IAEA FACTSHEET

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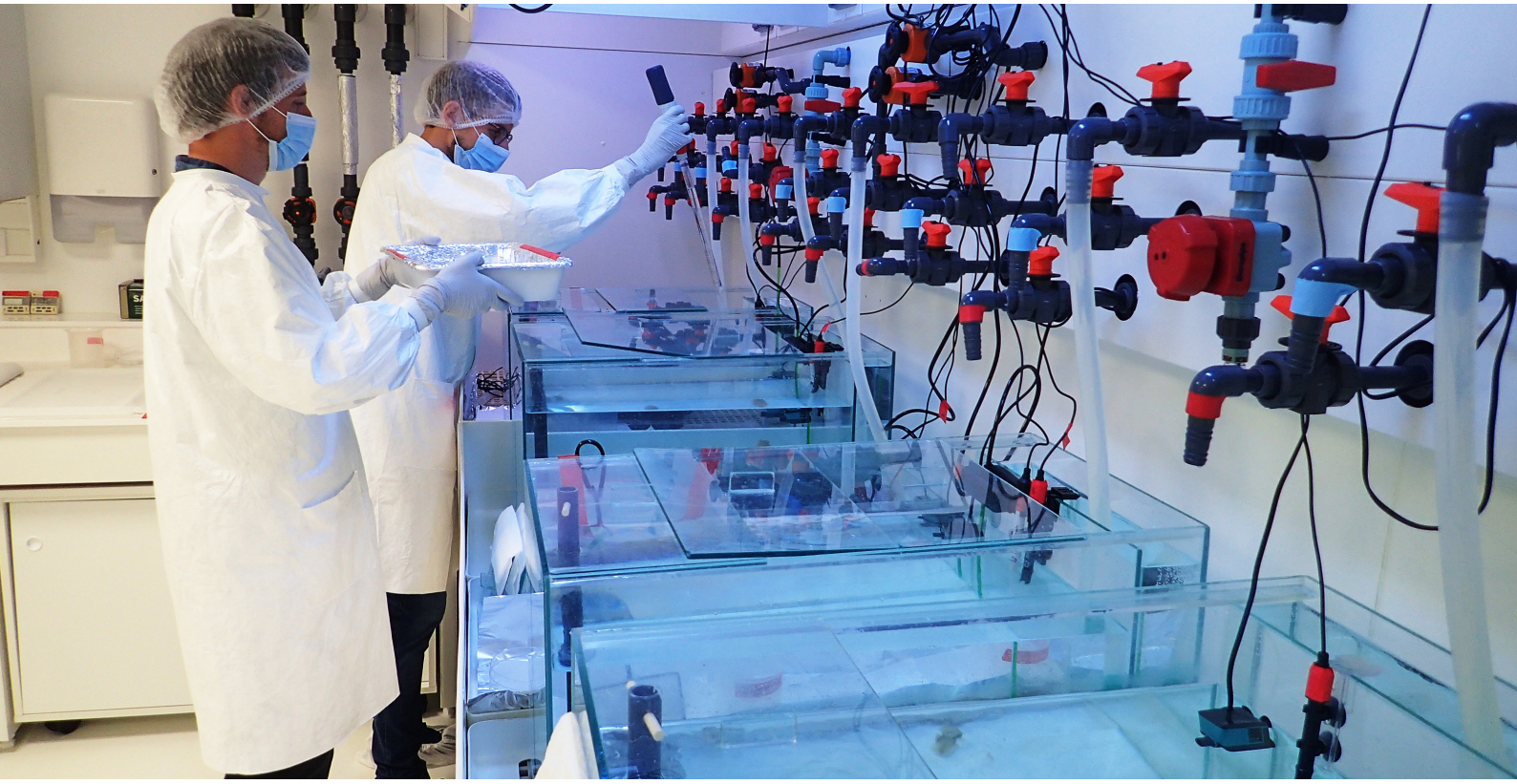
Nuclear Science & Technology

The IAEA's Radioecology Laboratory

Helping Member States Address their Most Pressing Environmental and Climate Change-Related Needs



Scientists at the Radioecology Laboratory examine what effects changes in the environment, such as those linked to climate change, will have on marine species. This includes studying the impact of ocean acidification on mercury levels in commercially-important species such as cuttlefish.

(Photo: F. Oberhaensli/IAEA)

What should I know?

Understanding and protecting the environment using new nuclear techniques defines the IAEA's work to help Member States address the negative impact of environmental changes, including climate change. The IAEA's Radioecology Laboratory, based in Monaco, uses nuclear techniques, radiotracers and stable isotopes to advance our understanding of natural processes occurring in the ocean, air and land. These efforts align the interests of Member States with the United Nations 2030 Agenda for Sustainable Development and the Decade of Ocean Science for Sustainable Development (2021–2030).

