Organic Pollutants and Organics

The NAEL-Environment Laboratories continued the development and optimisation of analytical methods for the measurement of Organochlorinated pesticides and Polychlorinated Biphenyls – PCBs, in edible marine biota and sediments. These compounds are regulated by the Stockholm Convention on Persistent Organic Pollutants (POPs), and although their use has been banned for decades in many countries, they are still detected in seafood and in some areas constitute an important health threat causing among other things, reproductive failure and suppression of the immune system.

Petroleum Hydrocarbons are also an issue of concern for seafood quality, especially at coastal areas subject to chronic petroleum contamination (at the vicinity of harbours, oil terminals and industrial zones) and NAEL-EL continues the development and optimisation of relevant analytical methods in edible marine biota, seawater and sediment to assist Member States in implementing relevant marine pollution monitoring programmes.

Radionuclides

In recent years, considerable concern for seafood safety has been focused on the Fukushima Daiichi nuclear accident and its potential impact on the surrounding marine environment. IAEA-NAEL have supported a capacity building project aimed at helping countries in South-East Asia and in Pacific Small Island Developing States to monitor existing radioactivity levels within their seawater, sediments and marine organisms and to assess the related risk to the environment. Workshops and training courses were organized to establish sampling methodologies and analytical procedures in order to collect benchmark data for natural as well as artificial radioactivity levels in the marine environment. Although still ongoing, the project has already helped countries such as Sri Lanka to answer questions on the presence and levels of radionuclides in their coastal ecosystems. Sri Lanka improved their capacity to analyse radionuclides in marine samples and was able to prove that the very low levels of caesium detected in Sri Lankan waters were the result of nuclear weapons testing fallout from the 1950s and 1960s. The project was thus successful in restoring confidence amongst the Sri Lankan population and their fishing industry which represents an important source of income for the country.

Fish displayed at the Fish Market in Colombo, Sri Lanka. (Photo: Nuclear Analytical Laboratory of the Sri Lanka Atomic Energy Board – SLAEB Team)

Scientists in Sri Lanka pull samples from the sea to monitor radioactivity levels. (Photo: SLAEB Team)

Preparation of samples collected previously. (Photo: SLAEB Team)

Fukushima - Ensuring Marine Monitoring Data Quality

Collection of seawater samples off Fukushima Daiichi NPP (Photo:IAEA)

IAEA's Environment Laboratories and ALMERA (the network of Analytical Laboratories for the Measurement of Environmental Radioactivity) joined forces in this year's first sampling mission organized in May together with the Nuclear Regulation Authority of Japan, aiming to collect samples for a new, more comprehensive test of analytical proficiency of the Japanese laboratories involved in marine radioactivity monitoring. The test targets commonly reported radionuclides in seawater and sediment. Like the previous two sampling missions, which took place in 2014 (see the Environment Laboratories Newsletter Vol 1, No 2, Jul-Dec 2014), this mission was carried out as part of a series of interlaboratory comparisons organized within the Nuclear Safety Action Plan project for "Marine Monitoring: Confidence Building and Data Quality Assurance". Present on-board were scientists from Ireland (Environmental Protection Agency, Office of Radiological Protection), Japan (Nuclear Regulation Authority, Ministry of Foreign Affairs and Japan Chemical Analysis Center), New Zealand (Institute of Environmental Science and Research) and the IAEA (Environment Laboratories in Monaco). Seawater and sediment samples were collected within a 10 km radius from the Fukushima Daiichi Nuclear Power Plant. A large volume of seawater was collected and homogenized on-board, and four identical sub-samples were prepared and shipped to the participating laboratories for the analysis of ^{3}H, ^{90}Sr, ^{134}Cs and ^{137}Cs. Using a grab sampler, sediment samples were collected and were then dried, grinded and homogenized in the Laboratory for Instrumentation and Analysis TECHNOS in Osaka. The homogeneity of sediment samples was checked by gamma spectrometry at the IAEA Environment Laboratories in Monaco and the samples were delivered for further analyses of ^{134}Cs, ^{137}Cs and plutonium isotopes in the participating laboratories. This sampling mission succeeded to produce an expanded set of samples, which, with the contribution of independent laboratories in the IAEA and ALMERA, will more broadly support the quality assurance of radioactivity data obtained by the monitoring laboratories in Japan. Two inter-laboratory comparisons and a proficiency test are planned for each of the following two years as part of the effort Japan and the IAEA are making to closely monitor the quality of the marine radioactivity data reported by Japan and to further increase the transparency of this process.

