

21|26 MARCH 2022



"Monaco Ocean Week offers a unique opportunity for dialogue, networking, innovation and transparency"

HSH Prince Albert II of Monaco







In regard to the ocean, as well as in regard to the world's major issues, the climate and biodiversity, we must reaffirm the importance of a shared vision of things based on collective values and geared towards the common good. For current generations as well as future generations.

The ocean offers us a particularly relevant example of this. It is central to most of the major changes occurring in our world. It directly feeds more than three billion of our contemporaries. It withstands the bulk of global trade. It contains infinite resources of renewable energy such as mineral resources which are increasingly coveted. It plays a key role in the mitigation of global warming. Lastly, it is home to a biodiversity that is so valuable yet so endangered.

Whatever way we see our future, the ocean plays a key role. A role made up of tension and contradiction which are intrinsic to our world and which we need to address.

For the ocean probably more than any other component of our planet, we therefore need to come up with new ways of organising our activities, reconciling our ambitions, and protecting our common heritage together. (...)

We must be guided by a concern to adopt a collective approach, to strengthen the political tools which are the initial expression, and to mobilise civil society as a whole – from public opinion to businesses, as well as NGOs and scientists. Our goal must be to take action all together, without delay.

Excerpt from the address by HSH Prince Albert II of Monaco, during the 13th edition of the *Monaco Blue Initiative* on 21 March 2022.

Int de la

HSH Prince Albert II of Monaco

CORALS, THE EXPOSED NERVES OF THE OCEAN

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RESILIENT COASTS

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CURBING PLASTIC POLLUTION

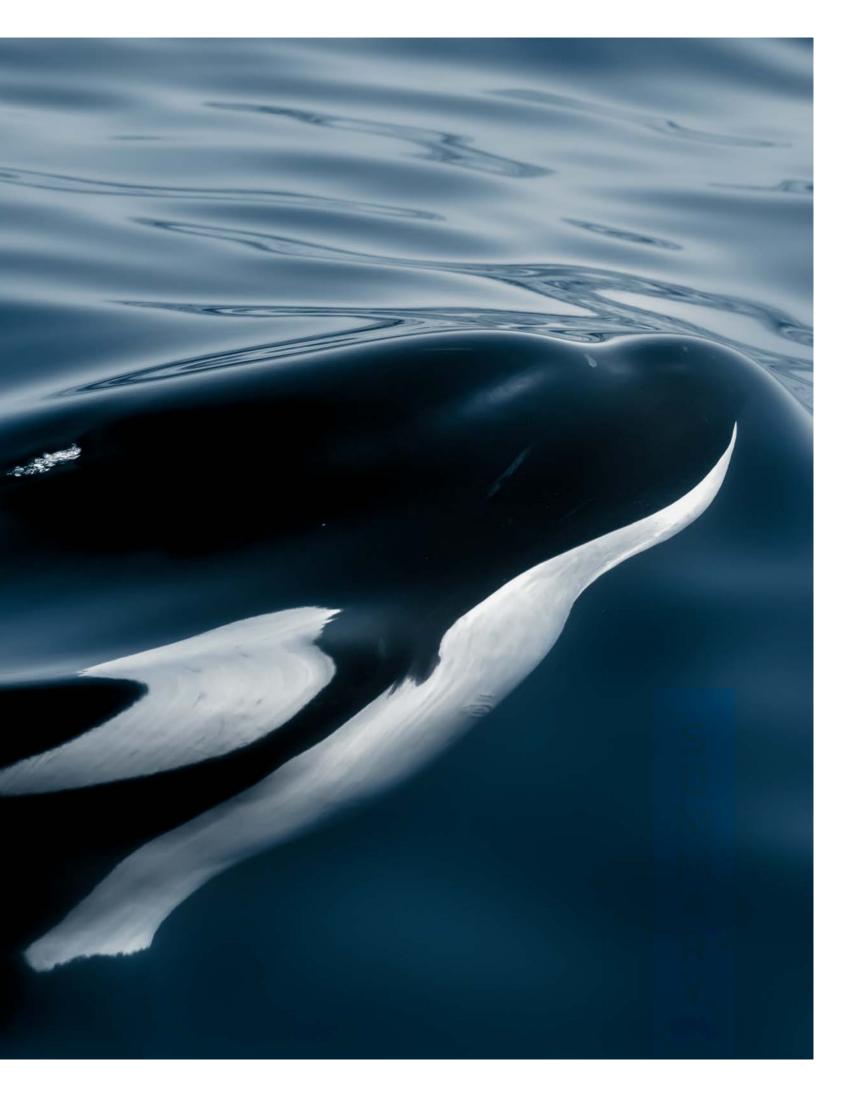


OCEAN GOVERNANCE

SOLUTIONS FOR THE OCEAN



BIODIVERSITY PROTECTION





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GLOBAL REPORT Coral health, the verdict is in

Data acquired over the last 40 years in thousands of sites across the world have been aggregated and analysed, enabling researchers at the Global Coral Reef Monitoring Network to provide an unprecedented scientific overview of the health status of the global coral reef ecosystem.

The authors of the report and members of the Global Coral Reef Monitoring Network (GCRMN) steering committee convened at the Oceanographic Museum and Novotel Monte Carlo for a 3-day scientific workshop behind closed doors. They also presented the latest global report on the Status of Coral Reefs of the World on Tuesday 22 March in the Hirondelle Conference Room of the Museum.

The presentation opened with a few words by HE Bernard Fautrier, Minister Plenipotentiary, Special Advisor to HSH the Sovereign Prince on environmental issues, who looked back on the accomplishments achieved during Monaco's 3-year presidency (in conjunction with Australia and Indonesia) of the International Coral Reef Initiative (ICRI). The Minister then commended this "very detailed and thorough analysis which takes on board the complexity of the coral reef situation across the globe". The 6th edition of the report is in fact the first in 13 years and the most comprehensive ever produced in the world.

Following the introductory words of Erica Towle, the representative of ICRI's current US presidency, in regard to the process of drawing up the report, as well as the United States' commitment, the representative of the United Nations Environment Programme, Takehiro Nakamura, pointed out the need to implement ambitious measures

on a global scale. GCRMN's global coordinator, David Souter, Research Director at the Australian Institute of Marine Science, subsequently gave an overview of this unique scientific publication which represents a decisive chapter in the history of the global coral reef Francis Staub, Coordinator ecosystem: "The sharp decline in coral cover observed over the last

"The reef communities once dominated by corals are finding themselves gradually being dominated by algae, thus reducing the complex habitat of coral architecture", of ICRI secretariat

two decades has nearly always been associated with a rapid increase in sea surface temperatures, suggesting their vulnerability to extreme heat events. This type of event is likely to occur more frequently with the ongoing warming of the planet."

A MIXED REVIEW

Four decades of data obtained from 12,000 sites spread across 10 coral reef regions in the world¹ show the major role that increased sea surface temperature plays in coral decline. Added to local environmental pressures, such as overfishing and water pollution, this major contributor has led to an alarming level of erosion of these ecosystems, which are home to one quarter of all marine species. However, the report shows that many coral reefs have shown resilience and are able to recover if the conditions allow, a conclusion which offers a note of hope for coral reef health in the long term.

REGIONAL VARIABILITIES

From the 10 regions studied, almost all have been affected by a decline in their coral cover. The ROPME sea area (around the Arabian Peninsula), South Asia, Australia and the Pacific exhibited the greatest loss and a parallel increase in algae cover. *"The statistical probabilities of decline have exceeded 75% in these regions, as well as in East Asia and the West Pacific Ocean – representing in total almost 50% of global coral reefs"*, the authors anticipate.

In Southeast Asia, the pattern differs from other global trends: no noticeable effect after the first mass bleaching event in 1998, pronounced resilience in 2019 after the bleaching event in 2016. *"With a population of 700 million inhabitants, this area suffers the most anthropogenic pressure but, surprisingly, remains relatively stable"*, explains Serge Planes, CNRS Director of Research at CRIOBE.

The report also highlighted the fact that, even if the lapse of time between large scale coral bleaching events was not sufficient for full coral reef recovery over the last ten years, partial recovery was observed between 2002 and 2009, and again in 2019 (+0.7%), proof of their capacity for resilience.

THE EXCEPTION OF THE CORAL TRIANGLE, SOUTHEAST ASIA

This coral region, at the intersection between the Pacific and Indian Oceans, which represents a third of global coral reefs, remains mysteriously spared from the trend towards erosion due to the warming of the surface water. Despite a decline in their distribution being recorded over the last decade, on average these reefs have greater coral cover today (+4%) than in 1983, when the first data were collected in this area.

Why have the corals of this region, despite being exposed to high temperatures and various anthropogenic stressors, experienced a different fate? Had they already endured warming events in the past? *"We lack data prior to 1978, but with 800 coral species listed, the high biodiversity of the Coral Triangle could come into play in respect of the dynamic nature of its coral cover"*, suggests French researcher Serge Planes from CRIOBE, as one of the possible explanations. The Coral Triangle exception and its numerous archipelagos could serve as an example to protect coral regions. ■

IN FIGURES

- 40 years of data
- 73 countries involved
- 12,000 sites
- Over 300 scientific contributors
- 2 million individual observations
- 3 years of data compilation and analysis
- 2 main indicators

1. Australia, Brazil, Caribbean, East Asian Seas, Eastern Tropical Pacific, Pacific, South Asia, Western Indian Ocean, Red Sea and Gulf of Aden, ROPME sea area (around the Arabian Peninsula).