The IAEA's Radioecology Laboratory (REL) uses radiotracers and other isotopic techniques to advance our understanding of how coastal and marine ecosystems —and their biota and intricate food webs — respond to current and expected future environmental and climate change impacts.

REL studies the transfer of pollutants within marine organisms in order to assess and monitor any impacts on seafood safety.

(Photo : S. Couture/IAEA)

For example, it carefully assesses the cumulative effects of environmental stressors using radiotracers and studies key marine species, such as mussels, fish and shrimp. These state-of-the-art techniques help Member States address, adapt and build resilience to future environmental challenges.

What does the REL do?

The REL conducts research and development on new nuclear and isotopic techniques to assist Member States' in addressing their most important coastal and marine ecological challenges and needs. This includes studies on the uptake and bioaccumulation of diverse contaminants (including pollutants, such as polonium, and biotoxins, such as ciguatoxins, found in harmful algal blooms), on ocean acidification, on ocean warming and on the marine carbon cycle — often in the context of future climate change scenarios.

The REL also hosts the Ocean Acidification International Coordination Centre (OA-ICC), which provides a global platform for conducting activities related to ocean acidification. The results of these activities are then transferred to Member States around the world through training events and exchange programmes.

How do nuclear techniques help?

Advanced nuclear and isotopic techniques provide key information on the processes, rates and mechanisms involved in the movement and biological incorporation of diverse contaminants (such as pollutants, biotoxins and radionuclides), and can help assess how these contaminants move through coastal and marine ecosystems under changing climatic and environmental conditions.

Methods developed in the REL include customized radiotracer applications using specially designed experimental aquaria that can replicate almost any natural ecosystem and can therefore provide proxy data on key processes, such as biological uptake, carbon sequestration or food web transfer.

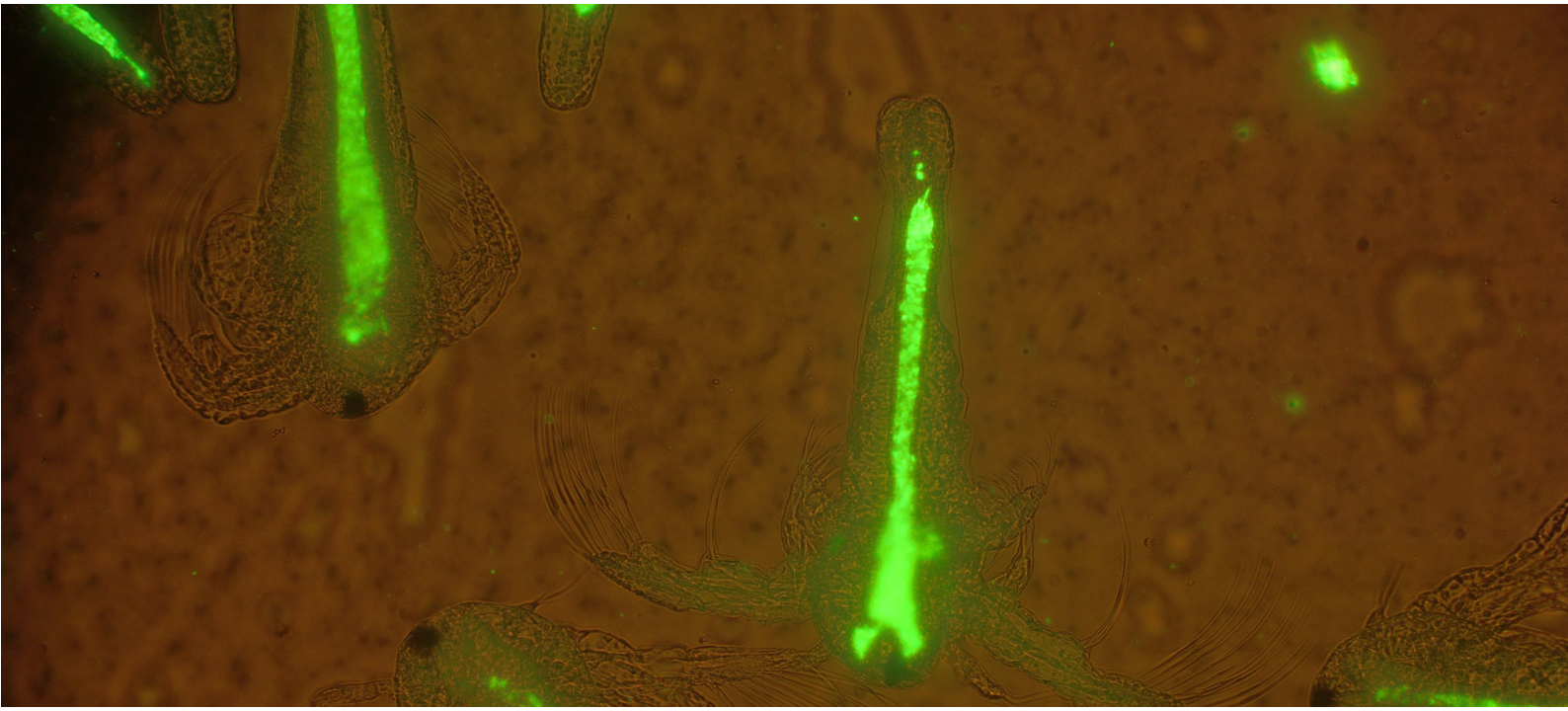
The use of radiotracers in laboratory and field settings has been invaluable in advancing our knowledge of the complexities of coastal and marine ecosystems and their possible vulnerabilities to future climatic and environmental stressors. For example, radioisotopes of metals such as cadmium, cobalt and caesium are often used to study bioaccumulation kinetics, as well as to track where the contaminants might end up in a particular marine organism, such as a crabs or fish.