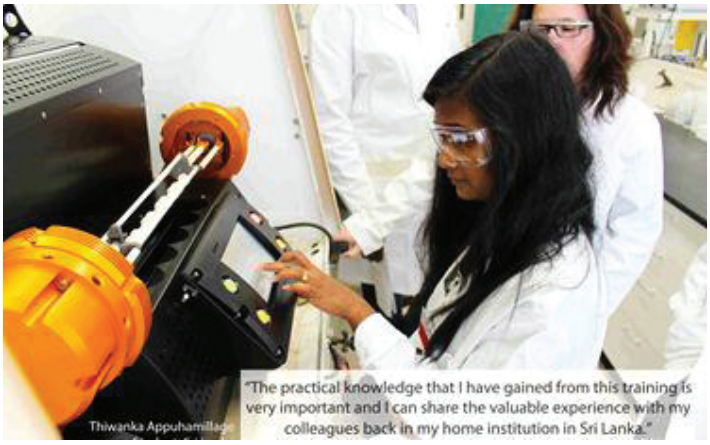
Participants in the sampling mission (Photo: IAEA)

ALMERA Scientists Trained on State-of-the-Art Methods for Rapid Environmental Radioactivity Assessment

For two weeks in May 2015, 22 scientists representing laboratories from 20 countries participated to **the 2nd Training Course on Rapid Assessment Methods for Environmental Radioactivity**, organized by the IAEA in collaboration with the Argonne National Laboratory (ANL) in the United States of America. The course was designed to address the needs of ALMERA (Analytical Laboratories for the Measurement of Environmental Radioactivity) network laboratories interested in enhancing their rapid

analytical capabilities for assessing environmental contamination in both routine and emergency situations. ALMERA was established by the IAEA in 1995 and is a world-wide cooperative effort of analytical laboratories aiming at providing reliable and timely analysis of radioactivity in environmental samples. During the training course, participants attended lectures and practical exercises, and participated in field work and laboratory hands-on practical work. The course was described by participants as a valuable experience, and as a unique opportunity to transfer new knowledge to their colleagues back home.

'A unique occasion to practice the latest techniques used in environmental radioactivity assessment and to learn new methodology"- Asivelo Solonjara



Thiwanka Appuhamillage, participant from Sri Lanka (Photo: G. Kis-Benedek/ IAEA)

Asivelo Solonjara, participant from Madagascar at the Argonne National Laboratories (Photo: G. Kis-Benedek/ IAEA)

Ryan Aniago, participant from the Philippines (Photo: G. Kis-Benedek/ IAEA)

Assisting Member States in Accurately Measuring Contaminants in the framework of Regional Marine Pollution monitoring programmes

IAEA-NAEL continues assisting Regional Seas Organisations on the accurate analysis of contaminants in the marine environment, in view of developing regional plans for protecting the marine environment and ensuring seafood safety.

In the framework of an extra-budgetary Letter of Agreement (LoA) signed with UNEP/Mediterranean Action Plan (MAP) on 26 May 2015, NAEL/Marne Environmental Studies Laboratory (MESL) is organising in 2015 two Proficiency Tests with participation of nationally designated Mediterranean laboratories on the analysis of trace elements and organic contaminants (pesticides, PCBs and petroleum hydrocarbons) in marine biota and sediments. Strengthening data quality assurance in the analysis of contaminants in marine pollution monitoring programmes is a priority for Mediterranean Member States for accurately assessing the state and trends of marine pollution and applying measures to protect human health and the sustainable delivery of ecosystem services. During their recent meeting in Malta (16-19 June 2015), Mediterranean Member States representatives to the

UNEP/MAP programme for the assessment and control of marine pollution (MEDPOL), recommended the continuation of the collaboration with IAEA/NAEL in order to continue improving the quality of marine pollution monitoring data.

