



Ocean Acidification  
International  
Coordination Centre

OA-ICC

PROMOTING GLOBAL COOPERATION  
TO ADDRESS OCEAN CHANGE

OCTOBER 2023 – MAY 2024

The cover image is a composite of several elements. At the top, there's a light blue background with a white, bubbly graphic on the right. Below this, a large circular graphic is divided into two main sections. The upper section shows a cross-section of the ocean with a brownish, turbid surface layer and a blue layer below. A silhouette of a crab is visible in the blue layer. The lower section shows a deep blue underwater scene with a large shark silhouette swimming towards the left, surrounded by smaller fish and coral. The overall design uses a color palette of blues, browns, and whites.

# OA-ICC HIGHLIGHTS

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

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Last fall, the ocean acidification community came together for the 4th edition of Ocean Acidification Week (OA Week). This virtual symposium, organized by the Global Ocean Acidification Observing Network (GOA-ON), provided a dynamic forum for the ocean acidification community to share the latest research findings and galvanize collective action in the face of this pressing environmental challenge.

From 30 October to 3 November 2023, OA Week hosted 94 virtual presentations across 22 sessions and attracted over 750 attendees. The sessions covered a breadth of OA-related topics, which highlighted the four goals of OA Week:

1. Engage the OA and broader oceanographic communities, raise awareness on OA, and bring attention to global OA monitoring, research, capacity building, and education efforts.
2. Share GOA-ON's three [high-level goals](#).
3. Raise awareness and create a community around OA research to support the UN Ocean Decade Endorsed Programme OARS ([Ocean Acidification Research for Sustainability](#)) in its implementation phase.
4. Engage early career ocean professionals through [ICONEC](#) (the International Carbon Ocean Network for Early Career).

The OA-ICC participated in this event through several sessions.

Sam Dupont (consultant IAEA OA-ICC) co-moderated a session on the Biological Impacts of OA, which provided new insights on strategies in support of measuring impacts of ocean acidification on organisms and ecosystems. During the session, Marc Metian (Research Scientist, IAEA Radioecology Laboratory) presented the results of recent experimental work on Ocean Alkalinity Enhancement (OAE) impacts on organisms. The recording is available here: [OA Week 2023 - Biological Impacts and OARS Outcome 4 \(youtube.com\)](#). During the Regional Capacity Session: "Building Carbonate Chemistry Measurement Capacity to Enable Effective OA Research", Dupont presented an overview of the OA-ICC Capacity Building program in Africa. The recording of the session is available here: [OA Week 2023 - Regional Capacity \(youtube.com\)](#).

As part of a session on the "Socio-economic Impacts of Ocean Acidification", Olga Anghelici (Associate Project Officer, IAEA OA-ICC) gave a presentation titled "How the IAEA, through the OA-ICC and otherwise, addresses the broader socio-economic impacts of ocean acidification" while Dupont discussed impacts of ocean acidification on human health. A recording of the session is available here: [OA Week 2023 - Socio-economic Impacts of Ocean Acidification \(youtube.com\)](#).



# GOOD-OARS-CLAP-COPAS International Summer School 2023

6-12 November 2023, Coquimbo, Chile

The 2nd edition of the GOOD-OARS-CLAP-COPAS\* Summer School took place from 6-12 November 2023 in Coquimbo, Chile, to teach the latest science of ocean acidification and deoxygenation. The Summer School was organized by UNESCO's Intergovernmental Oceanographic Commission (IOC/UNESCO), El Centro de Estudios Avanzados en Zonas Áridas (CEAZA) and the Universidad Católica del Norte, in cooperation with the IAEA OA-ICC, as well as many other partners and sponsors.