Areas of support for Member States

The REL currently provides support to Member States in the following areas:

Environment/climate change

The REL is equipped with world-class experimental aquaria that provide key information and answers on how contaminants move through coastal and marine food webs under changing environmental conditions, including temperature, salinity, carbon



Researchers at the Radioecology Laboratory use radiotracers to study what happens when plastic particles are ingested by marine organisms, like artemia (brine shrimp).

(Photo: F. Oberhaensli, M. Metian/IAEA)

dioxide and dissolved oxygen. This information is used to assess subtle climate change-induced impacts on biogeochemical cycles, as well as contaminant and toxin transfer in coastal and marine biota.

Monitoring pollution

The REL provides expertise on the flow of potentially toxic chemicals, such as heavy metals, biotoxins and radioisotopes in rivers, groundwater and coastal oceans. It studies toxins that settle on the seabed and that are possibly ingested by bottom feeders, such as clams and flat fish. The REL also conducts research on biological impacts based on particular chemicals and organism, as well as on bioaccumulation and possible trophic transfer.

Building capacity and sharing expertise

The REL develops new techniques and research and then uses this technology to assist Member States. For example, nuclear techniques can be used to quickly identify the potent biotoxin present in a harmful algal bloom event, which can be detrimental to marine organisms and even to humans through the consumption of contaminated seafood. The REL also provides training for Member State scientists, including on the use of radioligand receptor binding assays — an analytical procedure to quickly and accurately identify biotoxins in harmful algal blooms.

Ocean Acidification International Coordination Centre

As the oceans absorb about one fourth of the carbon dioxide emitted to the atmosphere, the acidity of seawater is gradually increasing. This can affect marine organisms and ecosystems in fundamental ways. To help address this, the REL hosts the OA-ICC, which actively facilitates, promotes and assists in coordinating global ocean acidification activities, including research.

The OA-ICC organizes training courses for national experts and provides access to data and resources to advance ocean acidification research. It promotes the development of data portals, standardized methodologies and best practices. The OA-ICC also works to raise awareness of the issue among

Scientists at REL use radiotracers and other isotopic techniques to improve our understanding of the impacts of human activities on the marine environment and climate.
(Photo: S. Couture/IAEA)

various stakeholders and to inform them about the role that nuclear and isotopic techniques can play in assessing the impacts of ocean acidification. To achieve these objectives, the OA-ICC works with many international partners and supports global and regional ocean acidification networks, including the Global Ocean Acidification Observing Network.

In 2019, the REL launched two new coordinated research projects (CRPs). The CRP on Applied Radioecological Tracers to Assess Coastal and Marine Ecosystem Health focuses on the development of new radioecological tools to assess the health of coastal and marine ecosystems. The primary goal of this four-year CRP is to develop, refine and apply nuclear techniques to assess coastal and marine ecosystems and their biota, particularly with respect to challenges from anthropogenic and climate change impacts, such as deoxygenation, harmful algal blooms, pollution, ocean acidification and marine plastics. The other four-year CRP is on Evaluating the Impacts of Ocean Acidification on Seafood — A Global Approach and aims to advance the understanding of the qualitative and quantitative effects of ocean acidification on seafood around the world, and to explore adaptation strategies for the aquaculture and seafood industries.

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