Seawater Radioactivity monitoring along the Pacific Coast of Mexico

Hands-on training on radioactive caesium determination in seawater was organised in Mazatlan, Mexico, from the 11th to the 15th of May 2015, in the frame of the Technical Cooperation Project "Building Capacity for the Detection of Radioactive Contamination in the Marine Coastal Zone". The project was set up in the wake of the Fukushima Daiichi NPP accident which resulted in a massive release of radionuclides to the Pacific Ocean. These radioactive releases, dominated by radiocaesium, were diluted and transported eastwards by the Kuroshio current and may be further diluted and dispersed towards the Pacific Mexican coast by the North Pacific Current and the Californian current, resulting in extremely low levels of radionuclides. The detection of very low levels of radioactive caesium in seawater, is a challenge that the Institute for Marine Sciences and Limnology of the National Autonomous University of Mazatlan (UNAM) has addressed with assistance from the Agency. The Mexican Pacific coastal area has a high socioeconomic and environmental relevance, due to important fishing and touristic activities. Following a request from the Mexican Government, the Agency works with UNAM to develop capabilities for analysing and monitoring marine radioactivity in this area. UNAM was provided new highly sensitive analytical equipment, sampling and sample preparation equipment and materials and training in specific sample analysis methods.

The training on collection and radiochemical treatment of seawater for radiocaesium analysis through low-level gamma spectrometric measurement was given by an IAEA expert and introduced 5 local staff to two different methods:. (Ammonium Phospho Molybdate (AMP) co-precipitation; and adsorption on cartridges impregnated with $CuFe(CN)_6$). Hands-on training in advanced low-level gamma-ray spectrometry was provided separately in the UNAM laboratory by an expert from the Karlsruhe Institute of Technology, Germany. First results for ^{137}Cs (half-life 30.2 years) activity concentrations were already obtained, and no trace of ^{134}Cs (half-life 2.06 years) could be detected. These results represent the very first data produced by UNAM scientists for the Mexican Pacific coast, which together with further measurements will provide present baseline levels. The scientists in Mazatlan plan to carry out continuous monitoring and to further improve their capacity to analyse ultra-low levels of radiocaesium.

IAEA expert and Mazatlan team (Photo: J. A. Sanchez Cabeza)

Promoting Global Cooperation to study the "other CO_2 problem"

The IAEA Ocean Acidification International Coordination Centre (OA-ICC), located at the Environment Laboratories, started the year organizing the 3rd International Workshop **"Bridging the gap between ocean acidification and socio-economic valuation",** co-organized with the Scientific Centre of Monaco (CSM) and held at the Oceanographic Museum in Monaco, 12-14 January 2015. The workshop provided a unique venue for global and multidisciplinary interaction, and focused on the impacts of ocean acidification on coastal communities. It brought together over 50 leading experts from a range of different backgrounds (natural sciences, economics, sociology, industry, government and policy making). His Serene Highness Prince Albert II of Monaco closed the workshop stating:

"*Ocean acidification is, I believe, one of the greatest scourges resulting from the considerable development of anthropogenic greenhouse gas emissions, to have both concrete and global impact.*" – HSH Prince Albert II of Monaco

Within the framework of its capacity building efforts, the OA-ICC supported researchers from developing nations (Brazil, China, Philippines, Mexico, India) to attend the 3rd International Symposium *«Effects of climate change on the world's oceans"* in Brazil, 23-27 March 2015.

