



Ocean Acidification
International
Coordination Centre

OA-ICC

PROMOTING GLOBAL COOPERATION
TO ADDRESS OCEAN CHANGE

MAY – SEPTEMBER 2023

A large graphic on the left side of the page depicts a cross-section of the ocean. The top part shows a sandy beach with waves crashing. Below the surface, there are silhouettes of a crab, a squid, and a shark swimming. The bottom part shows a coral reef with various fish. The background is a gradient of light blue and white, with a decorative bubble trail on the right side.

OA-ICC HIGHLIGHTS

The latest news and updates from the OA-ICC and its partners

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The OA-ICC well represented at the 2023 ASLO Aquatic Sciences Meeting

4 – 9 June 2023, Palma de Mallorca, Spain

ASLO meetings represent an important scientific global forum that facilitates a dynamic exchange of ideas, emergence of innovative concepts and approaches, development of professional networks and establishment of meaningful collaboration efforts. The 2023 edition ran under the title “Resilience and Recovery in Aquatic Systems” and brought together more than 2,300 participants from over 70 countries.

IAEA/OA-ICC scientists participated in this year’s ASLO meeting in Palma de Mallorca with several relevant contributions on the topic of ocean acidification, covering all major pillars of OA-ICC activities: science, capacity building and communication.

(1) Sarah Flickinger (OA-ICC Associate Research Scientist) presented a poster of the results of the OA-ICC capacity building programme, which aims to increase OA research capacity through outcome-based courses and collaboration with several international partners. The programme increases its impact by performing OA capacity evaluations to target training courses in low-capacity regions and through the identification of participants most likely to contribute to OA science based on prior course outcomes. By testing students’ general knowledge and determining contributions to the scientific literature pre- and post- course completion, the OA-ICC has built a dataset which enables improved selection of future course participants and teaching strategies. This model for evidence-based improvement of OA capacity building programmes can be used by IGOs, NGOs, and others engaged in capacity development.

(2) Sam Dupont (OA-ICC Consultant, Capacity Building focal point) led a special session titled

“Ocean Acidification 2.0 – From Chemistry to Society”, presenting an overarching approach to the impacts of ocean acidification on marine ecosystems and its translation into direct consequences on coastal communities’ food security and livelihoods, as well as economic activities and the socio-cultural patrimony. The session was conducted under the umbrella of the UN Decade Programme “Ocean Acidification Research for Sustainability” (OARS), which counts the IAEA/OA-ICC among its strategic partners. This session underlined the need for enhanced inter-disciplinary, more inclusive and more diverse collaboration efforts between scientists, policy makers, science communicators and other concerned stakeholders. Together they can co-design both science and solutions, in order to close the gaps in the understanding of complex interactions between different environmental stressors. Despite overwhelming research undertakings and evidence produced, the current approaches lack the integrative, symbiotic aspect, limiting conclusions and, therefore, generating ineffective responses. Discussions led throughout this session sought to assess the meaning of these challenges and prompt viable ways to overcome them.





The Executive Council of the Global Ocean Acidification Observing Network (GOA-ON) holds its annual 2023 meeting

10-11 June 2023, Palma de Mallorca, Spain

Underpinned by a robust partnership of international and governmental organizations, academic institutions and philanthropic bodies, GOA-ON is a global network connecting scientists in their common endeavour to 1) comprehensively describe the drivers of ocean acidification, 2) understand the ecosystem-level biological response to changes in seawater chemistry and 3) allow for viable projections (forecasts) required to inform coherent policies and timely actions. The OA-ICC has been a strong contributor to and facilitator of GOA-ON activities and products since its establishment more than a decade ago and has actively supported the proliferation of its regional hubs to boost collaboration and consolidate communities of practice.

GOA-ON's Executive Council (EC) convened in Palma de Mallorca earlier this year on the occasion of their annual in-person meeting. The aim of the meeting was to review recent activities and assess their impact, while identifying challenges and shortcomings and discussing effective ways to overcome them. The group thoroughly addressed modalities to expand and support ocean acidification monitoring worldwide, identifying sustainable financing solutions and integrate these efforts into the broader Ocean Acidification Research for Sustainability (OARS) initiative, a UN Ocean Decade-endorsed programme. In addition, communication within the wider network and between regional hubs was an important aspect tackled by the group; some of the options suggested included higher-frequency casual meetings, town halls and events on the side-lines of scientific conferences and other similar venues.

