IAEA | Ocean Acidification International Coordination Centre

OA-ICC

**PROMOTING GLOBAL COOPERATION TO ADDRESS OCEAN CHANGE**

**JUNE – DECEMBER 2024**

# OA-ICC HIGHLIGHTS

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

**In this Issue:**

# Launch of New Technical Cooperation Project with Ocean Acidification Component

**June 2024**

A new IAEA Technical Cooperation Inter-regional project entitled *"Strengthening Ocean Health for Sustainable Development: A Global Approach using Isotopic and Nuclear Techniques"* (INT7022) commenced with its first coordination meeting held at the IAEA Marine Environment Laboratories in Monaco from 4-6 June 2024. This ambitious four-year project involves scientists from over 40 IAEA Member States and will address several environmental issues affecting ocean health, including blue carbon, harmful algal blooms, and ocean acidification. Participants planned training courses, fellowships, and coordination actions for the next four years.

**Additional Member States are welcome to join the project. For more information, please contact the OA-ICC project office.**

*Participants of the kick-off meeting of the new Technical Cooperation Inter-regional project. © Ellie McDonald, IAEA*

# Annual OA-ICC Expert Group Meeting

**3 September 2024**

The OA-ICC Expert Group convened online on 3 September 2024 to discuss recent progress and future directions for the Centre. The group reviewed an analysis of previous efforts and provided advice on new opportunities, including expanding OA-ICC activities to address ocean acidification in a multiple-stressor context and consider ocean-based solutions such as marine Carbon Dioxide Removal (mCDR). The group also discussed how to best respond to evolving needs of IAEA Member States and identify new collaborations and financial partnerships.

# Basic Training Workshop on Ocean Acidification

**9-13 September 2024, Monrovia, Liberia**

The OA-ICC held a basic training course on ocean acidification from 9 to 13 September 2024 in Monrovia, Liberia. The course was co-organised by the IAEA and the United Methodist University (UMU), with additional financial support from the Ocean Acidification Alliance.

The course brought together 17 participants, including early-career scientists, graduate students, technicians and managers, most of whom were new to the field of ocean acidification. The training emphasised gender and geographical diversity in OA research, with nine female and eight male participants from six countries: Angola, Gambia, Ghana, Liberia, Nigeria, and Togo. The OA-ICC identified West Africa as a priority region for ocean acidification capacity development based on a 2021 survey circulated within the OA-Africa network, a regional hub of the Global Ocean Acidification Observing Network (GOA-ON).

The goal of this basic-level training course was to enhance participants' expertise in conducting ocean acidification research using best practices and avoiding common pitfalls. It encouraged networking and collaboration among scientists working on ocean acidification in West Africa and shared opportunities for international collaboration and resources available for the ocean acidification community. The course covered the basics of seawater carbonate chemistry, hands-on exercises calculating carbonate system parameters with software, and lectures on the biological responses of marine organisms to ocean acidification. Participants also learned how biology can inform local monitoring efforts and experimental design for ocean acidification laboratory experiments.

During the opening ceremony, Dr. Emmanuel Yarkpawolo, Executive Director of the Environmental Protection Agency (EPA) of Liberia, stated: *"This training will empower our scientists and communities with the knowledge and resources needed to protect our marine ecosystems and ensure the sustainability of our ocean resources."*

On the final day, the Gulf of Guinea OA network was officially launched as a regional sub-hub to OA-Africa. The network released a Call for Action for increased engagement and concrete measures to mitigate and adapt to ocean acidification. Following the event, an OA Africa Network Steering Committee meeting was held on 12 September. The Committee discussed strategies to empower African Member States to address ocean acidification in regions where equipment and capacity to measure and study ocean acidification remains limited.