David Souter

Research Director at the Australian Institute of Marine Science, coordinator for the Global Coral Reef Monitoring Network (GCRMN)

The conclusions of GCRMN's report show a significant decline in global coral cover, with signs of resilience since 2019. How should we interpret this recent trend?

<u>"The slight</u> increase in coral <u>cover in 2019</u> <u>shows that, on</u> <u>average, the</u> <u>world's coral</u> <u>reefs have</u> <u>maintained</u> <u>their ability to</u> recover." Although it is too early, the slight increase in coral cover in 2019 shows that on average coral reefs maintain their ability to recover (i.e. they are resilient). Moreover, this increase occurred at a time when sea temperatures were persistently high. This may therefore be initial evidence that corals adapt to higher sea temperatures.

The Coral Triangle in Southeast Asia seems to be exempt from the effects of rising water temperatures, whilst the Australian Great Barrier Reef is particularly affected. Why is there such a discrepancy?

Although Australia's coral reefs are extremely diversified (~600 species) compared to global standards, they are not as diversified as those found in the Coral Triangle, which present the greatest biodiversity in the world (~800 species). The discrepancy in the status of these two regions is due to the different disturbance regimes. Coral reefs in East Asia and Australia suffered the effects of marine heatwaves which resulted in mortality as a consequence of coral bleaching. However, the extent, gravity and frequency of coral bleaching were much more severe in Australia. Furthermore, Australian coral reefs also suffered from the impact of high-intensity cyclones and starfish epidemics, especially over the last two decades. Coral reefs in the East Asian Seas region did not experience such serious and frequent disturbances and therefore proved more resilient to the pressure of rising water temperatures.

Are you planning to include new types of data in future reports?

Yes. The implementation of mechanisms allowing us to incorporate data on reef fish in the next report will be a priority for GCRMN. Moreover, we are also hoping to include data describing changes in the structure of coral communities and the physical environment that affects coral reefs (sea temperature, nutrients, cyclones...). The next report will also incorporate socio-economic data: it will also describe the way in which reef status affects the human populations which depend on them for their food, their jobs and other economic and recreational activities.

Would it not be possible to assess coral cover faster by satellite and to monitor it in real time?

It is indeed possible to assess some aspects of coral reef health using satellites and remote sensing, such as the extent and localisation of coral reefs, the overall composition of individual reefs (i.e. areas of coral, algae, sand etc.), and even signs of coral bleaching. However, to date, our satellites are not able to determine accurately the health aspects of reefs, or the composition of coral species, and certainly cannot monitor fish. To do that, we need to enlist the services of divers or use other technology (cameras fixed to boats or underwater vehicles).

Were you surprised by some of the report's conclusions, such as the difference between regions?

I was surprised by some trends which we observed in the data. To be honest, I thought that the average global cover of hard coral would be much lower than it actually was. I was delighted to see that all was certainly not lost and that there was still hope for the world's coral reefs.

This report appears to treat the grim scenario of the inevitable disappearance of corals by 2100 with circumspection. Does this give reason for hope?

The report showed that global coral reefs are under pressure, in particular due to rising sea temperatures associated with climate change, and that on average, global reef status is in decline. However, the report also showed that on average, global reef status is better than we would have believed, and that they have maintained their capacity to recover. This resilience obviously gives us reason for hope, but it is also a reminder that the window for action to fight climate change is closing and that, as a global community, we should endeavour to maintain this resilience in order to offer a future to reefs all over the world.

CORALS, THE EXPOSED NERVES OF THE OCEAN []]

DATES

Prior to 1995 Coral cover was relatively stable

<mark>1998</mark> 1st mass bleaching (- 8% of coral cover, 6,500 km²)

2002-2009 Coral cover increase

2009-2018

2 bleaching events (2010 and 2016, - 14% of coral cover, close to 12,000 km²)

2019 Signs of localised coral regrowth (+0,7 %)

1983-2019

+4% of coral cover in the Coral Triangle, Southeast Asia



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ADAPTATION

In the Red Sea, corals are resistant to rising temperatures

What if some corals were able to endure climate change? A Swiss research centre focused on the Red Sea is studying on the unique fate of corals in this region. A glimpse of hope for the coral reefs of the future.

CORALS HEIRS OF A THOUSAND-YEAR-OLD HISTORY

Where do these Red Sea corals get their extraordinary resilience? We need to go back to their distant past to understand, more specifically to the last ice age during which the narrow Red Sea geological basin was isolated from the Indian Ocean and saw practically all its aquatic life disappear due to the increase in salinity. "After the last glacial cycle over 6,000 years ago, when the Red Sea was once again connected to the ocean, then recolonised by marine organisms from the South, the coral population gradually adapted to the high temperatures encountered in the southern part of the Red Sea." This is the story of the unique adaptation, which spans a thousand years, of these corals and the specificities resulting therefrom in regard to their lineage, which the Swiss researcher Anders Meibom presented to the audience, placing the opening evening of Monaco Ocean Week under the banner of the living world's adaptation to climate change.

IN FIGURES

+ 5°C: the increase to water temperatures endured by corals in the Red Sea CORALS, THE EXPOSED NERVES OF THE OCEAN 13

FROM SCIENCE TO DIPLOMACY

It was in the conference room of the Monaco Yacht Club that the Swiss Ambassador to France and Monaco, HE Roberto Balzaretti, welcomed Professor Anders Meibom, Director of the Transnational Red Sea Centre, one of the pioneers in the discovery of the singularity of the corals of the Aqaba Gulf and the Northern Red Sea. Recent scientific studies conducted at the Federal Polytechnic School of Lausanne, bringing together researchers from Israel and Saudi Arabia, showed that corals from this geographical region are extremely resistant to rising water temperatures, enduring an increase of up to 5°C, as well as to ocean acidification. An exceptional physiological performance in the world of corals, organisms that are hypersensitive to rising temperatures, as seen by the multiplication of wide scale bleaching events that have affected reefs all over the world.

Needless to say, the Transnational Red Sea Centre, established in 2019 with the support of the Helvetic Confederation, is keen to preserve this global treasure by conducting various scientific expeditions and setting up a robust database. "This centre will operate on the principle of open science, thanks to the creation of the Swiss Data Science Centre which will centralise the data and make them available to all partners", explained Dr. Olivier Küttel, Head of International Affairs at the Federal Polytechnic School of Lausanne. There is therefore only one step from science to diplomacy. "Due to the rapid decline of coral reefs worldwide, our study highlights the urgent need to reduce local stress factors in the semi-closed Red Sea region", the researcher Anders Meibom pointed out. But how can environmental pressure generated by human activity in the eight countries (Saudi Arabia, Djibouti, Egypt, Eritrea, Israel, Jordan, Sudan, Yemen) situated in this maritime corridor be regulated? Switzerland's neutrality hopes to unite sustainable regional cooperation, based on science to promote dialogue with a view to protecting these reefs with a unique destiny.

All these opportunities are underpinned by one hope: that these marine organisations will already be prepared to face the worst-case climate scenarios. This is when we can start dreaming: to protect this gem of the ocean thanks to open science which will overcome geopolitical tension and establish itself as the guardian of a global common property. And why shouldn't we believe that in the future these resistant corals could be transplanted in heavily degraded regions and contribute to coral reef resilience.

IN SIGHT

"After six weeks of exposure to a high temperature (1-2°C more than their summer maximum) and a pH of 7.8, none of the colonies showed visual signs of bleaching. (...) Instead, their symbiotic dinoflagellates exhibited improved photochemistry, higher pigmentation and a doubling in net oxygen production, leading to a 51% increase in primary productivity."

Thomas Krueger, Noa Horwitz,

Anders Meibom & Co, "Common reefbuilding coral in the Northern Red Sea resistant to elevated temperature and acidification", Royal Society Open Science, May 2017



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OPEN SCIENCE

The first World Plastics

Summit

Can open science reduce plastic pollution? It was with this goal in mind that a hundred or so international leaders in research and innovation focused on this global material met in Monaco.

An undisputed global concern, plastic pollution is concentrated in the ocean, the final destination of waste and particles loaded with contaminants. It was with the aim of generating momentum commensurate with this scourge that the first World Plastics Summit was launched during *Monaco Ocean Week*, under the high patronage of HSH Prince Albert II of Monaco. *"Together, we form a powerful team, and I am honoured to be the ideological inspirer of this project"*, declared with enthusiasm philanthropist Oxana Girko, awardee of the Women of Monaco's Green Award, who alongside Oleg Novachuk, largely contributed to funding the event aimed at strengthening cooperation between researchers, innovators and decision-makers at a global scale.