The enhancement of capacity building activities led by GOA-ON constituted a subject of primary concern for the EC. The group discussed ways to scale up trainings, put together comprehensive information packages for participants and assess the effectiveness of these exercises in terms of benefits for trainees and progress in the attainment of GOA-ON's broader vision and goals. Additionally, the EC received important updates from the International Carbon Ocean Network for Early Careers (ICONEC) and had the opportunity to understand how ICONEC wishes to contribute to GOA-ON in alignment with its members' professional and scientific goals.

The establishment of new regional hubs was another focus of the discussion, as GOA-ON seeks to increase the geographical reach of its efforts. Potential GOA-ON hubs for the Caribbean region and the Southern Ocean were considered, given current interest and existing regional capabilities (active focal points).





International group of scientists discusses potential scenarios for climate and ocean change adaptation pathways for atoll islands

13-15 June 2023, IAEA Marine Environment Laboratories, Monaco

Atoll islands are particularly vulnerable to global change impacts due to their specific geographical, biophysical and human aspects. Their often limited natural resources, fragile ecosystems and densely populated low-lying areas exacerbate risks associated with ocean acidification, climate change and other stressors to seafood security, economic viability (fisheries and aquaculture, but also tourism and leisure), population health (traditional, indigenous sea-based medicine) and even coastal reclamation usually ensured by expanding land on coral reefs.

In this context, the modalities to ensure the habitability of atoll islands in the near and longer-term future raises scientific and policy concerns. It is of primary urgency to correctly assess all potential risks and design targeted, island-specific and sustainable solutions using a “pathway approach”. Risk accumulation will be different depending on specific portions of the global ocean and the types of atoll islands, hence the need for distinct pathways harmonized with these particularities.

In recent years, this topic has been the focus of a committed international group of experts from Australia, Canada, France, Tuvalu and the United Kingdom. After a successful first in-person meeting held at the IAEA Marine Environment Laboratories in the spring of 2022, the group reconvened in Monaco on 13-15 June 2023 to assess progress made, identify current uncertainties and gaps in knowledge, and advance the work on the design of pertinent climate adaptation pathways for atoll islands.

Through extensive research and consistent discussions, the group has identified 20 adaptation measures specific to five previously defined habitability pillars (land, freshwater supply, food supply, settlement and infrastructure, economic

activities). Over the course of the June meeting, scientists endeavored to evaluate and score each measure’s potential to reduce risks to island habitability. As a result, a comprehensive scoring matrix was developed and operationalized that allows for the assessment of all proposed measures against the following criteria: 1) potential effectiveness (immediate and future); 2) readiness for implementation; 3) time until effectiveness can be measured; and 4) duration of the benefits (in case of partial or total implementation). Moreover, a comprehensive group analysis was carried out to map the best way for measures to be sequenced over time and warming scenarios (+1.5/2°C vs +4°C) to respond to changing environmental scenarios, while considering specific multiple stressor contexts.

The group will continue its work over the course of the coming year and will seek to translate results of this comprehensive research exercise in a number of scientific publications and compact policy guidelines that would allow for appropriately weighed and timed interventions.

Since its establishment, the group has been supported by a collaborative effort involving the Institute for Sustainable Development and International Relations (IDDRI), the International Atomic Energy Agency (IAEA), the Prince Albert II of Monaco Foundation (FPA2) and the Ocean Acidification and other ocean Changes – Impacts and Solutions (OACIS) initiative.





Group of early-career scientists benefits from comprehensive training in “blue carbon” research at the IAEA Marine Environment Laboratories

28 August – 8 September 2023, IAEA Marine Environment Laboratories, Monaco

The importance of coastal vegetated ecosystems in the global carbon cycle cannot be underestimated. Mangroves, tidal marshes and seagrass meadows are prominent carbon sequestration mechanisms that constitute vital nature-based solutions to climate change and ocean acidification mitigation and/or adaptation strategies. Internationally recognized as essential components of viable climate strategies, during the 2015 UNFCCC COP21 in Paris, these ecosystems have been gradually incorporated in many countries' Nationally Determined Contribution (NDC) towards cutting overall greenhouse gases (GHG) emissions and tackling climate and ocean impacts.

Research on “blue carbon” has experienced significant growth over the past decade. Scientists across the world have been striving to develop consistent methods to assess existing global stocks and burial rates of carbon in mangroves, seagrass meadows and saltmarshes. Many challenges in this regard have been raised by the lack of data from considerable parts of the world and by insufficient understanding of certain biogeochemical processes (e.g., gas exchanges, the role played by carbonate precipitation and dissolution in this cycle).