Dr. Yar-Donlah Gonway Gono, President of the UMU, highlighted the importance of the training and the new network: *"This course represents a crucial step forward in building the scientific capacity needed to tackle one of the most pressing environmental challenges facing our region. The launch of the Gulf of Guinea Ocean Acidification Network during this event will further solidify our commitment to regional cooperation in protecting our marine resources for future generations."*

*High-level representatives together with the students of the Basic Training Course on Ocean Acidification in Monrovia, Liberia, 9-13 September 2024. ©United Methodist University*

*Course participants work on regional ocean acidification research and action plans during the Basic Training Course on Ocean Acidification in Monrovia, Liberia, 9-13 September 2024. ©Lina Hansson, IAEA*

# Annual Meeting of the SCOR project Changing Ocean Biological Systems

**7-8 October, IAEA, Monaco**

Members of the SCOR project Changing Ocean Biological Systems (COBS) gathered at the IAEA Marine Environment Laboratories in Monaco from 7-8 October 2024 for their annual meeting. The group has developed best practices and tools, such as the MEDDLE guide, to plan meaningful multifactorial experiments in the laboratory to assess the impact of multiple stressors on marine organisms. They also conduct capacity-building activities to train scientists on using these resources. However, fundamental concepts for conducting multi-stressor experiments have yet to be widely adopted by the broader scientific community.

During the meeting, the group discussed plans to incorporate emerging concepts related to multiple stressors, including combining local and global stressors and integrating short-term variability with long-term evolutionary aspects. They also developed a plan to improve the communication of multiple-stressor science, from scientific capacity development to high-level policy, to increase the global uptake of key concepts.

The working group brings together experts from Chile, China, Germany, India, New Zealand, Sweden, the UK, and the US. The meeting was co-supported by SCOR and the IAEA OA-ICC. Many of the resources, including MEDDLE, are regularly used during OA-ICC capacity-building activities.

*Members of the SCOR project Changing Ocean Biological Systems (COBS) at their annual meeting at the IAEA Marine Environment Laboratories in Monaco, 7-8 October 2024. ©Ellie McDonald, IAEA*

# International Workshop on the Socio-Economic Impacts of Multiple Stressors

**9-11 October, Lycée Rainier III, Monaco**

In October 2024, the Scientific Centre of Monaco and the IAEA Marine Environment Laboratories organised the Sixth International Workshop on Bridging the Gap Between Ocean Acidification Impacts and Economic Valuation: An Interdisciplinary Approach to Address Multiple Ocean Stressors. The workshop convened an interdisciplinary group of 26 experts from 12 countries, equally representing the Global South and North.

The workshop addressed various environmental stressors affecting coastal marine ecosystems and their compounding impacts on ecosystem services. The overarching goal was to explore the complex interactions between local stressors (pollution, non-indigenous species, plastics, eutrophication) and global stressors (ocean warming, ocean acidification). These stressors often occur simultaneously, intensifying their impacts on biodiversity, ecosystem services, and human health.

Examining the connections between these multiple stressors provides insights into the economic and societal costs of inaction and potential solutions to address them. Participants formed four working groups to discuss key local stressors in the context of co-occurring global stressors driven by greenhouse gas emissions. The groups identified evidence-based solutions and formulated policy recommendations reflecting the need for an integrated approach to achieve ocean sustainability.

HSH Prince Albert II of Monaco, who attended the concluding session, highlighted in his closing address: *"To understand and address these mechanisms, we need to adopt an interdisciplinary approach. We need to combine the insights of natural science with those of humanities because the phenomena at work find their source in the conjunction of the two. And we must also think using the tools of economics and political science, because it is in these directions that the solutions we need to develop can also be found ".*

The main findings of the workshop are summarized in a Summary for Policymakers.


*HSH Prince Albert II of Monaco addressing the audience during the closing session of the 6th International Workshop Bridging the Gap Between Ocean Acidification Impacts and Economic Valuation, Lycée Rainier III, Monaco, 9-11 October 2024. ©Centre Scientifique de Monaco*

*Participants of the breakout working group on pollution during the 6th International Workshop Bridging the Gap Between Ocean Acidification Impacts and Economic Valuation, Lycée Rainier III, Monaco, 9-11 October 2024. ©Lina Hansson, IAEA*

# IAEA and Prince Albert II of Monaco Foundation Strengthen Long-Term Partnership on Ocean Acidification

A new partnership formalising a long-standing collaboration between the IAEA Marine Environment Laboratories and the Prince Albert II of Monaco Foundation was signed on October 3, 2024. The agreement was signed by the Foundation's Vice President and CEO, Olivier Wenden, and IAEA Deputy Director General (DDG) Najat Mokhtar at the Foundation's headquarters. The partnership focuses on ocean acidification and ocean-based solutions to climate change under the framework of the IAEA OA-ICC and the Foundation's initiative "Ocean Acidification and other Ocean Changes – Impacts and Solutions" (OACIS).