Starting in the morning of 24 March, and lasting four days, a hundred or so international plastic experts met at the Novotel Monte Carlo to address in detail the key challenges and solutions in this field. For many delegates, this was the first face-to-face meeting for several years due to the global pandemic.

A MIXING OF DISCIPLINES

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Biologists, chemists, engineers, environment specialists, materials experts, sustainability analysts, journalists, scholars, entrepreneurs, NGO representatives and members of the United Nations Environment Program (UNEP)... all of them demonstrated a genuine desire for openness and cooperation. The Summit thus provided the opportunity to pool approaches, promote solutions and create new synergy offering glimpses of more collaborative and systemic approaches to curb the flow of plastics, accelerate recycling and work towards a global objective: zero plastic pollution.

IN SIGHT "By joining forces, we can increase our collective resources and focus new energy on integrated solutions." Andy Pickford, Professor of molecular biophysics at the University of Portsmouth

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efan Venter, UPIX Photography

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TOWARDS MORE COLLABORATIVE SCIENCE

"We need to encourage global cooperation to accelerate plastic recycling and redesign", pointed out structural biologist John McGeehan, from the University of Portsmouth (United Kingdom), who set up a meeting with his colleague, chemical engineer Gregg Beckham from the National Renewable Energy Laboratory in the US, who declared: "We have a very narrow window of opportunity, but we can do it".

Speeding up the sharing of the best possible scientific data and analyses (the elapse between scientific breakthrough and publication is often long), was one of the recurrent themes of the summit. Thanks to the open-mindedness of the delegates attending, brand new data were shared within the group, already advancing the discussion on future directions and the best deployment of scientific resources.

FROM A GLOBAL TREATY TO CHEMICAL RECYCLING

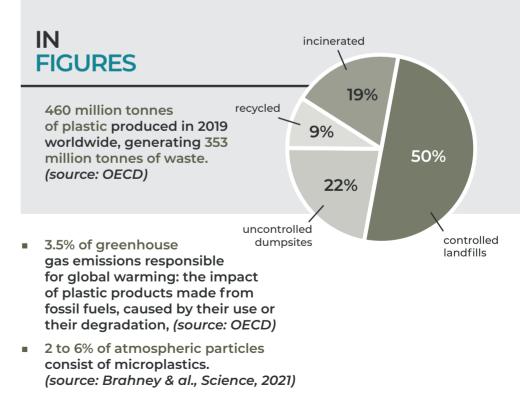
Providing an overview of the ways in which the global plastic issue is managed, the first session outlined the milestones for the Global Treaty on Plastic Pollution put forward in February 2021 by the United Nations Environment Assembly. The data shared by American oceanographer Kara Lavender Law and her colleagues revealed an exponential rise in plastic pollution which requires urgent attention if we hope to achieve large-scale mitigation. Microplastic contamination - an associated problem – has been reported not only in the ocean but also in the atmosphere where it follows other circulatory systems.

During the session on plastic recycling and redesign, the potential circulatory management of polymers and textiles was explored by several speakers. The following sessions were focused on chemical recycling, biocatalysis innovations and plastic redesign.

A PROMISING SUMMARY

Presented as a summary, the final session of the summit took place on Saturday 26 March 2022 in the presence of HSH Prince Albert II of Monaco, who pledged to support the next editions of this annual event in Monaco: "Let us make sure that the energy present in this room is renewable!" the Sovereign proclaimed with enthusiasm. After a review of the main discussions and conclusions of the Summit, UK chemist and sustainability leader, Tony Ryan, OBE, Professor at the University of Sheffield, spoke about the genuine value of carbon in plastics, a view that could lead to a more sustainable plastic economy.

At the end of the summit, which opened up new international collaborations, the experts met for an evening of discussions at the Oceanographic Museum of Monaco and agreed to meet again at the next *Monaco Ocean Week* for the second World Plastics Summit.





John McGeehan

Professor of structural biology, Director of the Centre for Enzyme Innovation at the University of Portsmouth (United Kingdom)

In your opinion, what is the main obstacle to the generalisation of plastic recycling?

I believe that the primary issue is the great diversity of plastics, meaning that many solutions have to be developed. Enzyme recycling is suitable for some plastics, such as polyesters, but we need different technology for other polluting plastics, such as polyethylene and polypropylene. During the summit, a broad range of technologies was presented, including mechanical, chemical, biological and thermal based processes.

The second key issue is the fragmentation of initiatives. In our Portsmouth laboratory alone, which has around thirty researchers, we carry out similar experiments to other teams in laboratories all around the world. There are similar consortiums in the world but currently they are not adequately inter-connected.

Can this summit promote this type of collaboration so that the plastic issue can be dealt with more effectively?

This is exactly what we hope to encourage. We want to avoid duplication and prompt researchers to share new data, because this is what will hugely accelerate research and enable us to address this global pollution. It's an enormous challenge because scientific competition has always been privileged! We need scientists, engineers, economists and environmentalists to produce more inclusive science. Thousands of researchers are working on this issue worldwide and increasingly appreciate the importance of being connected. Some are even beginning to get together in multi-disciplinary laboratories and pool their funds to develop ambitious projects. If we start to consider ourselves as a global team, and share tasks, we will increase our resources and our expertise, and that's very exciting!

I think that experts, and we can see this with the extraordinary energy emanating from this summit in Monaco, are ready to take the step into this open science, and not merely from an academic point of view. There was a session devoted to industry, where companies like Amazon, Patagonia and Carbios showed that they were keen to pool their efforts to reduce and manage plastic waste. We need to foster high ambitions. It's such a dreadful problem... But the solutions have the potential to generate genuine economic momentum.

In your opinion, what actions should be implemented first?

For decades, the global economic model has developed a long supply chain based on the use of plastic. It is going to be extremely difficult to change that, including people's habits. The first thing we need to do is of course reduce the unnecessary use of plastic. The second is to resolve the issue of its end of life. If we manage to resolve that, then plastic could become a material of the future, provided that we use it in a rational, specific and targeted way.

Is enzyme recycling, on which you are working, a solution inspired by nature?

Yes, absolutely. In nature, nothing goes to waste, and we can learn a lot from natural recycling processes. For example, the leaves of green plants have a protective waxy coating called "cutin", a natural polyester which has the same bonds as PET, the artificial plastic used for single-use plastic bottles and many textiles. If you are a bacterium and are attracted by the sugars contained in the leaves, you need to cross this protective layer. Therefore, these bacteria have developed enzymes capable of breaking down polymers. What we have done is to take these enzymes to our laboratories in order to improve them so that they can digest plastic faster. By recycling plastic into its original constituents, we can reduce our dependency on petroleum and gas resources to produce plastic and create value from plastic waste.

Have other enzymes currently been identified for other plastics?

Scientists are looking for enzymes in environments polluted by plastic all over the world. They take samples and analyse them in a laboratory in order to identify these new enzymes which are effective for other types of plastic, such as polyethylene (plastic bags) and polypropylene (hard plastic). We may also use artificial intelligence to help us speed up the development of new enzymes and we are working with innovative companies such as DeepMind, who also attended the summit. Others are working on plastics of the future which are recyclable as soon as they are developed.

Plastic tap by Benjamin von Wong, giant sculptures made from scavenged plastic bottles and installed in all corners of the world. ©Von Wong Production 2021 -#turnofftheplastictap

A SUPER ENZYME THAT ATTACKS PLASTIC

In 2016, a group of researchers in Japan isolated a bacterium that was producing an enzyme enabling it to use the plastic from polyethylene terephthalate (PET) bottles as a source of energy and food. Based on this natural enzyme which took several weeks to digest plastic, using special reactors, the researchers developed enzymes capable of breaking down PET in just a few hours. The molecules are then purified to produce bottles that are as solid and transparent as those manufactured from fossil-based plastics.



HUMAN HEALTH

Plastic: a threat for human health?

Following an initial report that attracted a lot of attention, the scientific group coordinated by the Monaco Scientific Centre and the Boston College has started a new study on the entire lifecycle of plastic, from the little explored viewpoint of its effects on human health.

Following an in-depth review² on plastic pollution and global warming published in *Annals of Global Health* in December 2020 and presented at *Monaco Ocean Week* 2021, internationally renowned scientists are continuing their research on the risks of exposure to plastic on human health. Beyond the increasingly better-defined impact of plastic pollution on ecosystems, how far-reaching are plastic hazards on human health? As alarm raisers, they pool their expertise in order to carefully review the entire lifecycle of plastic. *Monaco Ocean Week* sought to foster this still rarely addressed topic, which may well redefine the uses of a material derived from the petrochemical era.

2. Signed by around forty experts under the aegis of the Monaco Scientific Centre, the report "Human Health and Ocean Pollution" was published in Annals of Global Health, 86(1) in December 2020.