In line with its objective to develop local capacities and empower Member States to conduct pertinent research and develop optimal evidence-based solutions, the IAEA's OA-ICC organized a comprehensive, two-week training course on “blue carbon” at the Marine Environment Laboratories in Monaco, on 28 August – 8 September 2023, for 11 scientists from around the world (Argentina, Brazil, El Salvador, France/UK, Malaysia, Mexico, Pakistan, Panama, Senegal, Thailand, USA). The training course was graciously co-sponsored by the Prince Albert II Foundation of Monaco.

This capacity building exercise combined theoretical and practical hands-on experience to equip trainees with all necessary knowledge and skills required to carry out robust research in the capacity of coastal vegetated ecosystems to sequester carbon. Over the course of ten intensive workdays, trainees had the chance to go through the complete research cycle, from planning and design to field work, sample preparation and analysis (including nuclear and isotopic techniques), interpretation of data and scaling up of results.





A full day of sediment core sampling, preparation and analysis was carried out at the Villefranche Oceanographic Laboratory (France), with attentive scientific and logistical support from the local staff. Other institutions represented at the course through guest lecturers included the Autonomous University of Barcelona, the University of St. Andrews, the Sorbonne University and the Scientific Centre of Monaco. Moreover, participants benefited from one-on-one mentoring sessions with the course lecturers aiming to support their individual research needs and projects. Other relevant topics tackled during the training course included, to name a few,

policy drivers motivating “blue carbon” research, vulnerability of existing carbon stocks to ecosystem degradation and associated risks and socio-economic considerations on “blue carbon”.

The training course provided participants with ample opportunities to share knowledge and best practices, allowing for comparison of research approaches and identification of context and problem similarities. It also facilitated the development of an informal young “blue carbon” professional networking platform that could constitute a good basis for future scientific collaborations.



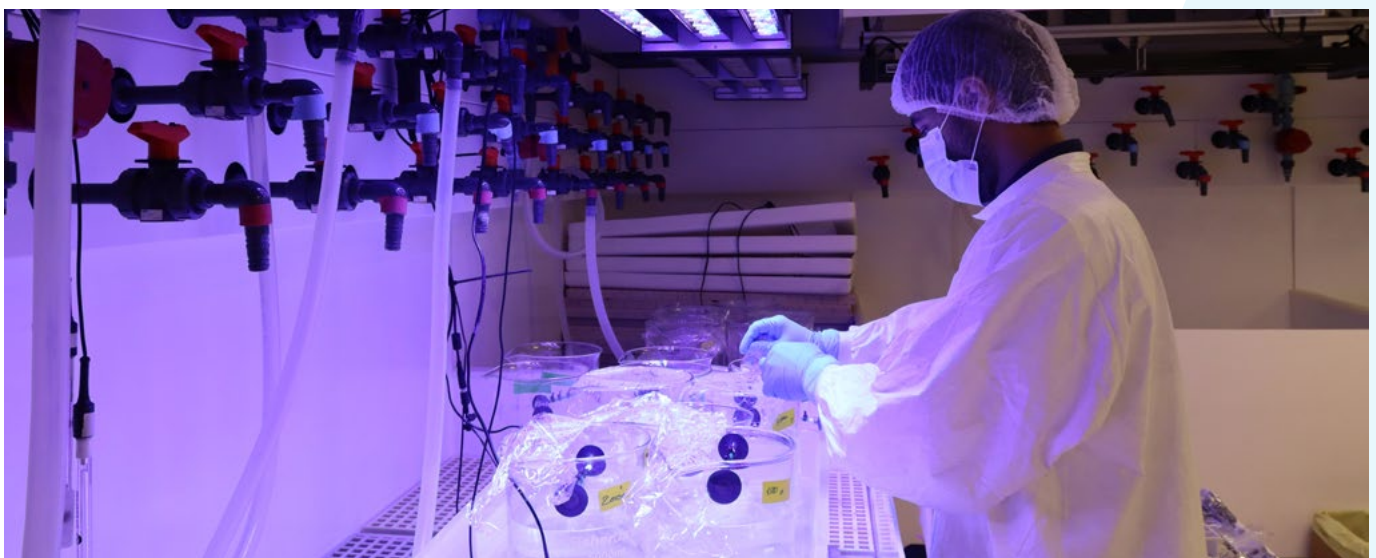


Ocean Alkalinity Enhancement (OAE) – a potential way to accelerate the ocean’s natural carbon sink

A massive amount of the carbon dioxide (CO₂) emitted through the combustion of fossil fuels and parallel deforestation dissolves into the ocean, leading to seawater acidification (lowering of its pH). The IAEA Marine Environment Laboratories in Monaco apply state-of-the-art technologies and research best practices to understand this phenomenon and its repercussions for marine life, vital ecosystems and human communities, and formulate appropriate, evidence-based adaptation and mitigation strategies.