Established in 2006, the Prince Albert II of Monaco Foundation (PA2F) aims to protect the environment and promote sustainable development. Ocean acidification has been a key focus of the PA2F since 2013, when the OACIS initiative was launched. OACIS brings together major organizations working on ocean acidification based in the Principality of Monaco, including the Monaco Government, the Oceanographic Museum, the Scientific Centre of Monaco, and the IAEA Marine Environment Laboratories, as well as the Villefranche Oceanographic Laboratory (French National Centre for Scientific Research (CNRS) /Sorbonne Universités), IDDRI, and the International Union for Conservation of Nature.

*"Ocean acidification is a global problem, but how its effects play out depend on local factors,"* said Wenden. *"Ocean acidification will hit harder in many regions of the world which do not necessarily have the resources or the capacity to monitor and to adapt. We are thrilled to be teaming up with the IAEA Marine Environment Laboratories to help bring knowledge and capacity to study ocean acidification to scientists across the globe".*

Mokhtar said: *"The IAEA is delighted and proud to formalise its long-lasting collaboration with the Prince Albert II of Monaco Foundation, a key player in marine conservation both in Monaco and internationally, with whom we share the same values and interests. We are excited to continue working together to ensure that the scientific data and information needed to take action on ocean acidification are available, and to amplify our impact together, enabling lasting progress for IAEA Member States."*

Under the new partnership, the IAEA and PA2F will co-organise training courses and expert meetings to empower countries to study and act on ocean acidification, ensuring that research in this field is inclusive and participatory. They also plan to organise joint events to raise awareness about the latest research on ocean acidification and ocean-based solutions among policymakers, resource managers, and other stakeholders at key ocean gatherings, such as the annual Monaco Ocean Week and the United Nations Ocean Conference and related events to be held in Nice and Monaco in June 2025.

As part of their joint activities, the two partners organised an international Winter School on Ocean Acidification and Multiple Stressors for researchers new to the field, which took place at the IAEA Marine Environment Laboratories in Monaco from 18-29 November 2024.

*Foundation Vice President and CEO, Olivier Wenden, and IAEA Deputy Director General, Najat Mokhtar, at the headquarters of the Foundation on 3 October 2024. © Ludovic Arneodo, PA2F.*

*CEO Olivier Wenden, IAEA DDG Najat Mokhtar, IAEA Marine Environmental Laboratories Director Florence Descroix Comanducci, Lina Hansson, Jean-Pierre Cayol, and Noura El-Haj on the steps of the Prince Albert II of Monaco Foundation, 3 October 2024, Monaco. © Ludovic Arneodo, PA2F.*

# Ocean Acidification Capacity Development Workshop

**UNESCO, Paris**

Following an initial workshop held at the IAEA Marine Environment Laboratories in Monaco in March 2024, the Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO) hosted a follow-up workshop in Paris from 15-17 October 2024. The two workshops brought together 24 participants, including scientists, trainees, and programme managers, each actively engaged in different types of capacity-building efforts on ocean acidification and representing diverse regions and expertise. The workshops aimed to coordinate global capacity-sharing efforts on ocean acidification among key players, ensuring complementarity, avoiding duplication, maximising available resources, and addressing gaps. The group also identified opportunities for collaboration and agreed on a common set of metrics to evaluate the success of efforts.

At the workshops, the group agreed on three overall objectives for international ocean acidification capacity-sharing activities:

**1. Exposure**: Countries have the human and technical capabilities to measure ocean acidification and report to the Sustainable Development Goal 14.3.1 indicator.

**2. Impact:** Countries have the local knowledge and technical and human capacity to project biological impacts based on observational and experimental studies.

