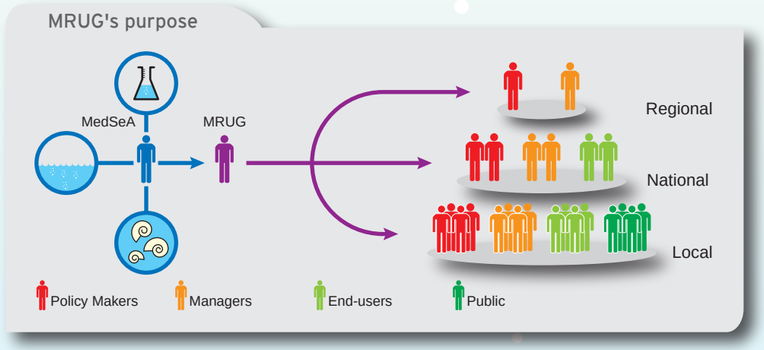
The Mediterranean Reference User Group

The Mediterranean Reference User Group (MRUG) is an advisory body of the MedSeA project. It is composed of scientists, marine and coastal managers, conservation practitioners, industry representatives, science policy advisors and policy makers, and other stakeholders, mainly from countries bordering the Mediterranean Sea. The MRUG ensures the work and results of the MedSeA project are not only promoted and widely disseminated but are translated into a form that all audiences can understand. The MRUG also ensures that there is a clear understanding of the implications of ocean acidification for policy, socioeconomic and environmental issues which are of importance to stakeholders and end-users in the Mediterranean region. Additionally, the MRUG will assure the quality of the dissemination methods used by the MedSeA scientists.



The MRUG aims to:

- Synthesis the key scientific results from MedSea research;
- Advise on the types of data, analyses and products that will be most useful to managers, policy advisers, decision makers, and politicians;
- Advise on the format and nature of key messages arising from the research;
- Advise on the dissemination procedures to ensure that the results from the research are disseminated to, and accessible by, all potential end users; and
- Translate and transmit key science developments into their own sector and parent organisation.

What can we do?

When it comes to mitigating the impact of acidification and warming on the Mediterranean Sea, we can:

- Reduce other environmental stresses (e.g. pollution, over fishing, habitat destruction) to build resilience into the marine environment;
- Create effective marine protected areas to help the ocean cope with these global stressors;
- Use marine spatial planning so as to promote the conservation and sustainable management of coastal ecosystems as major carbon sinks which are being referred to as "Blue Carbon" and integrate Blue Carbon into the global policy and financing processes; and
- Adopt stringent reductions in greenhouse gas emissions, including the reduction of emissions from marine industries.

However, short of global collaboration, the risks for each country posed by warming and acidification becomes ever more acute. Here, the implementation of ecosystem-based adaptation strategies through integrated coastal and ocean management institutions at national, regional, and local levels is revealed to be fundamental. This includes amongst others the establishment and effective management of networks of marine protected areas, as healthy and intact marine systems can absorb and store more carbon.

Partners

Ameer Abdulla • IUCN, University of Queensland | Paola Agostini • EC, DG Research and Innovation | Michelle Allsopp • Greenpeace Research Laboratories | John Baxter • Scottish Natural Heritage | Purificació Canals • MedPAN | Pierre-Yves Cousteau • Cousteau Divers Foundation | Maoz Fine • BIU, Bar Ilan University | Laure Fournier • Total Foundation | Javier Garat Perez • EuroPêche | Marina Gomei • WWF Mediterranean | Catherine Goyet • UPVD, Université de Perpignan | Evangelia Krasakopoulou • HCMR, Hellenic Center for Marine Research | Dan Laffoley • International OA-RUG Chair | Matthias Leisinger • Kuoni, Ltd | David Santillo • Greenpeace Research Laboratories | Kathy Tedesco • UNESCO-IOC | Kristian Teleki • Global Ocean Commission | Carol Turley • PML, Plymouth Marine Laboratory | Atila Uras • United Nations Environment Programme - Mediterranean Action Plan | Marcello Vichi • CMCC, Centro Euro-Mediterraneo per i Cambiamenti Climatici | Chloë Webster • MedPAN | Patrizia Ziveri • ICTA, Universitat Autònoma de Barcelona

Contact

Mr Kristian Teleki | Co-chair Mediterranean Reference User Group | kteleki@globaloceancommission.org
Dr Ameer Abdulla | Co-chair Mediterranean Reference User Group | ameer.abdulla@gmail.com
Dr. Patrizia Ziveri | MedSeA Project Coordinator | patrizia.ziveri@uab.cat
Dr. Carol Turley | MedSeA Outreach and Knowledge Exchange Leader | ct@pml.ac.uk

MedSeA project website: http://medsea-project.eu

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Tipping the balance: CO_2 and the Mediterranean Sea

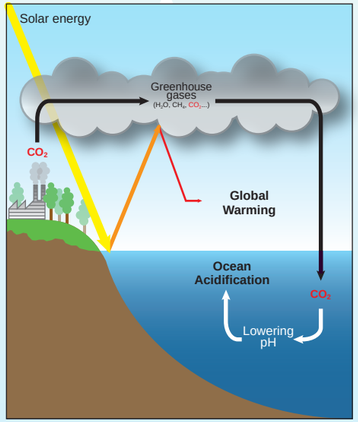
Leaflet designed by Michaël Grelaud | michael.grelaud@uab.cat

The rapidly changing Mediterranean

An introduction to ocean acidification in the Mediterranean: why it matter's and how you can help

The facts!