*Students, organisers, and lecturers of the GOOD-OARS-CLAP-COPAS Summer School 2023 on the Coquimbo campus of UCN. Photo courtesy of Kirsten Isensee*

The Summer School was conceptualized by the Global Ocean Oxygen Network (GO2NE) and the Global Ocean Acidification Observing Network (GOA-ON), to provide a global and multidisciplinary overview of deoxygenation and ocean acidification, enhancing understanding of their complexities and

cumulative impacts. The two related UN Decade of Ocean Science for Sustainable Development programmes, the Global Ocean Oxygen Decade (GOOD) and the Ocean Acidification Research for Sustainability (OARS), were also involved in the development of the summer school.



*Students taking seawater samples during the GOOD-OARS-CLAP-COPAS Summer School 2023.*

The summer school provided an opportunity for 33 young researchers from 17 countries to meet more than 15 world experts to learn more about OA and deoxygenation, through presentations and practical sessions on modelling, laboratory experiments, shipboard measurements and analysis, communication and an introduction to ethics in science. The programme closed with a stakeholder day, where students and teachers visited offshore sea scallop aquaculture platforms in Tongoy Bay and interacted with local stakeholders.

The next edition of the GOOD-OARS summer school is provisionally planned for 2025.

\*GOOD (Global Ocean Oxygen Decade), OARS (Ocean Acidification Research for Sustainability), CLAP (research programme for Climate Action Planning) and COPAS (Centro de investigación Oceanográfica en el Pacífico Sur-Oriental)



# Workshop on Communicating Ocean Acidification

13-24 November 2023, San José, Costa Rica

Quality data and information on ocean acidification is needed if we want to address and minimize its impact, but it is crucial that the science is communicated to all stakeholders, including policy makers, industry leaders, and the public, so that they understand and can act on the issue. Scientists have a key role to play in communicating their work to a broader audience.

From 13-24 November 2023, the OA-ICC organized a training workshop on communicating ocean acidification, hosted by the University of Costa Rica. Ten mid-career ocean acidification researchers from 10 countries (Argentina, Brazil, Greece, Malaysia, Panama, Peru, Philippines, Portugal, South Africa and the United Kingdom) gathered in San José, Costa Rica. Over two weeks, participants interacted with local (Celeste Sánchez Noguera, University of Costa Rica; Pablo Muñoz Cambronero, Organization for Tropical Studies) and international lecturers (Jessie Turner and Juliana Corrales, OA Alliance; Sam Dupont, OA-ICC). They also had the opportunity to work and discuss with key stakeholders including journalists

(Irene Maria Rodríguez Salas, La Nación), policy makers (Mariamalia Jiménez Coto, Ministry of Foreign Affairs, Costa Rica), and NGOs (Haydée Rodríguez Romero and Marco Quesada Alpízar, Conservation International).

Throughout the workshop, participants discussed key aspects to consider when designing and communicating the science of ocean acidification. They were encouraged to apply their scientific thinking when communicating about their work, defining clear goals, identifying key actors needed, key message and method. As part of the workshop, the participants designed an ocean acidification educational activity at an "Art-in-the-City" event in San José, engaging around 50 local citizens to commit to taking action to protect the ocean. They also designed 8 different communication activities for high school students that were tested at a local school. The diversity of expertise and experience of the participants and trainers was an asset to the development of a new ocean acidification communication framework, considering key aspects such as accountability, regional differences and ethics.



Workshop participants and lecturers



Trainees put theory into practice at a local art event in San José, engaging with citizens.



# Final Research Coordination Meeting “Evaluating the Impacts of Ocean Acidification on Seafood – A Global Approach”

4-7 December 2023, IAEA Marine Environment Laboratories, Monaco

In December 2023 the OA-ICC hosted the final meeting of the IAEA Coordinated Research Project (CRP) “*Evaluating the Impacts of Ocean Acidification on Seafood – A Global Approach*” at the IAEA’s Marine Environment Laboratories in Monaco. The CRP brought together scientists from 17 IAEA Member States (Argentina, Bahamas, Brazil, Costa Rica, Cuba, Ecuador, Egypt, France, Kenya, Lebanon, Mexico, Morocco, New Zealand, Sweden, Thailand, Türkiye and USA) to study the impact of ocean acidification on locally and economically relevant seafood species in their respective countries. The framework for the CRP was first developed in Kristineberg, Sweden, in 2019 when the participating scientists met to