**3. Adaptation/Mitigation:** Countries have a good understanding of existing and emerging solutions, data needs, and co-design principles.

The group is currently working on a white paper detailing the metrics developed, which will be made available to the community in the coming months.

*Participants of the Ocean Acidification Capacity Development Workshop, October 2024, IOC-UNESCO, Paris. © IOC-UNESCO.*

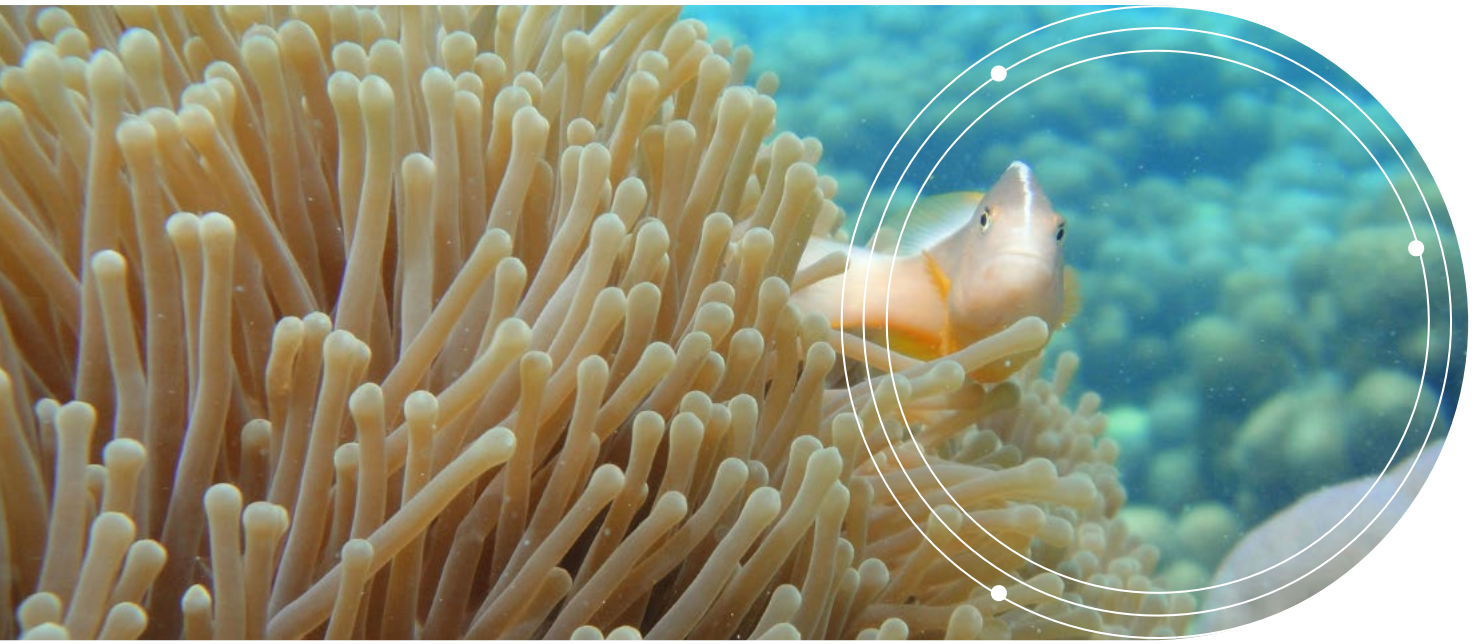
# 2nd Winter School on Ocean Acidification and Multiple Stressors

**18-29 November 2024, IAEA, Monaco**

Marine organisms and ecosystems are exposed to an array of global and local environmental pressures, such as overfishing, pollution, climate change, and ocean acidification, which could lead to compounded impacts. However, information on the combined impacts of these stressors is largely lacking, and existing studies are often inadequately designed or apply key concepts inaccurately.

The *Second Winter School on Ocean Acidification and Multiple Stressors* took place at the IAEA Marine Environment Laboratories in Monaco from 18-29 November 2024, with 12 participants from 11 countries (Argentina, Bangladesh, Costa Rica, Croatia, Ghana, Italy, Namibia, Nigeria, Malaysia, Philippines, Portugal).