The OA-ICC serves all those looking for comprehensive and targeted resources on ocean acidification – the scientific community, policy makers, media, schools and the general public. The project's unique bibliographic database on ocean acidification, accessible free of charge online, is continuously updated and contains at present nearly 2800 references. Since the beginning of the year, over 19,000 internet users from 70 countries have accessed the OA-ICC news stream that provides daily updates on ocean acidification, from the most recent scientific papers to career opportunities in OA research, meetings, media coverage etc. The OA-ICC recently expanded its set of communication tools with the "*OA-ICC Highlights"* – a one-page summary of the project's main achievements provided on a quarterly basis.

The goal of the OA-ICC is to act as an international hub for information sharing and support for ocean acidification research and training. Several activities are planned for the second half of the year (regional training courses, development of E-learning modules, inter-comparison exercises, new outreach materials etc.).

Centre Scientifique de Monaco (CSM) and IAEA Team (Photo: CSM)

Towards a GOA-ON Data Portal

From the 1st to the 2nd of June 2015, **the IAEA Ocean Acidification International Coordination Centre (OA-ICC**) coordinated a two-day meeting in regards to the **Global Ocean Acidification Observing Network (GOA-ON)** with the aim to create a joint portal for access to global ocean acidification data. The meeting brought together eight experts from seven different countries discussing the way forward to (1) extend and update the current GOA-ON inventory and (2) propose a web portal interface for ocean acidification metadata retrieval. The group discussed the advantages and inconveniences of existing data portal systems, useful search filters, the use of common controlled vocabularies and discourses, metadata standards and interoperability between different data providers. This technical meeting, organised within the IAEA Environment Laboratories premises in Monaco, represented the second meeting held by the OA-ICC in the framework of the project's efforts to encourage and promote international management of and access to ocean acidification data.

GOA-ON and IAEA experts in IAEA-EL (Photo: O. Anghelici/IAEA)

Monacology 2015: "From the Sea to our Plates

HSH Prince Albert II and Monacology IAEA team; June 2015 (Photo: K. Nehr/ IAEA intern)

The **11th edition of Monacology, Monegasque Awareness Week for Children on Environment and Sustainable Development**, was held between 15 and 19 June 2015 in Monaco.

In this context, the IAEA Environment Laboratories, organised a pedagogical workshop focusing on the theme **'From the Sea to our Plates'**, which explained how pollutants transfer and accumulate along the food chain and eventually to humans. Through a game using plastic fish of different sizes representing a virtual food chain, children were able to visualize how contaminants, even at low concentrations in the sea, can accumulate from the lower trophic levels to the top predators. "This workshop was conceived as a game to help children discover by themselves how "small" pollutions can eventually become "big" pollutions, which can end-up in our plate", said Roberto Cassi, NAEL/MESL staff who was responsible for the coordination of the IAEA/NAEL Monacology 2015 team. The main message delivered was that no pollution is small enough to be neglected and that each one of us can definitely play a role in protecting the environment. The IAEA's workshop was visited by approximately 900 children aged 5-12 years old, who were educated while playing.

As H.S.H. Prince Albert II of Monaco said: **"It is a very good workshop for children, giving an easy-to-understand, clear message on the need to protect the environment"**

Children playing the game set up by the IAEA at the 11th edition of Monacology, June 2015. (Photo: R. Cassi/ IAEA)

Game set up by the IAEA at the 11th edition of Monacology, June 2015. (Photo: O Anghelici/ IAEA)

Proficiency Test Exercises

More than 280 laboratories representing 56 countries participated in the 2015 proficiency test exercises on the determination of radionuclides in environmental samples. To assist Member States in enhancing the reliability of their environmental radioactivity data and to support their environmental monitoring and research programmes, the IAEA Terrestrial Environment Laboratory organizes annual proficiency test exercises that enable laboratories worldwide to evaluate their analytical performance. In the current year, 203 participants registered for the proficiency test open to all laboratories world-wide free of cost, provided as a support to the IAEA's Member States. In addition, 81 laboratories from the IAEA's ALMERA (Analytical Laboratories for the Measurement of Environmental Radioactivity) network registered for their

specific proficiency test exercises. The sample set for these exercises consisted of water, biota and sediment samples. The laboratories are requested to measure radionuclide content in the supplied sample set and report their measurement results to the IAEA which, in turn, compares their measurement results to the reference values, and issues individual reports, as well as recommendations, to each laboratory.