While there are numerous initiatives to reduce greenhouse gases emissions, reaching the target of the Paris agreement will require the implementation of methods to remove CO₂ from the atmosphere. Ocean Alkalinity Enhancement (OAE) is an emerging area of research that seeks to enhance CO₂ capture by the ocean as well as increase the ocean’s buffering capacity. The term

alkalinity refers to a body of water’s ability to resist changes in pH. It is important to note that the ocean has a built-in buffering system due to the presence of carbonate ions. Carbonate ions bond with hydrogen ions in seawater, thereby preventing increases in seawater acidity. One of the ways to enhance the capture of CO₂ by the ocean in order to mitigate ocean acidification is to scatter alkaline material over coastal areas and the open ocean. Deployment of OAE will lead to complex and dynamic changes in seawater chemistry, with the risk of simultaneously dispersing other potential toxic compounds and impurities from the minerals. Currently, very little is known about the potential impact of OAE implementation on marine species and ecosystems; therefore, it is important to investigate the possible impacts of artificially increased alkalinity and associated trace elements on marine life.



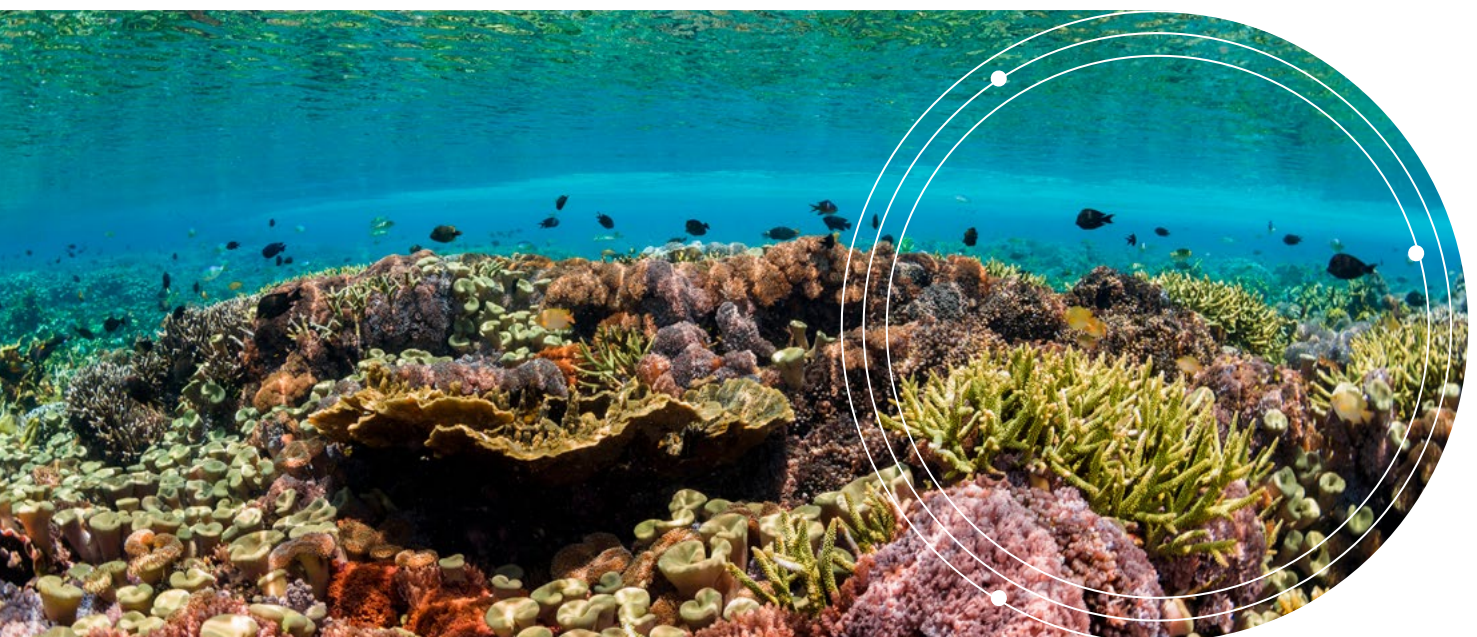


The Radioecology Laboratory (REL) uses radiotracers to research the effects of OAE on marine organisms. Radiotracers are isotopes of atoms; they contain more neutrons than normal, causing them to decay at a constant rate called half-life. For example, calcium 45 (Ca-45) can be readily absorbed by marine organisms that rely on calcium carbonate to form their structures (e.g., skeletons, shells). IAEA scientists quantify the amount of Ca-45 absorbed by calcifying organisms under different scenarios of OAE to evaluate its impact on their calcification.