The programme included lectures on key concepts relevant for multiple-driver research, such as the difference between a driver and a stressor and the definition of synergistic, antagonistic, and additive effects of stressors. The course focused on laboratory experiments to understand the individual impacts of ocean acidification, temperature, and lithium pollution on the calcification of the coral *Stylophora pistillata*, using the radiotracer $^{45}Ca$. The results of the single-stressor experiments were used to model the combined effects of the three stressors and develop an experimental design to test this model. The goal is for the group to collaborate after the course to write a joint publication with the results.



*IAEA scientist Francois Oberhaensli showcases aquabenches, which can recreate various aquatic environments, at the IAEA Marine Environment Laboratories. © Lina Hansson, IAEA*

Participants also visited the Oceanography Laboratory of Villefranche-sur-Mer for practical exercises on measuring and manipulating pH and total alkalinity in the lab for experimental purposes and calculating the full set of carbonate chemistry parameters using the software seacarb.

Sam Dupont, Senior Lecturer at Gothenburg University and IAEA OA-ICC consultant, said:

*"Entering the complex field of multiple stressors can be intimidating. This course is designed to provide each participant with the tools and a strategy to perform multiple-stressor research based on their needs and opportunities."*

At the end of the course, participants worked on designing a multiple-driver experiment relevant to the local context and key issues faced in their countries.

Maria del Mar Eivers, a participant from Argentina, said: *"The Winter School created the perfect environment for us to improve our understanding on how to address the challenge of multiple-stressors research. Being able to interact with professionals with vast experience in this field and learn about cutting-edge techniques was priceless. Plus, it was beyond enriching to bond with colleagues from all over the world, sharing our knowledge with each other and hopefully setting the base for future cooperation."*

The course was based on resources and tools developed by the SCOR COBS Working Group on multiple stressors, such as the MEDDLE simulator, which allows users to perform virtual multiple-stressors experiments.

The Winter School was the second edition in a series of trainings that the OA-ICC plans to organise annually in November in Monaco. The series is co-organised by the IAEA OA-ICC and the Prince Albert II of Monaco Foundation under the Foundation's OACIS initiative and in partnership with the Oceanography Laboratory of Villefranche-sur-mer.

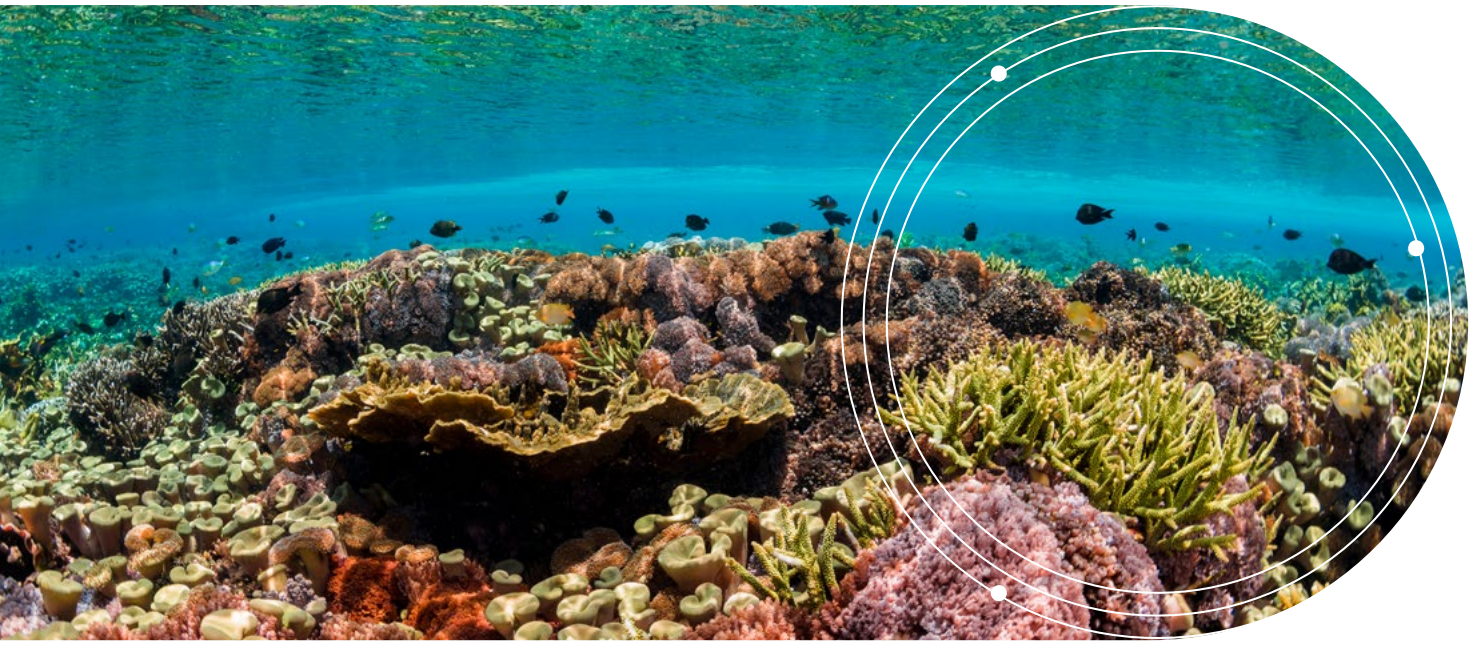
*A participant in the Winter School on Ocean Acidification and Multiple Stressors, which took place from 18-29 of November 2024, uses seacarb to calculate carbonate chemistry parameters. © Lina Hansson, IAEA*