Proficiency test samples cover all environmental compartments, from soil and water to vegetation, unprocessed food products, and aerosols. (Photo: S. Tarjan/ IAEA)

Africa and metal pollution

The IAEA Environment Laboratories in Monaco welcome experts from developing Member States from all over the world and create an enabling research climate that allows them to acquire or strengthen competences in their analysis and understanding of pollution in marine ecosystem and how it affects the human society. The government of Ghana has expressed a growing concern with the environmental quality of its coastal ecosystems and has requested the support of the IAEA in training its future specialists in the study of sanitary impacts of anthropogenic (industrial, agricultural, household waste) metal pollution.

This year the Radioecology Laboratory in Monaco supported the academic endeavors of a student from Ghana tackling the topic of heavy metal pollution in the context of Ghanaian coastal ecosystems and its impact on the local communities. Ms. Harriet Kuranchie-Mensah spent 18 months on the premises of the Monaco IAEA laboratories learning to apply nuclear techniques in her research goals. With the help and guidance of the Radioecology staff, Harriet replicated the Ghanaian marine ecosystems at an aquarium scale. Economically relevant species of bivalve mollusks were imported from Ghana and exposed to heavy metal radioisotopes meant to trace dynamics of pollutant assimilation.

The experimental results Harriet obtained showed that bivalves were contaminated not only by the toxic elements present in the composition of seawater, but also by the ones contained in their food. The routes of contamination are different and their stored amounts and locations in the organisms also vary, as does the speed of decontamination when placed in clean water environments. The flesh of contaminated organisms also shows that pollutants' transition to the human body depends on the local culinary practices. During the experiment, Harriet simulated human digestion using specific enzymes in order to accurately quantify the intestinal absorption of the pollutants. Results suggest that the ingestion of pollutants could be reduced by informing local communities about the use of certain cooking methods in contributing to the problem.

Harriet's experience can be reproduced to study the transition of pollutants to the human body through many other species. The essential aspect is to develop researchers' capacity to identify and understand the problem and define adapted mitigation strategies.

Six months of practical applications of nuclear techniques and twelve months of experimental work were necessary to shape a future expert in this area. Turning Harriet's experience into a systematic capacity building methodology for scientists from the developing world would also allow for the creation of an international network towards improved coastal ecosystems monitoring and restoration. Using the atom as an instructive tool endorses IAEA's philosophy on the peaceful uses of nuclear science and technology.

Harriet Kuranchie-Mensah in the IAEA/NAEL laboratories (Photo: J.L. Teyssie/IAEA)

The IAEA and Fellowship

An important mission of NAEL is the transfer of knowledge through training or provision of expertise to Member States. For the 2014-2015 biennium, NAEL has, so far, provided expert training to 42 TC fellows and 25 interns.

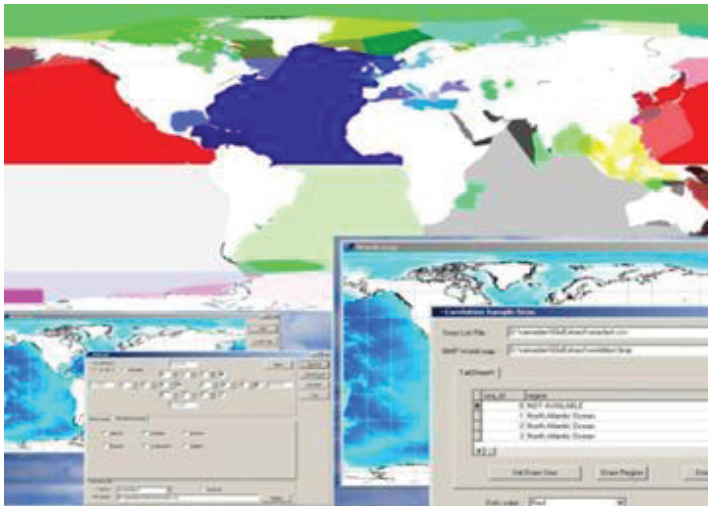
Mr Marc Romero, from the Philippines, was trained at NAEL on the receptor binding assay. (Photo: M-Y. Dechraoui Bottein/ IAEA)