Since 2023, the IAEA’s Radioecology Laboratory has been conducting research on key marine species such as sea urchins and corals to understand their response to OAE. In a first experiment, sea urchin larvae were exposed to a wide range of alkalinities relevant in the context of OAE. The results of the experiment revealed

that alkalinity did have a negative impact on their survival across the whole spectrum of alkalinity levels. In a second experiment, IAEA scientists used Ca-45 isotope radiotracers to measure coral calcification rates at different levels of seawater alkalinity; results are being currently compiled and will be published at a later date.

The IAEA will continue this type of research for the years to come. Understanding the importance and added value of wider cooperation in this particular research area, IAEA scientists joined forces with an international group of experts to develop a “[Guide to Best Practices in Ocean Alkalinity Enhancement Research](#)” that will be published by the end of 2023 in the journal *State of the Planet*. This knowledge will be incorporated in training courses specifically designed to respond to needs and priorities of IAEA Member States through various OA-ICC capacity building programmes.



OA-ICC Staff News



OLGA ANGHELICI, Associate Project Officer

Olga comes originally from the Republic of Moldova and joined the OA-ICC as Associate Project Officer on 1 April 2023. She is an experienced international development professional with a solid background in project management, external relations, partnerships and communications, acquired over years of United Nations assignments carried out in Vienna, Monaco and Geneva. Her career in the United Nations System started in 2011 and unfolded within specialized agencies such as IAEA, UNOPS, UNFPA and UNODC. She contributed to and led activities in various thematic areas including climate change and ocean acidification, public health and non-communicable diseases, gender mainstreaming and social policies, vocational education and lifelong learning.

Olga holds several academic degrees in international relations, public health, science communication, journalism, government and public administration, and has a special interest in sustainable development. Her personal interests include creative writing, guitar playing, and body & mind practices such as yoga and pilates.



FRANK GRABA, Intern

Frank comes from the USA and started his internship at the IAEA Marine Environment Laboratories on 1 September 2023. He will be working with the OA-ICC for a year, supporting the project's overarching activities in science, capacity building and communication. Some of his specific assignments with the OA-ICC relate to the development and maintenance of the OA-ICC bibliographic database, contribution to dissemination and outreach efforts and event implementation. Moreover, Frank will work alongside Radioecology Section researchers on ocean acidification-relevant experiments, applying and further enhancing his experimental and data management skills.

Prior to joining the OA-ICC, Frank was studying environmental science at the Georgia Tech University in Atlanta, USA. His academic background covered a range of ocean science topics, including ocean acidification, marine carbonate chemistry and thermohaline circulation, which inspired him to venture into the field and explore these in a hands-on manner. Outside of work, Frank enjoys going on hikes, playing volleyball, spending time with friends and trying new foods.



Upcoming events

GOOD-OARS-CLAP-COPAS International Summer School 2023,
6 – 12 November 2023, Coquimbo, Chile

Workshop on Communicating on Ocean Acidification,
13 – 24 November 2023, San Jose, Costa Rica

**Ocean acidification in the Persian Gulf, the Red Sea and the
Mediterranean: scaling down risks and scaling up solutions (on the
side-lines of the UNFCCC COP28),**
3 December 2023, Dubai, United Arab Emirates

**Final Research Coordination Meeting on Evaluating the Impacts of
Ocean Acidification on Seafood – A Global Approach,**
4 – 7 December 2023, IAEA Marine Environment Laboratories, Monaco



OA-ICC ONLINE RESOURCES

OA-ICC News Stream

<https://news-oceanacidification-icc.org/>

Recent publications, media coverage, events, jobs etc.

OA-ICC Website

<https://www.iaea.org/services/oa-icc>

Relevant information and resources for different audiences / languages

OA-ICC Bibliographic Database

<https://www.zotero.org/groups/2199752/oa-icc>

Over 10,000 references with citations, abstracts, and keywords

OA-ICC Data Compilation and Portal

<https://www.pangaea.de/?q=OA-ICC&f.project%5B%5D=OA-ICC>

Data sets on the biological response to ocean acidification: access to experimental data from more than 1,100 scientific papers on a user-friendly portal