discuss the experimental design of the project, including common parameters to be assessed by all participants (carbonate chemistry, survival, growth etc.). Additional measurements, using more advanced techniques such as nuclear and isotopic tracing, calcification and respiration measurements were also considered, depending on the capacity and equipment available in each country. The experimental design included exposure to future OA conditions for six months, before switching to a higher pH environment to attempt to repair any damage caused by exposure to acidified seawater.

The project was impacted by quite a few challenges related to the pandemic (supply chain disruptions, lab closures, lockdowns, etc). Despite this, the participants devised creative side projects; e.g. a survey on social media to gauge public understanding of ocean acidification and its impacts, released in the different participating countries.

The CRP has already resulted in the publication of three scientific articles, and it is expected that more than 10 papers will be produced in total. Throughout the project, participating scientists shared their knowledge and skills with colleagues in their respective countries, allowing the benefits of the CRP to have greater impact beyond the core group of participating scientists.



CRP participants meet in Monaco to discuss the results of their research.



# OA-ICC at COP28

30 November – 12 December 2023, Dubai, UAE

*Speakers at the OA-ICC event at COP28: Montaha Behbehani, Kuwait Institute for Scientific Research (KISR), Nathalie Hilmi, Scientific Centre of Monaco (CSM), Jessie Turner, International Alliance to Combat Ocean Acidification (OA Alliance), Steve Widdicombe, Plymouth Marine Laboratory (PML) and Lina Hansson, Prince Albert II of Monaco Foundation (FPA2).*



## SIDE EVENT

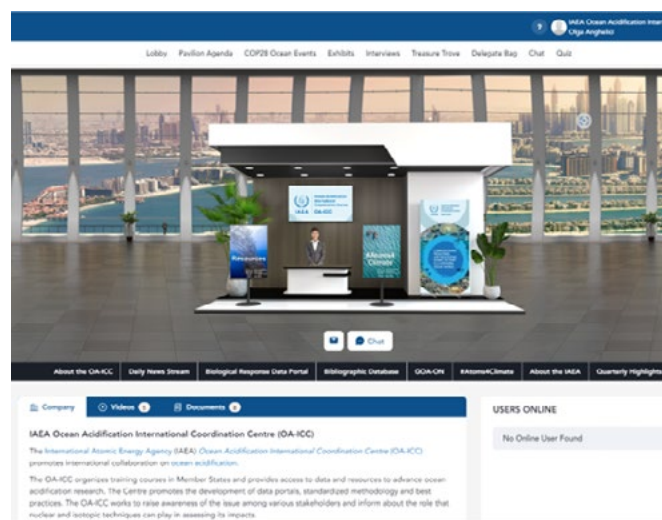
The IAEA OA-ICC was present at the 2023 UNFCCC Climate Conference (COP28) in Dubai, UAE, where it held an engaging side event on ocean acidification impacts and solutions, focusing on the Persian Gulf, the Red Sea and the Mediterranean. The side event highlighted success stories and lessons learned, emphasized current and projected challenges to marine food chains, human sustenance, economic activities and seafood security, and discussed sustainable pathways for effective adaptation and mitigation solutions.

The coral reefs of the Persian Gulf, the Red Sea and the Mediterranean Sea provide countless ecosystem services for millions of inhabitants of coastal areas, but they are threatened by climate change and ocean acidification. Since 2012, the IAEA's OA-ICC has successfully collaborated with scientific communities and governance structures in the region to address ocean acidification and related stressors.