Both research and knowledge transfer activities rely on a strong cooperation with national institutions or international organisations. Cooperation is essential to provide comprehensive and efficient support and is fundamental to promoting sustainable development. The participation of the IAEA at the IOC-UNESCO International panel on HABs (IPHABs) has led to concrete joint activities to improve HAB management in Member States. The Practical arrangement with the National Ocean Atmospheric Administration (NOAA) has led to the validation of the Paralytic Shellfish Poisoning - Receptor Binding Assay PSP-RBA, and its regulatory application. The collaboration with NOAA together with that of the Malarde Institute in French Polynesia (a cooperation agreement exists between ILM and the IAEA), will be essential for the validation of the Ciguatera Fish Poisoning - Receptor Binding Assay CFP-RBA. Related projects include CRP on HABs, a PUI project, technical and scientific support to 30 Member States via TC national and regional projects and the unique collaborating centre on HABs in the Philippines.

Intern's Corner *

Mr. Pouya Yarahmadi Dehnavi was awarded an internship at the IAEA Environmental Laboratories in Monaco where he worked on IAEA's Marine Radioactivity Database (MARiS). Mr. Yarahmadi Dehnavi was able to get first hand exposure on the structures of existing datasets and generated productive work within a short period of time. A specific task was to collect and create data using MARiSapp, an in-house Member State Access application.

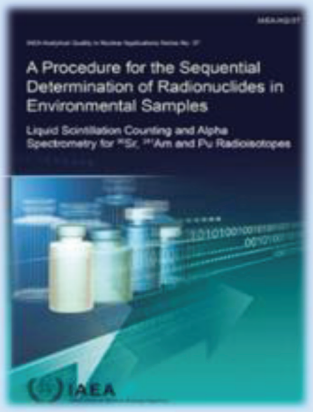
"MARiS programme is slowly but surely developing and expanding and I was involved in activities that were synergistic to this endeavour. One approach that I recommend for future interpretation of the dataset is to generate geospatial maps using Generic Mapping Tools (GMT). Indeed, graphic representations help to better convey information than simple tables of numbers. Most importantly, I would like to thank Mr. David Osborn and his team for giving me the opportunity to put into practice my skills in a geospatial software as well as experiencing the unique atmosphere and "camaraderie" of the IAEA. I shall forever remember this wonderful experience" says Mr. Yarahmadi Dehnavi.



Screenshots of the applications involved (Figures: H. Ramadan/IAEA).

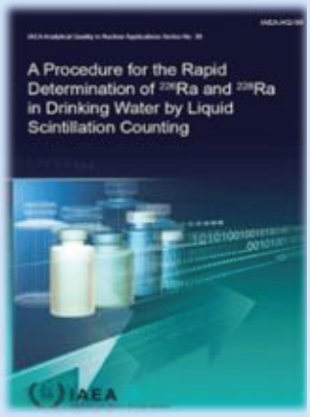
* This edition of Environment Laboratories Newsletter was coordinated by intern Ms. Kelly Nehr.

New Technical Reports



"A Procedure for the Sequential Determination of Radionuclides in Environmental Samples: Liquid Scintillation Counting and Alpha Spectrometry for ^{90}Sr, ^{241}Am and Pu Radioisotopes", IAEA Analytical Quality in Nuclear Applications Series No 37 (IAEA/AQ/37); October 2014, 65 pages.