IN

SIGHT

THE GROUNDWORK FOR A GLOBAL STUDY

For this large-scale project, the Monaco Scientific Centre and the Boston College joined forces with the Minderoo Foundation, represented in Monaco by Sarah Dunlop, who runs the "Plastics and Human Health" programme for this Australian organisation, and paediatrician, specialising in child neurodevelopment, Christos Symeonides. Over two days, from 22 to 23 March 2022, a core group of experts in the fields of public health, toxicology, medicine, planetary health, exposure science and marine science, examined and compiled current knowledge on this matter, identified gaps and targeted areas requiring further research as a matter of priority. In one of the rooms at the Novotel Monte Carlo - for some via videoconference - researchers from 9 countries (France, United Kingdom, Switzerland, United States, Australia, Nigeria, Uruguay, Japan, Thailand), laid the groundwork for a new transdisciplinary scientific study which will be presented, with the backing of a major scientific journal, at Monaco Ocean Week 2023.



"About 10,500 different chemicals are added to plastic to give it properties of flexibility, stability, UV and flame resistance, and it is these chemicals that leak out of the plastic and enter our bodies." **Sarah Dunlop**, Director of the Plastics and Human Health Programme at the Minderoo Foundation

A TRANSDISCIPLINARY OVERVIEW

The core of the 19 contributors present in Monaco refined the report's structure and distributed the headings of the various chapters which will be based on the contribution of around sixty global experts. Consequently, alongside biologists and marine chemists, the human health experts (endocrinologists, paediatricians, epidemiologists, toxicologists, public health physicians...) gave themselves one year to submit their conclusions. "We have sought to ensure an inclusive approach and a form of equity between the countries of the North and countries of the South. women and men, young researchers and experienced researchers" explained Hervé Raps, Physician Delegate for Research at the Monaco Scientific Centre and coordinator of this programme alongside the director of the Boston College's Observatory on Pollution and Health, and renowned epidemiologist and paediatrician, Philip J. Landrigan.

DIAGNOSIS AND RECOMMENDATIONS

Benefitting from the support of the Minderoo Foundation and the Prince Albert II of Monaco Foundation, this study will also set out recommendations aimed at modifying policies relating to chemical products and plastics, in order to protect human health and ocean health more effectively. Further information is required regarding each production phase and the use of plastic, in particular concerning the impact of additives added to polymer plastics materials, and the specific dangers of microplastics and the lesser-studied nanoplastics. What are the known and suspected pathologies? The report will include a section on environmental justice and an assessment of the economic cost of plastic pollution, taking into account the destruction of ecosystems, in addition to the pathologies generated on human health. A core chapter will also focus on solutions, from a regulatory, operational (initiatives) and technical (new materials, alternatives) point of view.



<u>"Adding human health considerations to the core of negotiations, whether these are climate-related or concerning the protection of ecosystems, especially the ocean, is providing an additional argument for activating and accelerating change. It is adding the need to take urgent action."</u>

Hervé Raps, Physician Delegate for Research at the Monaco Scientific Centre



LIFE CYCLE OF PLASTIC

- global plastic production has increased from 1.7 million tonnes a year in 1950 to over 400 million tonnes today,
- 10 to 12 million tonnes of plastic waste are dumped into the ocean every year,
- by 2025, the total amount of plastic waste at sea will be close to 150 million tonnes.

HUMAN HEALTH

- approximately 10,500 different chemicals are used in the composition of plastic,
- today some 700 industrial chemicals are found in the human body, which were not present in our grandparents.

(sources: Annals of Global Health, 86(1), 2020)



The 13 awardees of BeMed 2022 commit to a plastic-free Mediterranean

How can we combat the comeback of single-use plastic, encouraged by the health crisis? To continue to hinder the diffusion of plastic pollution in a severely affected region, the association Beyond Plastic Med (BeMed) renewed its call for micro-initiatives in the Mediterranean region, promoting a series of initiatives committed to reducing single-use plastics.

During the online conference, which was held on 24 March 2022, BeMed unveiled the **13 winning projects** (from 10 countries) joining the extensive Mediterranean network BeMed. Consumption, tourism, maritime transport, agriculture, fishing and hospitals... These are all areas in which the members of this active network are involved in order to implement sustainable solutions and share good practice to fight the plastic plague.

PROFILE

Housed within the Prince Albert II of Monaco Foundation, the **BeMed** association has received the generous support of the Didier and Martine Primat Foundation and the Foundation for Future Generation's Aether fund, for the benefit of its call for micro-initiatives.



IN FIGURES

In 10 years, the Mediterranean has accumulated 1.2 million tonnes of plastic in its waters. (source: The Mediterranean: Mare Plasticum, rapport de UICN, 2020)

<u>Above</u>: Several project leaders who received support from BeMed in 2021, as well as some awardees from previous years, gathered to share their experience within the BeMed network. ©M. Dagnino

REDUCING SINGLE-USE PLASTICS

Creation and development of a community of dedicated players in Minorca thanks to a mobile application.

Go Zero Waste & Plastic Free Menorca - Spain Supporting a Cyprian hospital and producing a good practice guide.

Health Care Without Harm Europe - Cyprus Creation of a group of stakeholders from the maritime transport sector and implementation of action plans.

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Isotech Ltd Environmental Research and Consultancy - Cyprus Raising awareness within the hotel & catering sector and seeking alternatives.

NGO Zeleni dom_Green Home - Montenegro

STUDYING AND EDUCATING

Education and involvement of children in fun activities to fight plastic pollution and promote good practice in their homes.

Network for Children's Right -Greece Supporting 2 schools in the implementation of a scientific protocol enabling them to identify macroplastics collected on beaches and quantify microplastics found in sea urchins.

Hellenic Centre for Marine Research - Greece Reviewing, standardising and making scientific data and existing resources on plastic pollution more understandable to facilitate their use by networks of players involved.

University of Salento, Department of Biological and Environmental Science and Technology - *Italy*

INNOVATING, COLLECTING AND RECYCLING

Review of used plastics and identification of alternative solutions in the agricultural sector.

Cyprus International Institute of Management - Cyprus

Implementation of recycling facilities for agricultural waste and creation of an implementation guide to facilitate its replication.

Association AgroTech SM - Morocco

Programme to support start-ups to develop innovative ideas on reducing plastic use and solutions for waste collection, treatment and processing.

Leancubator - Algeria

Mapping abandoned fishing gear and developing methodology for its recovery.

NaturDive - France

Collection and recycling of fishing nets and educating fishermen on the environmental consequences of abandoning them at sea.

Lebanese Developers - Lebanon

Work on the plastic waste collection system and fostering the social and financial integration of informal waste collectors.

Green Alafco - Tunisia

24 CURBING PLASTIC POLLUTION



BEMED

Launch of a community of practice

The members of the Beyond Plastic Med (BeMed) network have laid the foundations for a Community of Practice (CoP) to combat plastic pollution in the Mediterranean.

The 23 March 2022 was a day that offered the 12 project initiators having received the support of BeMed in 2021, as well as a few awardees from previous years *(photo previous page)*, the opportunity to share their experience within the BeMed network, as explained by Lucile Courtial, BeMed's Executive Secretary. By means of this meeting, the association was keen to facilitate and intensify the projects underway and enable the stakeholders involved in plastic pollution in the Mediterranean to gain access to a common toolkit, needs expressed at last year's meeting. The challenge was to structure, with the awardees, the foundations for a CoP in order to capitalise on the network's experience more effectively and to reap the benefits of the projects receiving support. How can the results and key moments of each project be shared so that the activities of other organisations can be enhanced? How can we cooperate more effectively and create greater impact at Mediterranean level by drawing on the expertise of the BeMed community? Pooling data and mapping knowledge, harmonising communication, strengthening the implementation of the European Union's policy and the Barcelona Convention, fostering cooperation... The workshop addressed all of these issues from a synergistic point of view, with the objective of structuring the newly established BeMed network CoP. The first webinars and workshops will be in operation in the summer 2022, making the network more active than ever.

Plastic-free Mediterranean islands

Action plan, sustainable alternatives, awareness... Six exemplary projects from the BeMed community are fighting against the plastic plague throughout the Mediterranean region.

At the end of this community-building day hosted by the BeMed network, a workshop resulting from the capitalisation process for the BeMed-Islands programme (led by SCP/RAC³ and SMILO) was devoted to island territories. The projects dedicated to fighting plastic pollution in the Mediterranean islands presented the activities and results achieved. *"This good practice will form part of the suggested recommendations for plastic-free Mediterranean islands"* said Mercedes Muños Cañas, Head of Nature Conservation and Food Systems at IUCN-Med, which is keen to generalise these pioneering projects across the Mediterranean region.

3. The Regional Activity Centre for Sustainable Consumption and Production (SCP/RAC) and Small Island Organisation (SMILO).

FOR PLASTIC FREE CROATIAN ISLANDS

Croatia - Association for Nature, Environment and Sustainable Development – SUNCE.

Action plan 2021-2026 to reduce plastic pollution and use of single-use plastics, drawn up with the municipality of Sali on Dugi Otok Island in the Adriatic Sea.

TOGETHER FOR ZERO PLASTIC IN ALBANIAN ISLANDS Albania - Royal Albania Foundation.

Action plan managed by a cooperation of institutions, in conjunction with municipalities from 10 Albanian islands and isles.