## VIRTUAL BOOTH

The OA-ICC also joined the 2023 Virtual Ocean Pavilion running on the sidelines of the UNFCCC COP28. The COP28 Virtual Ocean Pavilion was dedicated to showcasing why the ocean matters in climate negotiations and to all life on our planet. It aimed to increase knowledge, commitment, and action for the ocean-climate nexus for a broad array of stakeholders. The OA-ICC exhibition booth, located under the Exhibit Hall area of the

pavilion and accessed free of charge, offered visitors information on the OA-ICC and its main activities and services to Member States in its three areas of focus: science, capacity building and communication. It emphasized the role that the IAEA plays in ocean acidification research through the use of nuclear tools and technology and its leadership in coordinated global action on OA. The booth highlighted the numerous resources offered by the OA-ICC (news stream, bibliographic database, data compilation on the biological response to ocean acidification), publications, videos as well as links to other relevant information platforms offered by OA-ICC partners. The OA-ICC virtual exhibition booth also facilitated interactive exchanges between visitors and project staff through a dedicated Chat section.





# OA-ICC at Monaco Ocean Week

19 - 22 March 2024

The OA-ICC organized several events during the 2024 edition of Monaco Ocean Week, a week devoted to the ocean held every year in Monaco, attracting more than 1000 ocean practitioners.

## 19 MARCH: Marine carbon dioxide removal: from blue carbon to ocean alkalinity enhancement

On the second day of Monaco Ocean Week, this half day event delving into the hot topic of potential ocean-based approaches to help address OA and climate change drew a full house. During two panel discussions, moderated by a journalist, experts from science, economy, conservation, policy and business debated the potential benefits and challenges of ocean-based measures to combat climate change and ocean acidification, with a special focus on protecting and restoring blue carbon ecosystems (a nature-based approach) and ocean alkalinity enhancement (a technological approach).

Olivier Wenden, Vice President & Chief Executive Officer, Prince Albert II of Monaco Foundation, and Florence Descroix-Comanducci, Director, IAEA Marine Environment Laboratories provided opening remarks, followed by a high-level keynote speech by Mahlet Naomi Mesfin, Deputy Assistant

Secretary for Ocean, Fisheries and Polar Affairs, US Department of State's Bureau of Oceans and International Environmental and Scientific Affairs. Jean-Pierre Gattuso, Research Director, CNRS-Sorbonne University- IDDRI set the stage before the panels with an overview of ocean-based solutions. The event was closed by Chrystel Chanteloube, Head of Division & National Focal Point to UNFCCC, Ministry of Foreign Affairs and Cooperation, Monaco Government.

The event was co-organized by the Prince Albert II of Monaco Foundation (FPA2), the IAEA OA-ICC, the Scientific Centre of Monaco, the Monaco Oceanographic Institute, the Monaco Government, CNRS, IDDRI and IUCN in the framework of the [OACIS initiative](#). It was co-sponsored by the OA-ICC and FPA2.

The session is available online here:

[Marine carbon dioxide removal: From blue carbon to ocean alkalinity enhancement \(youtube.com\)](#)



**Panel 1:** "Role of blue carbon in climate mitigation and adaptation". Moderator Genie Godula, journalist with France24 and panelists (from left to right): Michel Kaine, Founder & CEO, Grogenics, Phillip Williamson, Honorary Associate Professor, University of East Anglia, Nathalie Hilmi, Section Head, Environmental Economics, Scientific Centre of Monaco, Jana Friedrich, Section Head, Radioecology Laboratory, IAEA Marine Environment Laboratories and Minna Epps, Director, Global Marine and Polar Programme, IUCN.



**Panel 2:** "Ocean Alkalinity Enhancement - can it work and what are the consequences?" Moderator Genie Godula and panelists (from left to right): Alexandra Deprez, Research Fellow, International climate governance, IDDRI, Douglas Wallace, Professor, Department of Oceanography, Dalhousie University, Robert Steenkamp, Chair of International Law of the Sea and International Environmental Law, University of Hamburg and GEOMAR Helmholtz Centre for Ocean Research Kiel, Nicolas Sdez, CEO & Co-founder, PRONoe and Daniela Basso, Full Professor, Dept. of Earth and Environmental Sciences, University Milano-Bicocca.