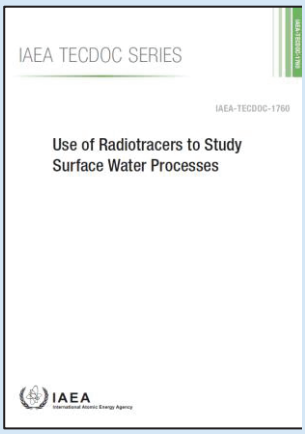
^{90}Sr, ^{241}Am and Pu radioisotopes are among the most hazardous radionuclides produced in nuclear fission and activation processes. Monitoring their presence in the environment is of major importance that requires the availability of up-to-date validated analytical procedures. The publication describes a validated method for sequential determination of ^{90}Sr, ^{241}Am and Pu radioisotopes in environmental samples. The method can be used in Member States' laboratories for the measurements of radionuclides in environmental samples
(http://www-pub.iaea.org/books/IAEABooks/10761/A-Procedure-for-the-Sequential-Determination-of-Radionuclides-in-Environmental-Samples-Liquid-Scintillation-Counting-and-Alpha-Spectrometry-for-90Sr-241Am-and-Pu-Radioisotopes)



"***A procedure for the Rapid Determination of ^{226}Ra and ^{228}Ra in Drinking Water by Liquid Scintillation Counting",*** IAEA Analytical Quality in Nuclear Applications Series No 39 (IAEA/AQ/39); December 2014, 57 pages.

^{226}Ra and ^{228}Ra are very significant from a radiological point of view, since they can easily be incorporated into bones due to their similar properties with calcium. Monitoring their presence in industrial waste products and consumer products is of major importance for the protection of human health and environment, and requires the availability of up-to-date rapid validated analytical procedures. The publication describes a rapid validated method for the screening of ^{226}Ra and ^{228}Ra activity levels in drinking water to be used in Member States' laboratories in emergency situations and routine monitoring.

(http://www-pub.iaea.org/books/IAEABooks/10796/A-Procedure-for-the-Rapid-Determination-of-Ra-226-and-Ra-228-in-Drinking-Water-by-Liquid-Scintillation-Counting)



New IAEA publication on "Use of Radiotracers to Study Surface Water Processes" (IAEA-TECDOC-1760).

To assist Member States in the field of environmental studies related to natural or anthropogenic processes that modify the environment, TEL contributed with an IAEA TECDOC on "Use of Radiotracers to Study Surface Water Processes" (IAEA-TECDOC-1760). The document summarises the current status of radiotracer applications in surface water environments as well as addressing challenges to the use of radiotracers in this field.

Radioactive tracers can be extremely useful in studying such processes, and thus help to investigate the common problems faced by many States and to find adequate solutions. Problems such as water pollution, erosion, river sedimentation, and the loss of storage capability of water reservoirs, thereby reducing fish stocks, can cause great damage and negatively affect the well-being of local populations.

This publication is the outcome of an IAEA consultants meeting on the use of radioactive tracers to study surface water processes and can serve as a key reference to all concerned directly or indirectly with this topic.

http://www-pub.iaea.org/books/IAEABooks/10689/Use-of-Radiotracers-to-Study-Surface-Water-Processes

This edition of the Environment Laboratories Newsletter was edited by Mr. Laval Liong Wee Kwong