# 4th edition of OA Week

**18-22 November 2024**

The Global Ocean Acidification Observing Network (GOA-ON) organised the 4th edition of Ocean Acidification Week (OA Week) from 18 to 22 November 2024. This virtual forum began in 2020 during the COVID-19 pandemic, when in-person events and conferences were postponed. Following the successful in-person Symposium on the Ocean in a High $CO_2$ World in 2022, OA Week has continued annually to maintain momentum around ocean acidification research and provide a virtual platform for the ocean acidification community to exchange their latest findings.

The 4th edition of OA Week highlighted the ocean acidification knowledge we need to restore humanity's relationship with the ocean. The week featured presentations from the GOA-ON Regional Hubs on the latest scientific studies in their networks, as well as community discussions and sessions on ocean acidification topics identified by GOA-ON members. In total, OA Week hosted 77 virtual presentations across 19 sessions and attracted over 770 attendees. The OA-ICC participated in this event through a presentation by Lina Hansson, Associate Project Officer, on the OA-ICC Capacity Building Programme in Africa during the OA-Africa session. Recordings of all presentations from OA Week are available on the GOA-ON web site.



# OA-ICC at COP29

**11-22 November 2024, Baku, Azerbaijan**

The OA-ICC, represented by Jana Friedrich, Head of the IAEA Radioecology Laboratory, participated in three side events during COP19 in Baku, Azerbaijan:

» "Adaptation to a Rapidly Changing Ocean: Opportunities for Timely, Effective and Equitable Solutions at the Local & Regional Scale," Commonwealth Pavilion, 15 November, organised by the Commonwealth Blue Charter and Plymouth Marine Laboratory.

» "Climate-Ocean Change and Food Security," Commonwealth Pavilion, 15 November, organised by the Ocean Acidification Alliance and the Commonwealth Blue Charter.

» "Striving for Ambitious Ocean-Based Action: How UN-Oceans Can Support Member States in Scaling Up Ocean-Related Actions," 16 November, organized by UN-Oceans.

During the UN Ocean side event, Jana Friedrich and Prof. Nayerah Shaltout from the National Institute of Oceanography and Fisheries in Egypt discussed capacity-building efforts to research ocean acidification impacts and solutions in Africa. The discussion highlighted success stories and lessons learned from a decade of ocean acidification capacity-building efforts by the OA-ICC and outlined next steps crucial to achieving Sustainable Development Goal Target 14.3, which aims to minimise and address the impacts of ocean acidification.