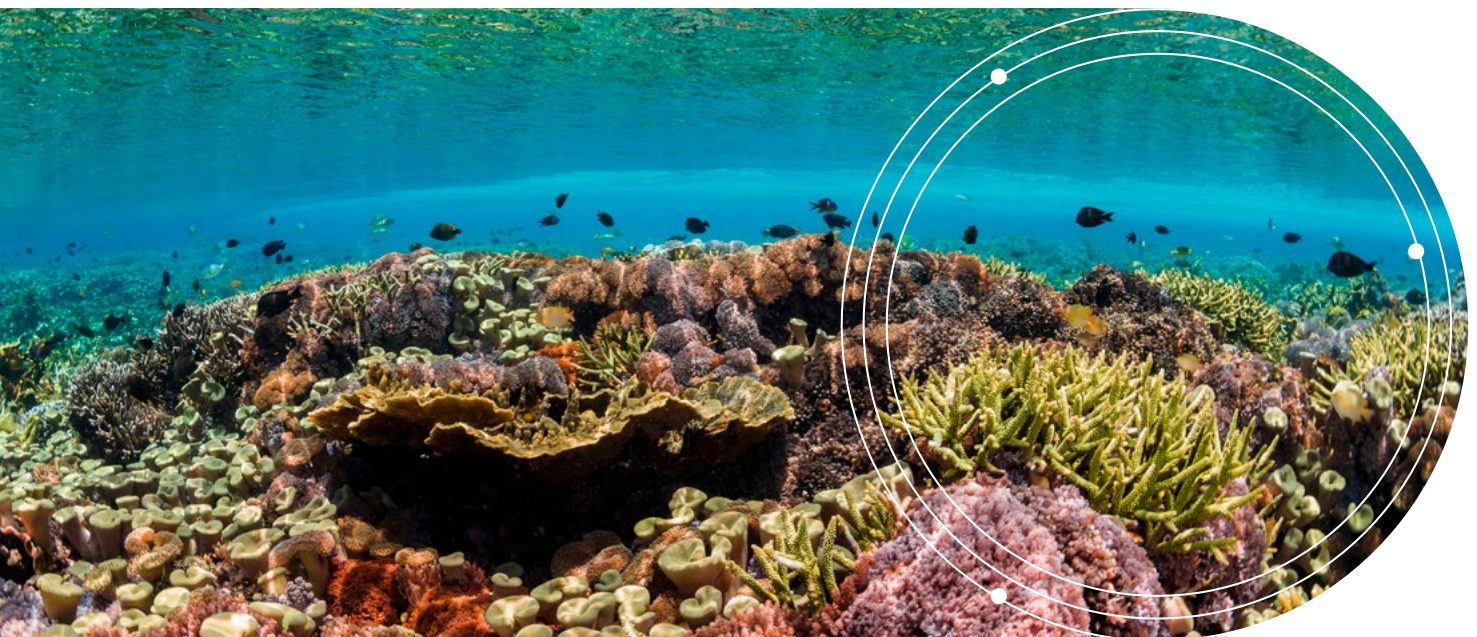
### 18-20 MARCH: Workshop on Methodology for Capacity Building

The OA-ICC hosted a group of experts for a Workshop on Methodology for Capacity Building in Monaco from 18 – 20 March during Monaco Ocean Week. Major international players in OA capacity building from IOC-UNESCO, Prince Albert II of Monaco Foundation, NIWA, Plymouth Marine Laboratory, NOAA, GOA-ON, and The Ocean Foundation attended. The meeting led to fruitful discussion on past, present, and future capacity building activities to better coordinate and align efforts in the future.