DEVELOPMENT OF SUSTAINABLE ALTERNATIVES BASED ON LOCAL BUSINESSES

Îles d'Or, Hyères - Small Islands Organisation. Implementation of local, natural and reusable alternatives to single-use plastics made from wild cane waste and conducted with businesses on the Hyères islands, a local designer, and the music industry in Provence.

A GUIDE TO THE ALTERNATIVES TO SINGLE-USE PLASTICS IN THE TOURISM AND HOSPITALITY SECTOR

Balearics - Save the Med/Ibiza Preservation.

2 tools set up to assess and promote sustainable alternatives to single-use plastics in the tourist sector.

PLASTISTOP TUNISIA

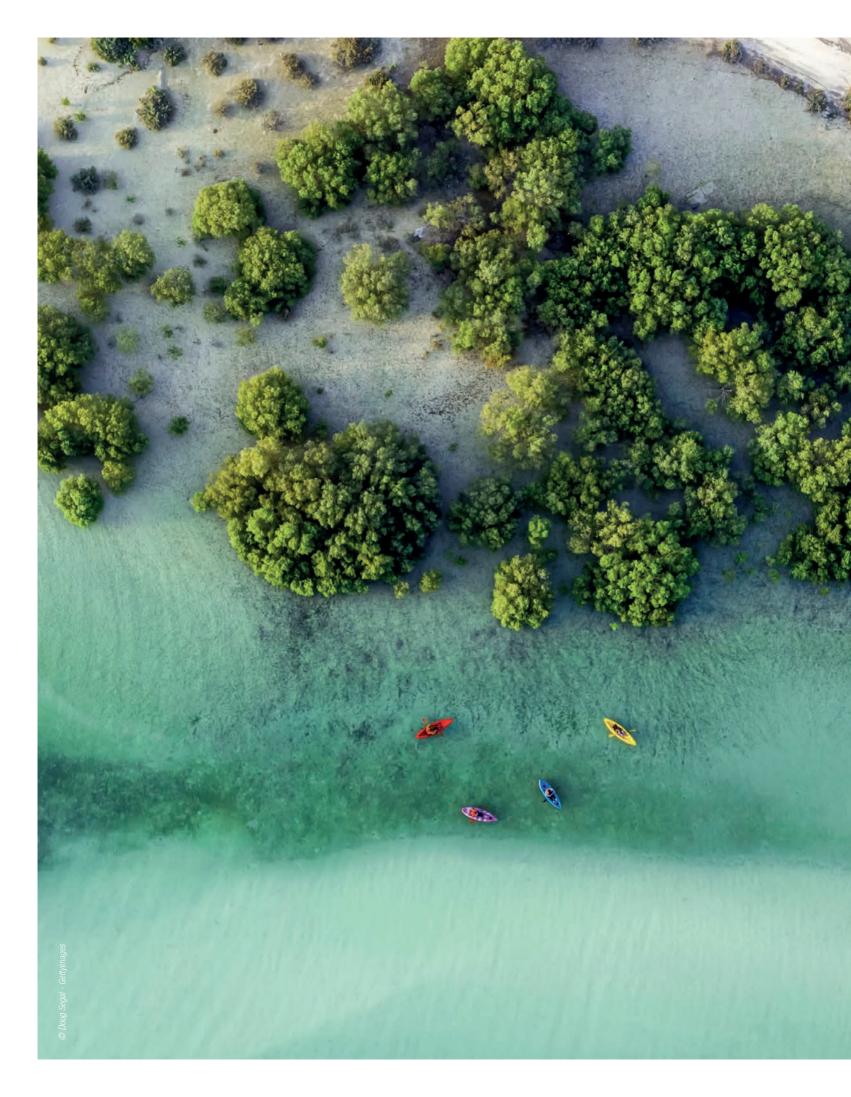
Tunisia - Association Jlij pour l'environnement marin.

Communication activities to encourage plastic waste sorting, collection and reduction with students, local communities, tourists and trade.

CLEAN SEAS BY ECO-SCHOOLS MALTA Malta - Nature Trust Malta.

Educational programmes on the impact of offshore plastic waste and existing solutions, the aim of which is to obtain "Eco-School" certification recognised by UNESCO.

Balearic islands. © stijn-dijkstra-pexels.com





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A shared ocean

Under the high patronage of HSH Prince Albert II of Monaco, the 13th edition of the *Monaco Blue Initiative* was one of the key international ocean events. The need for a new ocean vision prevailed all the topics addressed.

On 21 March 2022, in the plenary room at the Oceanographic Museum of Monaco, over 200 participants including high-ranking officials and political representatives, took part in the panel sessions throughout the day focused on ocean conservation, blue economy and finance, and multilateral efforts.

For the opening of the event, jointly organised by the Oceanographic Institute, Prince Albert I Foundation, and the Prince Albert II of Monaco Foundation, the Sovereign stressed the importance of sharing a vision based on collective values focused on future generations and the preservation of the ocean, a common good. *"Whether they are of a political, legal or economic nature, current ocean management tools are still inadequate. This forum for dialogue on the ocean, which we created in Monaco 13 years ago, provides us with the opportunity to identify efficient tools and to prepare the future", the Sovereign affirmed, pointing out the issues at stake on the international agenda over the following months.* Consequently, the *Monaco Blue Initiative*, which mobilises the expertise of the main players involved in ocean conservation and governance, but also in the blue economy and finance, once again provided an invaluable space for reflection on policy priorities in terms of sustainability and responsibility. This edition fully assumed its role as the nerve centre of global strategic discussions on ocean-related issues.

"We need to scale up the implementation of nature-based marine climate solutions to ensure carbon sequestration, coastal protection and biodiversity support", affirmed HE John Kerry, the US Special Presidential Envoy for Climate, called for concerted and timely global action to "save the ocean", showcasing the United States' positioning in regard to efforts to decarbonise maritime transport, develop green shipping corridors and adopt a United Nations High-Seas Treaty.

Another key partner, the People's Republic of China, confirmed its commitment to *"play an active role in discussions on high-level protection of the marine environment and global ocean governance"*, assured Huang Runqiu, China's Minister of Ecology and Environment. The latter gave details of all the ocean measures implemented by China, such as the restoration of 1,200 kilometres of coastline and 23,000 hectares of coastal wetlands.

A position acknowledged by Belgium, highly involved in conducting the High-Seas Treaty, confirming its faith in blue diplomacy: *"This is a period where multilateralism needs to be reinforced"*, declared Vincent Van Quickenborne, Belgium's Minister for the North Sea, calling for a network of highly and fully protected areas, and stating that Belgium had already protected 37% of its share of the North Sea.

Moderated by BBC World News presenter, Yalda Hakim, the three thematic sessions structured the discussion platform between representatives of governments and international organisations, scientists, stakeholders in finance and ocean-related industries, as well as members of civil society. In their keynote speeches, government officials from the European Union, the Seychelles, Tunisia and Costa Rica, also defended the vision for a sustainable ocean and gave an overview of their countries' involvement in reaching international objectives in regard to the protection of marine ecosystems and reduction of the carbon impact.



today – conservation, the blue economy, ocean funding and multilateral efforts – we need to adopt a collective approach, reconcile our ambitions, strengthen political tools, mobilise civil society as a whole so that we can take action together without delay."

HSH Prince Albert II of Monaco



<u>"Our enemy is our</u> <u>attitude. We need to fight</u> <u>the status quo: this is</u> <u>essential for science and</u> <u>our survival. We cannot</u> <u>continue to live on a</u> <u>planet where the ocean</u> <u>is not governed. The</u> <u>ocean must become an</u> <u>international priority</u> <u>in our eyes."</u>

<u>HE John Kerry, United</u> <u>States Special Presidential</u> <u>Envoy for Climate</u>

A bold vision for ocean conservation

The need to drive a bold vision for ocean conservation was based on the input of speakers from the first session who suggested various ways to sharpen ambitions in order to address growing ocean challenges. "A bold vision should begin with a great idea and a calendar", suggested Minna Epps, IUCN global marine and polar programme director, noting that only ten years separated the announcement of the first man on the moon by John F. Kennedy and the moment when Neil Armstrong set foot on the moon's surface. "Achieving complete and effective protection of 30% of the ocean by 2030 needs to become our bold vision", continued the speaker. Representatives of the United Nations, governments and civil society from Europe and Africa in turn reasserted the importance of taking action for this target to fully protect one third of the ocean, whilst advocating the sustainable management of the entire ocean space.

BREAKING WITH THE PYRAMID SYSTEM

Discussions then focused on the plan to build in small island states, the first affected by ocean disturbances. *"Conservation should take into account the local socio-economic fabric"*, cautioned Tommy Melo, co-founder of Biosfera, an NGO set up in Cape Verde promoting the involvement of coastal communities in marine protected areas.

The issue of distributing funds allocated to ocean protection was discussed between the panellists. Since top-down measures are often poorly suited to the local realities, funding on a smaller scale could be deployed directly to local civil society organisations in order to overcome the administrative burden of major financial instruments. Intermediary structures act as vital links in the budgetary breakdown.