*Speakers of the side event "Adaptation to a Rapidly Changing Ocean: Opportunities for Timely, Effective and Equitable Solutions at the Local & Regional Scale," in the Commonwealth Pavilion on 15 November. © Thecla Keizer, Plymouth Marine Laboratory.*


*Jana Friedrich and Nayerah Shaltout discussing ocean acidification capacity-building in Africa during the UN Ocean side event: "Striving for Ambitious Ocean-Based Action: How UN-Oceans Can Support Member States in Scaling Up Ocean-Related Actions," on 16 November. © Jessie Turner, Ocean Acidification Alliance.*

# New publications and resources

» Dupont S., Edworthy C., Sanchez-Noguera C., Metian M., Friedrich J., Flickinger S., Bantelman A., Galdino C., Graba F., Anghelici O. & Hansson L., 2024. The IAEA ocean acidification international coordination centre capacity building program: empowering member states to address and minimize the impacts of ocean acidification. Oceanography 38(1): 26-0. https://doi.org/10.5670/oceanog.2025.102

» Yang Y., Brockmann P., Galdino C., Schindler U. & Gazeau F., 2024. An update of data compilation on the biological response to ocean acidification and overview of the OA-ICC data portal. Earth System Science Data 16: 3771–3780. https://essd.copernicus.org/articles/16/3771/2024/.

» The first edition of the Practical Best Practices for Ocean Acidification Monitoring is now available online! The website includes more than 20 streamlined protocols for measuring key chemical parameters, such as total alkalinity and pH, as well as guidelines for lab safety, field sampling, datasheet templates, and more. While detailed technical guidelines for seawater carbonate chemistry measurements and ocean acidification research exist, this practical, hands-on version is intended as an accessible resource for scientists new to ocean acidification research, particularly users of the GOA-ON in a Box monitoring kit.

Future editions of the “Practical Best Practices” guide will include protocols and methods to study the effects of ocean acidification on marine organisms, as well as a decision tree to help users identify the most appropriate, fir-for-purpose, techniques and methodologies for their research questions.

Coordination support for this work was provided by The Ocean Foundation, the IAEA OA-ICC, and the NOAA Ocean Acidification Program, with two in-person coordinating meetings in 2019 and 2024 hosted by the IAEA OA-ICC.

# OA-ICC Staff News

## WELCOME TO COURTNEY WITKOWSKI, OA-ICC Associate Research Scientist

Courtney joined the OA-ICC in November 2024 as an Associate Research Scientist. She holds a Master of Environmental Science and Management degree with a specialisation in coastal and marine resources management from the University of California, Santa Barbara.

Courtney spent the last three and a half years with the National Oceanic and Atmospheric Administration's Ocean Acidification Program. As the executive secretary of the U.S. Interagency Working Group on Ocean Acidification, she facilitated strategic coordination among federal agencies on ocean acidification actions to implement national priorities. She also led the writing and publication of the U.S. Ocean Acidification Action Plan and the first national U.S. Ocean Acidification Vulnerability Assessment.

In her new role, Courtney will facilitate international collaboration on ocean acidification science as a member of the Global Ocean Acidification Observing Network's executive secretariat. She will also support OA-ICC training activities and resources and contribute to ocean acidification policy discussions at the international level. Courtney is excited to continue working with the ocean acidification community in this new role and looks forward to connecting with new international partners.

# Upcoming events

## Annual OA-ICC Expert Group Meeting

3 April 2025, Monaco (online)

## Training Course on Ocean Alkalinity Enhancement — Assessing the Impacts on Marine Organisms

7–11 April 2025, IAEA Marine Environment Laboratories, Monaco

## Presentations and side events at the One Ocean Science Conference and the UN Ocean Conference

3-13 June 2025, Nice, France

## Basic Training Course on Ocean Acidification for Caribbean SIDS

Venue and timing to be confirmed

## Cooperation meeting: 2nd GOOD-OARS Summer School

4-11 November 2025, Malaysia

## Third Winter School on Ocean Acidification and Multiple Stressors

24 November – 5 December 2025, 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 10,900 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 1,600 scientific papers in a user-friendly portal

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