The goal of the meeting was to collaborate on future events and improve existing methodology

to reinforce and optimize global capacity to offer high-quality training on ocean acidification. The participants reflected on past capacity building efforts to understand the successes and downfalls of previous trainings; and discuss how these insights can be used to better plan for the future.

The working group will continue to survey the methods being used to carry out capacity building as well as evaluate existing data to analyse previous efforts. Overall, the meeting created a better understanding of what resources we have and what can be analysed to better improve capacity building. The meeting also produced a better understanding of the strengths and weaknesses of each participating organization in terms of their limiting factors.







Workshop participants, including Christopher Sabine (University of Hawaii), Melissa Melendez (University of Hawaii), Katherina Schoo (IOC-UNESCO), Lina Hansson (Fondation Prince Albert II de Monaco), Olga Anghelici (IAEA), Sarah Flickinger (IAEA), Kim Currie (NIWA), Stephen Paton (Smithsonian Tropical Research Institute), Abed El Rahman Hassoun (GEOMAR), Frank Graba (IAEA), Sam Dupont (University of Gothenburg/IAEA), Damboa Cossa (Eduardo Mondlane University), Carolina Galdino (IAEA), Elise Keister (NOAA).

## 21-22 MARCH: Workshop on Optimizing Methodologies for Ocean Acidification Monitoring and Chemical Analyses

As part of Monaco Ocean Week, twenty experts met at the IAEA Marine Environment Laboratories to finalize the “Practical Best Practices for Ocean Acidification Monitoring” guide, a compendium of 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 OA research and with limited resources, especially users of the [GOA-ON in a Box](#) OA monitoring kit.

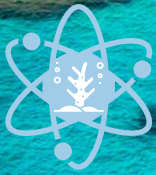
Jana Friedrich, Section Head of the IAEA Radioecology Laboratory, highlighted the significance of such guidelines: *“We need practical and commonly agreed methods that can be applied consistently to monitor ocean acidification and assess its impacts.”*

Future editions of the “Practical Best Practices” guide will include protocols and methods to study the effects of ocean acidification on marine organisms. Workshop participants also drafted a decision tree

to help users identify the most appropriate, fit-for-purpose, techniques and methodology needed for the scientific question that they are trying to answer with their research.

Sam Dupont, marine biologist from the University of Gothenburg and a consultant with the OA-ICC, emphasized that *“developing practical tools such as decision trees can empower researchers to address local and regional impacts of ocean acidification effectively.”*

The first edition of this document will be published online ([Practical Best Practices for Ocean Acidification Monitoring](#)) by the end of the year, and represents an important step forward for inclusive and purposeful global ocean acidification research.



# OA-ICC at the UN Ocean Decade Conference

10-12 April 2024, Barcelona

The UN Ocean Decade Conference was a key moment for the international community to gather and to assess the progress of the Decade, and an opportunity to highlight the work of the OA-ICC to a high level, international audience.

The OA-ICC capacity building program was highlighted during a satellite event on *“Moving from science to action on ocean acidification”*, co-organized by the IAEA OA-ICC, OA Alliance, and NOAA in partnership with GOA-ON and the UN Ocean Decade Program OARS (Ocean Acidification Research for Sustainability). The satellite event discussed the need for increased OA awareness, the importance of capacity building programs in increasing regional science and policy response, pathways forward for OA Action and commitments to OA Actions under the UN Decade of Ocean Science. The event was an opportunity to share OARS Programme partner activities, tools, and resources to help stakeholders define their OA information needs for decision-making or management purposes.