NEW JURISDICTIONS

The panel members called for a high-seas treaty to be finalised rapidly, in order to legislate areas located beyond national jurisdiction. In addition, they recommended that precautionary and polluter-pays principles be adopted. The implementation of a global ocean tax was examined, as well as a proposal for a legally binding international agreement on plastic pollution by the end of 2024. These ocean planning assumptions are aimed at ensuring the sustainable use of an increasingly busy ocean space.



"It is time to agree finally on specific protection for the Antarctic, our planet's thermostat and a land of peace, research and cooperation. A great deal of effort was necessary to determine the reasons and limitations for protecting these seas, and there is a large consensus to define three additional maritime areas which deserve to be protected."

<u>Teresa Ribera Rodríguez, Spain's Minister</u> for the Ecological Transition



© Jason Houston - The Nature Conservancy

THE SEYCHELLES, A LEADER IN MARINE CONSERVATION

The Seychelles have developed innovative and local tools to reconcile conservation with fair economic development. One of these tools is the development plan for the Seychelles ocean space, prepared with The Nature Conservancy and UNDP, the centre piece of which is the restructuring of the Seychelles' debt in exchange for the designation of 30% of its exclusive economic area (1.4 million km²) as a marine protected area. The debt-for-nature exchange will fund climate change adaptation through the management of coasts, coral reefs and mangroves.

In 2018, the Seychelles also launched the world's first sovereign blue bond to support sustainable fisheries and develop the blue economy, whilst at the same time extending marine protected areas.

THE KENYAN COAST. A SUCCESSFUL EXAMPLE OF THE BLUE **ECONOMY**

"A coalition between financial institutions. philanthropy, and Governments, the Global Fund for Coral Reefs is a 10-year, 625 million dollar blended finance instrument with the goal to finance innovative business models that increase the resilience of coral reefs and the communities that depend on them. A regional programme in Kenya and Tanzania is among the first projects supported by the new fund, the first one dedicated to Sustainable Development Goal 14. This funding has the potential to be transformative for local communities", noted Leticia Carvalho, coordinator of UNEP's marine and freshwater section in Kenya.



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MONACO BLUE INITIATIVE

Developing a sustainable blue economy

The purpose of the second session was to build on best practice and success stories in terms of a sustainable blue economy. Panellists from philanthropy, civil society and the private sector explored developments in interactions between economic activities and ocean conservation in order to define more effectively what constitutes a sustainable blue economy. According to the United Nations Environment Programme's financial initiative, a blue economy should offer inclusive and equitable economic benefits, restore the ocean ecosystems and be founded on clean technology, renewable energies and circular economy principles.

INCLUSIVE AND EQUITABLE

Ocean conservation stakeholders and funders are increasingly working with, instead of against, economic players. In some cases, such as illegal and destructive fishing, dissuasive tools are used to encourage new players to become involved. In other cases, a policy framework is necessary to prohibit harmful activities altogether. The Minister for Fisheries and the Blue Economy of the Republic of Seychelles stressed the importance of local solutions, mentioning the fishermen's community on Praslin Island (the archipelago's second largest island) which voluntarily stopped all fishing for 6 months during the reproduction period, significantly increasing fishery resources.

RESTRICTIVE

There is a broad consensus concerning incompatibility between a sustainable blue economy and the development of deep seabed mining and offshore oil and gas activities. *"The model that seems to be emerging for deep seabed mining is one of fast-paced and unbridled expansion in the ocean depths. This could begin within the next year and a half and would be extremely harmful", warned biologist Diva Amon, Director of the NGO SpeSeas. However, a recent study showed that 99% of the necessary data is missing, not to mention a regulatory and financial framework which would ensure a fair sharing of revenue.*

BIOECONOMY

Tiago Pitta e Cunha, Managing Director of the Oceano Azul Foundation & Oceanario de Lisboa (Portugal) advocated for a blue bioeconomy that helps to decarbonise: "In Portugal, forest owners can receive money for the ecosystem services provided by their forest. But we haven't yet found a way of doing the same for the ocean, which is not privately owned". By giving a value to ocean ecosystem services and carrying out an audit of the environmental and climatic impact on businesses, science and technology can play a key role in determining how damage can be prevented and positive alternatives for nature be developed. océanographique

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100 YEARS IN MONACO 100 years

SOLUTIONS FOR THE OCEAN / THE BLUE ECONOMY 33



<u>"Ultimately, we cannot</u> <u>change the ocean if we don't</u> <u>change the economy."</u> <u>Tiago Pitta e Cunha,</u> <u>Managing Director of the Oceano</u> <u>Azul Foundation & Oceanario de</u> <u>Lisboa (Portugal)</u>





"The blue economy offers us the opportunity to choose a global path to manage our development sustainably, critically reviewing each phase of our decision process." Jean-François Ferrari, Minister for Fisheries

and the Blue Economy of the Republic of Seychelles.

A native of Trinidad and Tobago, a small developing island state, deep-sea biologist, Director of SpeSeas, Diva Amon, called for the **creation of regional centres and ships dedicated to ocean research**. By opening ocean science to other territories, the latter would have a sustainable transforming effect, not only by training local experts on ocean issues, but also by allowing them to remain on site and be more efficient custodians of their ocean habitat.



MONACO BLUE INITIATIVE

Accelerator of blue finance

How can we accelerate the transition towards a positive economy for the ocean? This was the key question that was the main focus on the 3rd session of this event, devoted to blue finance. The first conclusion was that public and philanthropic funds alone cannot provide the substantial and sustainable funding necessary to reach crucial ocean restoration and conservation targets. The blue finance maritime landscape has evolved since the *Monaco Blue Initia-tive* 2021: banks and insurers are being urged to play a leading role.

They are supporting awareness and decision-making in the blue economy, not only to encourage activities promoting the ocean but to withdraw funding for harmful practices. "We also need to put an end to harmful subsidies – over 30 billion dollars of public funds is spent every year on destructive fisheries – and to reinvest these funds in ensuring 30% of the ocean space is protected by 2030 and the guarantee of a 100% sustainable ocean", pointed out Karen Sack, Director of the Ocean Risk and Resilience Action Alliance. France, tempered the remarks of the panel, pointing out that finance was only part of the solution. "Although it may be a trigger, it is governments that call the shots for making decisions and leading negotiations". Long overlooked in international climate discussions, "the link between ocean health and the climate has only just been acknowledged", pointed out the Portuguese Minister for Maritime Affairs, Ricardo Serrão Santos, in his introductory address to the panel at the climate conference in Glasgow in November 2021. Financial risks ensue, policy and financial levers exist. But they have to be put in place. "If we do not radically change the financial system's current risk/return framework, we will not be able to move the thousands of billions necessary", proclaimed Bertrand Badré, Managing Partner and Founder of Blue like an Orange Sustainable Capital.

Sylvie Goulard, Deputy Governor of the Banque de



The panellists focused on the ways in which financial resources from the private sector could be targeted to ocean conservation and sustainable activities. Re-designing the bank system to manage the transition towards a low-carbon economy, assess the impact of climate risks, channel finance so that it is productive and non-predatory, thus contributing towards a green economy rather than perpetuating the status quo... All these issues were discussed from a technical and philosophical point of view.



From left to right: Lucy Holmes, WWF / Karen Sack, Ocean Risk and Resilience Action Alliance / Elsa Palanza, Barclays / Bertrand Badré, Blue like an Orange Sustainable Capital / Sylvie Goulard, Bangue de France / Yalda Hakim, BBC World News.





COSTA RICA IS DOING ITS BIT

By expanding the Cocos Island National Park and creating a marine protected area, this Latin American country has increased its protected waters from 3% to 30%.



<u>"If we want to be carbon neutral and positive</u> <u>for nature by 2050, all countries need to</u> <u>take action now and to consolidate their</u> <u>conservation objectives quickly, even before</u> 2030, because this is the decisive decade." <u>Andrea Meza Murillo, Costa Rica's Minister</u> <u>of Environment and Energy</u>

NEW TOOLS

The panellists turned the spotlight on new blue finance tools, including the *Sea Change Impact Finance Facility*, the *Taskforce on Nature-Related Financial Disclosure*, and the *Network for Greening the Financial System*. Crédit Suisse mentioned a sustainable development bond focused on the ocean; an Ocean Engagement fund invested in listed securities. It is also a matter of debt-for-nature swaps and blue bonds. Targeting different categories of investor, these instruments have all been developed with partners from conservation and international development organisations.

Last, the session showed the way in which financial players can enter the ocean space in partnership with conservation organisations. New financial instruments and investment strategies are more than ever necessary for a blue and sustainable future.



"With its 1,300 km of coastline, Tunisia is seeking to intensify and support any cooperation aimed at improving the protection of common ecosystems, in order to meet sustainable development goals, as well as ensuring the wellbeing of the populations concerned." Leila Chikhaoui, Tunisia's Minister for the Environment



"The banking system dates back to the Industrial Revolution. We need to do better. It is not a question of creating an umpteenth system, because we can integrate the ocean into the work that has already been done on the climate in a large matrix." Elsa Palanza, Global Head of Sustainability and ESG, Barclays, United Kingdom



- 8.5 billion dollars: the risk value for the investment sector if ocean activity continued with no change,
- the shift to a sustainable development trajectory could reduce this risk by 5 billion dollars,
- 66% of companies listed on the Stock Exchange are exposed to risks related to declining ocean health. (sources: WWF, 2021)

BLUE INVESTMENT

Sustainable finance, a driver of the blue economy

This investment mechanism, gaining momentum in the marine sector, needs to come to terms with climate risks.