Upcoming Events

Dates	Description	Location
31 August - 4 September 2015	2nd Research Coordination Meeting of the IAEA Coordinated Research Project 'Environmental Behaviour and Potential Biological Impact of Radioactive Particles'	Vienna, Austria
2 October 2015	Visit of the Vienna-based Permanent Missions to NAEL	Monaco
12 - 15 October 2015	Technical Meeting on Major Environmental Considerations Associated with Uranium Mining and Milling	Vienna, Austria
12 - 16 October 2015	Training Course on Ocean Acidification	Cape Town, South Africa
12 - 16 October 2015	4th Consultancy Meeting for the Preparation of an IAEA Publication	Vienna, Austria
13 - 15 October 2015	12th ALMERA Coordination Meeting	Monaco
19 - 20 October 2015	Meeting on Improving the Management of OA Biological Response Data,	Monaco
21 - 22 October 2015	Meeting of the GOA-ON to Develop a Forecast Modelling Tool for Observing	Monaco
22 - 23 October 2015	Meeting of the Global Ocean Acidification Observing Network to develop Data Synthesis Products, Environment Laboratories	Monaco
26 October - 6 November 2015	MED POL Training Course on the Analysis of Organochlorine Pesticides and Polychlorinated Biphenyls in Environmental Samples	Monaco
26 October - 6 November 2015	MED POL Training Course on Analytical Techniques for the Determination of Trace Elements in Marine Samples	Monaco
2 - 6 November 2015	ALMERA Training Course on In-Situ Gamma-Ray Spectrometry	Spiez, Switzerland
9 - 27 November 2015	Training course on Marine Ecosystems and Industries at Risk: Impact of Multiple Stressors, Monaco	Monaco
17 - 21 November 2015	Training Couse on Best Practices in OA Research, Xiamen,	Xiamen, China
30 November - 4 December 2015	Final RCM on CRP OA,	Monaco
8 - 9 December 2015	Meeting of the CELLAR Network on Coordination of European Underground Laboratories with Gamma Spectrometry Facilities	Monaco

You & NAEL

Reference Materials (RMs)

NAEL provides reference materials to laboratories world-wide to assist them in the quality of the results they produce by nuclear analytical techniques.

Each of the RM is characterised for analyses belonging to one of the following groups: Radionuclides, Trace Elements and Methyl Mercury, Organic Compounds, Stable Isotopes. IAEA is the world's largest supplier of matrix reference materials characterised for radionuclides, some of the IAEA reference materials characterized for isotope ratios are at the highest metrological level as international measurement standards.

For further information, please contact: EL@iaea.org and visit http://nucleus.iaea.org/rpst/ReferenceProducts/About/index.htm

Interlaboratory Comparisons (ILCs) and Proficiency Tests (PTs)

The implementation of accepted quality assurance practices to analytical chemistry is recognized as a prerequisite to producing data with known metrological qualities. Regardless of the target analyse or sample type, quality assurance and quality control are the cornerstones to analytical data validation and the results from ILCs or PTs are of crucial interest for laboratories as these provide clear information of its measurement capabilities. NAEL organizes more than three IC and PT exercises annually, one each for radionuclide, organic and inorganic contaminants. The inorganic study also includes the determination of methyl mercury.

For further information, please contact: EL@iaea.org and visit http://nucleus.iaea.org/rpst/ReferenceProducts/Proficiency_Tests/index.htm

The ALMERA network

The ALMERA network (Analytical Laboratories for the Measurement of Environmental Radioactivity) is a cooperative effort of analytical laboratories world-wide. Members of the network are nominated by their respective IAEA Member States as those laboratories which would be expected to provide reliable and timely analysis of environmental samples in the event of an accidental or intentional release of radioactivity. NAEL in Seibersdorf and Monaco are additional members of the network and are the central coordinator of the ALMERA network's activities.

NAEL helps the ALMERA network of laboratories to maintain their readiness by coordinating activities including organization of meetings, development of standardized methods for sample collection and analysis, and organization of interlaboratory comparison exercises and proficiency tests as a tool for external quality control.

For further information, please contact: almera @iaea.org and visit http://nucleus.iaea.org/rpst/ReferenceProducts/ALMERA/index.htm

Ocean Acidification-International Coordination Centre (OA-ICC)

The OA-ICC news stream (news-oceanacidification-icc.org) provides daily information on ocean acidification (scientific papers, media coverage, jobs and meeting announcements). The OA-ICC data compilation on the biological response to ocean acidification gives easy access to ocean acidification experimental data through a user-friendly data portal *(http://www.iaea.org/ocean-acidification/page.php?page=2203).*

The OA-ICC bibliographic database is regularly updated on Mendelay. The data base currently has more than 2000 references and includes citations, abstracts and allocated keywords that can be used for statistical analysis. (*http://www.mendeley.com/groups/4333941/ocean-acidification-oa-icc/)*.

Impressum

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