A second event *“Ocean Carbon - the knowns and unknowns”*, co-organized and supported by the IOC-UNESCO WG Integrated Ocean Carbon, the Global Ocean Acidification Observing Network, the Ocean Decade Programme OARS, the Global Decade for Blue Carbon, Plymouth Marine Laboratory, the ICONA project, the Ce2Coast Project, and the IAEA OA-ICC. This event discussed the importance of Integrated Ocean Carbon Research to fill knowledge gaps and identify priority actions in ocean carbon science for sustainable development. The activities of three major Ocean Decade programmes addressing the changing ocean carbon cycle were presented: the Global Ocean Decade Programme for Blue Carbon (GO-BC), Ocean Acidification Research for Sustainability (OARS) and the IOC working group Integrated Ocean Carbon Research (IOC-R).



From left to right: Courtney Witkowski, NOAA OAP, Jan Newton, GOA-ON, Rebecca Martone, Tula Foundation, Sarah Flickinger, IAEA OA-ICC and facilitator Jana Friedrich, Section Head - Radioecology Laboratory, IAEA.



Participants in the panel discussions of the event *“Moving from science to action on ocean acidification”*, co-organized by the IAEA OA-ICC, OA Alliance, and NOAA in partnership with GOA-ON and the UN Ocean Decade Program OARS (Ocean Acidification Research for Sustainability).



Moderator Kirsten Isensee, IOC-UNESCO, with panelists Richard Bellerby, Norwegian Institute for Water Research, Jana Friedrich, IAEA Marine Environment Laboratories, Sylvain Agostini, University of Tsukuba and Kevin O'Brien, UW, NOAA PMEL.

# OA-ICC Staff News

## THANK YOU OLGA AND SARAH!

March and April 2024 marked the end of OA-ICC service for Olga Anghelici (interim OA-ICC Associate Project Officer) and Sarah Flickinger (OA-ICC Associate Research Scientist). The OA-ICC is extremely grateful for all their hard work and accomplishments during their respective tenures and wish them the best in their future endeavours!

Should you like to contact Sarah or Olga, please feel free to reach out to the current OA-ICC team.



## WELCOME TO LINA HANSSON, OA-ICC Associate Project Officer

Lina joined the team in May 2024 and is thrilled to be back with the OA-ICC after an exciting experience with the Prince Albert II of Monaco Foundation. A Swedish national, Lina holds a Master of Science degree in Biotechnology Engineering from the University of Lund. She has fifteen years' experience in scientific project management and coordination in an international and multicultural environment. Lina was the Project Manager of the first large-scale EU project on ocean acidification (EPOCA; 2008-2012) at the Oceanography Laboratory in Villefranche-sur-Mer, France, then played a key role in launching the OA-ICC at the IAEA in 2012. She was the Associate Project Officer of the OA-ICC until 2019. In her role with the Prince Albert II of Monaco Foundation, Lina was coordinating the Foundation's initiatives, which covered several topics related to environmental conservation,

from marine to freshwater to terrestrial ecosystems. She was also coordinating the OACIS initiative: "Ocean Acidification and other ocean Changes – Impacts and Solutions", led by the Foundation, which studies the impact of climate change on the ocean, including ocean acidification, as well as potential solutions to mitigate its impacts. OACIS regroups the main players in Monaco actively working on ocean acidification (Prince Albert II of Monaco Foundation, IAEA, Monaco Scientific Centre, Oceanographic Institute and the Monaco Government) as well as CNRS, IDDR and IUCN.

Lina is looking forward to working with old and new friends to help shape the next chapter of the OA-ICC!



# Upcoming events

## **Annual Meeting of the OA-ICC Expert Group**

3 September, online

## **Basic Training Course on Ocean Acidification**

9-13 September, Monrovia, Liberia

## **Annual Meeting of the SCOR Working Group on Multiple Stressors**

7-8 October, IAEA Marine Environment Laboratories, Monaco

## **International Workshop on the Socio-Economic Impacts of Multiple Stressors, co-organized with the Scientific Centre of Monaco (CSM)**

9-11 October, Monaco

## **Training Course on Ocean Acidification and Multiple Stressors – Second Edition**

18-29 November, 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