A conference on sustainable finance was held on the premises of the Monaco Scientific Centre (CSM) on Tuesday 22 March 2022, as a continuation of the *Monaco Ocean Week* 2021 event. Current manifestations of climate change, such as hurricanes and forest fires, are attracting attention regarding the magnitude, scope and urgent need to understand the physical hazards and to assess the impact and opportunities for the financial sector. Conducted by Nathalie Hilmi, an economist specialising in macroeconomics and international finance, Head of the Environmental Economy Section at CSM and IPCC member, then by Patricia Cressot, President of the *Monaco Women Finance Institute*, asset manager at *Rosemont International*, two panels followed one another, ranging from science to finance, and involving local financial institutes.

NATURAL CAPITAL AND SUSTAINABLE BLUE FINANCE

How can we address the environmental crisis which is detrimental to natural capital? George Jabbour, Professor of financial engineering and investments at George Washington University mentioned that "although the ocean is a source of concern (rising water levels, extreme weather events...), it is also a great source of hope, thanks to its potential in terms of the blue economy". Sustainable blue finance as a solution, in particular thanks to "sustainable bonds" or green bonds, is the leitmotiv of Alain Safa, President of CEMAFI International, who encouraged reflection on the European example seen from the angle of public-private interactions. The aim of these interactions is to create investment dynamics, especially since the ocean-related economy is expected to grow two-fold by 2030.

INTERRELATED ISSUES

A global and coordinated response is needed in regard to the climate situation, not only from the finance sector but also from civil society. This is the project put forward by Walid Al-Saqqaf, founder of Rebalance Earth, who presented the goal of this service platform for global ecosystems: *"We are working in partnership with companies that have committed to a zero net carbon footprint and who promote the protection of key species"*, the speaker explained.

To conclude, a video by Angelique Braithwaite, a marine biologist for over twenty years and a member of *Blue Finance*, was shown, presenting a case study on the protection of coastal areas promoting the development of hotel projects based on ethical and coastal protection principles.



10%: the cost of biodiversity loss to the global economy every year, (source: UNEP)

Over 3 billion people depend on the ocean every day.

INVESTMENT IN NATURE AND CLIMATE

PIONEERING APPROACHES

Considered an oxymoron for many years, the expression "sustainable finance" was the focus of the second half of the conference, which explored the role of the financial sector in the implementation of sustainable practices. Stéphane Herpe, one of the three speakers, Chief Investment Officer at CFM Indosuez Wealth Management, highlighted the good performance of businesses that invested in the environmental responsibility sector, via the Environment, Social and Governance approach. "Companies that anticipated strategies incorporating an ESG approach had better results than the others". This approach, encouraged by the expectations of younger generations, allows for a corporate innovation system with complete transparency, which helps to create a virtuous circle.



- 3,000 investments managed as SRI in Europe in 2021,
- In the United States, 1/3 of assets are managed as SRI.

THE SOCIAL IMPACT OF INVESTMENTS

The question regarding the social impact of investments is also the core of the project run by Agricorp, a member of the *Ressources Monaco* group, a global organisation specialising in natural resources. Managing Director, Frédéric Damasie, showed how Agricorp's undertakings, primarily in Africa, were consistent with the promotion of sustainable farming and the link between humankind and the economy, for example through sustainable projects in Madagascar, chiefly for the benefit of small-scale vanilla growers and their communities.

The strategic choice made by CFM Indosuez is focused on the development of investment funds active in the blue economy with the following levers: smart shipping, job creation, protection of coastal populations, waste management in the marine environment, conservation of marine life, renewable energies, fight against unequal fisheries..., for sustainable, profitable investments and a return with social impact.

The social impact of an investment also requires a rapprochement between the producer and the client, in the fisheries sectors, believes the President of the *Association des Investisseurs Responsables de Monaco* and founder of *Wealth Monaco*. By showing counterexamples which alienate the producer from the client, Joana Foglia demonstrated the need for the values of an inclusive economy.



<u>"Socially responsible investing (SRI)</u> is no longer a niche phenomenon but a genuine groundswell." Stéphane Herpe, Chief Investment Officer at CFM Indosuez RE ITIFIQUE ONACO 38

E-EDUCATION

Towards environmental awareness 3.0

How could digital technology improve environmental education and awareness? This was the focus of the conference hosted by the MERI Foundation at the Monaco Scientific Centre on 23 March 2022.

QU

In France, 80% of students expect a catastrophic future with regard to the climate and the extinction of species (*La Croix survey, 2021*).

ENTRE

IENTIFIQUE

MONACO



FNTRE

OUF

CENTRE

SCIENTIFIQUE

DE MONACO

CLIMATE E-EDUCATION

Often overlooked during environmental debates, education on climate change is nonetheless crucial. Digital technology offers high-quality global environmental education platforms. The Office for Climate Education (OCE), under the aegis of UNESCO, promotes climate change education at an international level thanks to a collection of educational tools produced in cooperation with international experts : "It is vital that teachers around the world have access to free educational resources produced from IPCC data, but also to professional development based on the best climate and teaching research", says David Wilgenbus, CEO of OCE, who stresses the importance of educating all levels of the educational chain on climate issues. Because a review of the educational context has shown substantial gaps, the new climate situation being the focus of awareness rather than actual learning.

As Juan F. Davila y Verdin, Director of FutureED explains, "there is no sustainability without long-term environmental and climate education". Going beyond a purely academic framework, the FutureED platform enables a wide range of users to access trustworthy scientific content presented in layman's terms, thanks to online courses.

APPLICATIONS ET AI

Tim Spuck, Director of the Education and Public Engagement network at Associated Universities Inc, appreciates the role of digital technology in the dynamics of connection, global cooperation and inclusion, facilitating "the union of inter-generational forces to combat climate change". Artificial intelligence and citizen science could be combined to come up with an environmental monitoring system 3.0 capable of sending live warnings to scientists and policy makers based on the data uploaded by citizens via their telephone. The panel did not omit to address the question of the environmental responsibility of digital technology, "particularly in terms of the extraction techniques for minerals needed for mobile phones".

The environmental education application TerritoriAR is an example of e-education connected to the ground. Developed since 2018 by the Caserta Foundation in association with the MERI Foundation and 3 emblematic nature reserves in Chile, it provides the geographical location of trails, geological landmarks, species of flora and fauna, and promotes interculturality, using enhanced reality multimedia capsules. How whales change climate

https://www.youtube.com/watch?v=M18HyXyeach

FASHION FOR THE PLANET

menaco ocean week

#MOW2022

Focus on sustainability and the positive impact

A loyal participant of *Monaco Ocean Week*, the association *TAF-The Animal Fund* has focused on two areas that have a strong impact on the ocean: fashion and financial investment.

On Thursday 24 March 2022 in the meeting room of the Monaco Yacht Club, the conference began with a presentation of the association presided over by the vibrant Berit Legrand.

MORE SUSTAINABLE FASHION

The event open to the general public continued with one of the partners of *TAF-The Animal Fund*, Angelo Legrand, Founder of the responsible clothing brand *R4 Clothing*. The young entrepreneur drew attention to the devastating effects of the fast fashion industry on the ocean and the importance of moving towards sustainable fashion structured around circularity, transparency, innovation and respect for the environment.

MORE RESPONSIBLE INVESTING

The floor was then given to the representative of the asset management company *2PM Monaco* who spoke about sustainable investment procedures, and more specifically the alignment of client investments with their Environmental, Social and Governance (ESG) values. Increasingly widespread, the attention to investment purpose and the trend towards a positive impact investment should be extended to the corporate sector *"in order to put an end to ecological laundering"*, insisted Louis Legrand, underlining the importance of this new finance tool.

The event, which was open to all, concluded with a call for more transparency and responsibility in these sectors of the economy which have repercussions on the health of the ocean and of marine mammals.

IN FIGURES

 8% to 10% of global carbon dioxide emissions generated by the fashion industry, (source: UNEP)

39

- 35% of microplastics released into the ocean are said to come from textile washing, (sources: IUCN)
- 1% of the materials used in clothes manufacturing is recycled. (source: Ellen MacArthur Foundation)

NATURE-BASED SOLUTIONS

The Seaweed Revolution

The Oceanographic Museum of Monaco hosted *Seaweed Day*, an event bringing together seaweed ambassadors, seen as an ocean-based sustainable solution and offering innovative economic opportunities.