As carbon emissions increase and carbon dioxide levels (CO_2) in the atmosphere rise, so does the concentration of CO_2 in the ocean. The ocean has been very efficient in absorbing CO_2 and this has decreased the accumulation of carbon dioxide in the atmosphere and thus reduced the potential warming effect on our climate. However, we have reached a point where the ocean is absorbing so much CO_2 that it is changing the chemistry of the ocean resulting in 'ocean acidification'. This poses a threat to the fundamental chemical balance of ocean and coastal waters, marine ecosystems and could potentially result in large changes in global biogeochemical cycles, and thus the entire ocean system.



Implications of the CO_2 on the global warming and the ocean acidification

Why should you care?

Ocean acidification could also have significant social and economic effects due to its potential impacts on tourism (e.g., as a result of marine habitat degradation, such as coral reefs, or invasion of non-native species) or fisheries and aquaculture (resulting from altered life cycles of key surface- and bottom-dwelling animals, including shellfish). There is growing concern that impacts of acidification would be widespread from individual organisms up through marine food webs, affecting commercial fisheries and shellfish industries, thereby threatening protein supplies and food security for millions of people. The effects on such marine-based activities could indirectly affect land-based economic activities and jobs on a much larger scale.

Potential sensitivity and vulnerability to global change in the Mediterranean

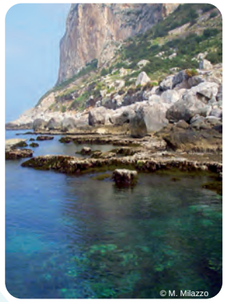
Although the general impact of acidification on water chemistry is globally well understood, the response of small and complex water bodies like the Mediterranean Sea is unknown. Specific research activities and detailed regional studies are needed to shed light on ocean acidification in the Mediterranean.

Important sectors that could potentially be affected by ocean acidification are tourism, fisheries, and aquaculture. Mediterranean acidification may also lead to harmful algal blooms, affect jellyfish distribution patterns, influence shellfish physiology and impact major contributors to habitat building such as reefs. Links between these and other activities need to be established to identify the direct and indirect economic effects of ocean acidification.

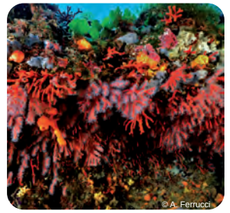
Critical Mediterranean ecosystems under ocean acidification and climate change

MedSeA researchers have identified three iconic ecosystems in the Mediterranean which are likely to experience environmental change in the near future and which are particular vulnerable to changes in ocean chemistry:

Seagrass (*Posidonia oceanica*) meadows are known as a hot-spot of biodiversity in the Mediterranean Sea, supporting hundreds of species as a shelter and nursery.



Vermetid reefs, structures built by living organisms (such as marine snails) that rises from the bottom towards the surface of the sea, which are equally important for their high biodiversity and shore protection.



Coralligenous reefs (accumulation of calcareous encrusting algae) are a major touristic attraction covering large sections of the Mediterranean coastal waters from a depth of a few meters to over a hundred meters. The highly diverse community of these reefs hosts one of the most iconic and commercially important species, the Red Coral (*Corallium rubrum*).

Other threatened species

Red coral: Unique biodiversity

Coccolithophorids (plankton): Part of the foundation that of all marine food webs are based on

Intertidal community

The MedSeA's Reference User Group

We live in a rapidly changing world – issues like ocean acidification could in time affect all our futures. Scientists study big issues like Mediterranean Sea acidification and warming through observations, experiments and modeling to improve our knowledge and understanding of the consequences of these changes on the Mediterranean Sea ecosystems and those that live near it, get their income from it or just go to enjoy it. Good decisions are based on sound advice. Policy-makers and the public need scientists, like those in MedSeA, to produce the knowledge and evidence of risk in a rigorous and impartial way. However, scientists are not always able to communicate their results very well to the broader public and policy makers. This is where MedSeA's Reference User Group (MRUG) comes in - scientists and research-users working together to ensure that the latest scientific evidence is rapidly communicated in a way that we can all understand and use.

A window to the future

In order to understand the long-term biological effects of permanent exposure to high CO_2 concentrations, marine communities around underwater volcanic vents that release millions of litres of CO_2 per day are being studied. The high CO_2 levels in the surrounding seawater have major impacts on marine life including about a 30% reduction in species diversity at around pH 7.8, compared with normal seawater having a pH 8.1.

This ongoing study in the Aeolian Islands shows severe reductions in the ability of coastal marine organisms to resist corrosion of their shells or skeletons due to the dramatic effects of CO_2 on seawater chemistry. Seagrasses thrive well at increased CO_2 levels but major groups such as corals, sea urchins and calcified algae are removed from the ecosystem and can be replaced by invasive species of algae. MedSeA studies show that warming seawater temperatures can make the effects of ocean acidification worse. This research help us to see what the future effects of ocean acidification might be and demonstrate, for the first time, what happens to marine ecosystems when key groups of species are excluded due to rising CO_2 levels.

Venting of CO_2 at a Mediterranean site provides the opportunity to observe changes in ecosystems along gradients of decreasing pH close to the vents. Sea grasses and brown algae grow well at the vents but groups such as sea urchins, coralline algae and stony corals are excluded as the waters become more acidic.