The afternoon of 24 March 2022 opened with an overview of the full potential of seaweed. In his welcome address, the Director of the Oceanographic Institute, Robert Calcagno, said that "companies with a focus on seaweed are at the intersection of ocean conservation and economic growth". The Oceanographic Institute positioned itself in its unifying role and facilitator of solutions that have seaweed as their DNA. "The seaweed-focused community was very small, but it is rapidly developing. We are pioneers and by 2030 in Europe the market will be worth 9.3 billion Euros, reducing up to 5 million tonnes of CO2 every year and creating 115,000 jobs", added former European Commissioner for Maritime Affairs, Maria Damanaki. "The aim of this event is to show that things are really falling into place in the seaweed industry", said Adrien Vincent, Director of Seaweed for Europe, who stressed the key role of science and investors in the development of a European seaweed economy.



PROFILE



Created in 2020, the mission of the coalition Seaweed for Europe is to accelerate the development of a sustainable seaweed industry in Europe. It groups together 100 members from 16 countries.

IN FIGURES

- 10,000 species of seaweed,
- 35 million tonnes/year: global production of seaweed,
- 97% of production is cultivated, 3% of production is derived from wild seaweed,
- 56 producer countries,
- 95% of production comes from Asia,
- x3: the number of seaweed start-ups and companies in Europe in 10 years.

SEAWEED CHAMPIONS

Various pioneers in the seaweed sector mounted the rostrum during *Seaweed Day*, presenting the deployment and economic trajectory of their company as their vision. Tomorrow's superfood, seaweed may well play a role in the food security sector (*HQ Seaweed, This is seaweed, Seadling, Oceanium*).

This promising industry may also have a strong environmental impact: Mikael Westerlund, creator of the pilot plant *Origin by Ocean*, elected one of the 5 most promising start-ups in Finland, highlighted the merits of a seaweed biorefinery to fight against plastic pollution and ocean eutrophication, major environmental challenges. The Director of Investment Funds for the Regeneration of Ocean Health, *Swen Blue Ocean*, supported by IFREMER, considers this industry to be "a way of producing low-carbon", which could represent "a productive alternative enabling us to reduce methane production from cattle breeding".



For the duration of *Seaweed Day*, the hall of the Oceanographic Museum was transformed into a showcase of pioneering seaweedbased products and prototypes, foods in biopackaging, as well as textiles and cosmetics, and even a signing session with Vincent Doumeizel for *La révolution des algues* (Equateur, 2022).

A PROMISING INDUSTRY IN EUROPE

A detailed analysis of 223 European seaweed companies, published by **Seaweed for Europe** in a 2021 report, shows that the last ten years have been marked by an extremely high trajectory: *"The European pipeline does not only comprise businesses in the start-up phase, but also quite commercially mature businesses. It is extremely solid"*, Jennifer Ring from Seaweed for Europe, remarks. *"30% of these businesses are not dedicated to a single application, because seaweed offers a whole range of applications, sometimes with a zero-waste objective"*. From an investment point of view, the seaweed market is becoming increasingly attractive, the amount invested has multiplied by a factor of 23 since 2012.

Launched in February 2022, **EU4Algae** is a brandnew collaborative e-platform whose goal is to disseminate information on the seaweed sector in Europe. "We are trying to see how this sustainable and regenerative production method can be optimised, we are developing support mechanisms for the seaweed business, as well as ocean farming in the countries of Europe", says Maris Stulgis, European Commission DG MARE and Head of EU4Algae.

SEAWEED AND BLUE CARBON: A GROUND-BREAKING STUDY

The second session provided the exclusive opportunity to unveil the study⁴ on carbon sequestration by seaweed, produced on the initiative of NGO Ocean 2050. Its president, Alexandra Cousteau, wasted no time in introducing eminent marine ecologist Carlos M. Duarte, Professor at the King Abdullah University of Science and Technology (Saudi Arabia) and Chief Scientist at Ocean 2050. The latter pointed out that "wild seaweed contributes to carbon sequestration at the same level as seagrass, mangroves and salt marshes all combined". The study, led by the Professor, took samples of sediments (3,300 samples) located under 21 seaweed farms across the globe to determine the carbon sequestration potential. Some have existed for 3 years, others, such as the one in Tokyo Bay, have been there for 300 years. Covering an area varying from 1 hectare to 150,000 km², each farm has a unique layout. The methodology used to assess carbon sequestration was based on the analysis of accumulated carbon stocks carried out by Professor Antonio Delgado at the Andalusian Institute for Earth Science Research (Spain), as well as the dating of the various soil strata by Doctor Pere Masque from the UN International Atomic Energy Agency (IAEA) in Monaco.

4. "A seaweed aquaculture imperative to meet global sustainability targets", Carlos Duarte et al., Nature Sustainability, October 2021.

IN FIGURES

- 2/3 of seaweed farm soils have high levels of organic carbon,
- 2 tonnes of CO₂ / hectare: the annual average level of carbon sequestration.

SEAWEED FORESTS: THE AMAZON OF THE SEA

 7.2 million km², i.e. the equivalent of the Amazon Forest which borders the planet's coastlines. (source: Duarte et al., 2022)





AQUACULTURE WITH A POSITIVE IMPACT

Founded in 2020, the *Kelp Forest Foundation* studies the environmental impact of the first giant kelp farm, deployed off the coast of Namibia according to a strict ecological protocol. Training local scientists, the Foundation uses 4 distinct methods, including bioacoustics and environmental DNA, to analyse the biodiversity of the site, as giant kelp can provide a habitat for some 800 species.

Based on the data collected on the Great Barrier Reef, an endangered ecosystem, the **Australian Seaweed Institute** identified seaweed farming as a solution for the future and has launched a large-scale impact study. "Currently, seaweed farms are considered first and foremost as rendering an environmental service, through carbon sequestration or methane emission reduction, before being considered a commercial service: we have changed our approach", says Jo Kelly, Director of the Institute.

AN INNOVATION SECTOR

Water soluble or edible innovative packaging (Notpla, FlexSea...), biostimulants (*Climate Foundation*), a commercial website to develop the seaweed market (Placedesalgues.fr), start-up accelerator (Katapult Ocean)... Pioneers presented their concept to the participants of *Seaweed Day*.

A COALITION FOR FOOD SECURITY

The lack of international regulations in terms of food security is a critical point for the development of the seaweed market. The meeting urges cooperation and brings together today speakers from the seaweed industry from 70 member countries. *"Everything has to be based on science, we don't want to repeat the mistakes we made with land farming. Science is the locomotive of the global coalition for food and environmental security which brings together 70 member countries", confirms Vincent Doumeizel, Ocean Advisor for the United Nations Global Compact, Director of the Food Programme at the <i>Lloyd's Register Foundation* in London.

The coalition also identified certain risks for producers, as explained by the Director of the Safe Seaweed Coalition, Professor at CNRS, Philippe Potin: *"The key concern is hidden content, such as arsenic, which prevents us from putting these products on the market, or issues relating to the introduction of new species and ecosystem disturbances"*. To harmonise approaches, the coalition has established a protocol.

BLUE FOOD FOR ACTION Changing the trajectory of ocean crises

Following a first publication resulting from the previous *Monaco Ocean Week*, the Varda group and its partners brought together ocean scientists, governance experts and those involved in ocean protection in order to continue avenues for reflection and actively prepare the future United Nations Ocean Conference.

"Shouldn't the plastic waste policy be modelled on the policy developed successfully in the 1980s for radioactive waste which consisted in no longer treating it as diluted and dispersed elements but in identifying it as permanent radionuclides in the biosphere?", questioned the members of the Varda Group in the article "From Blue Food for Thought to Blue Food for Action", published with the support of the Prince Albert II of Monaco Foundation. This document led to a rich discussion encouraging the authors to prepare this new webinar, the first of a series of consultations whose conclusions will be presented in Lisbon at the end of June 2022.

BOLDNESS OR THE WIND OF CHANGE

How can we scale up the proposals updated last year so that they constitute a roadmap for ocean management? This was the dynamic that drove this round table organised within the Prince Albert II of Monaco Foundation. "We need bold approaches, as pointed out by John Kerry, US Special Presidential Envoy for Climate, and this process is a fine example" initiated Rémi Parmentier, Director of the Varda Group. Swiss philanthropist Dona Bertarelli, an advocate for ocean conservation, added: "There are high hopes for the 30% protection target by 2030, but we need to think bigger and complete what is already underway".



AN EXPERT AND COLLABORATIVE VISION

Romain Troublé, Director of the Tara Ocean Foundation, convinced the attendees of the need to create stronger and collaborative policies, as well as new tools. Experts agreed on the need to support ambitious protection goals, putting the protection of marine areas (High Seas, deep seas, marine protected areas) before any operational issues. The creation of sciencebased ocean management with "a holistic perspective which allows the management of biodiversity, fish stocks, minerals, energy, carbon and contaminants" was encouraged by Lisa Levin, Director of the Centre for Marine Biodiversity and Conservation at Scripps Institution of Oceanography in California.

An overview was made on geopolitical issues in the Antarctic and Mediterranean challenges in terms of marine protected areas. In Vladimir Ryabinin's opinion, Executive Secretary of UNESCO's Intergovernmental Oceanic Commission, this type of high-potential collaborative process may contribute to "codesigning" the Ocean Decade.

CHANGING THE TRAJECTORY OF OCEAN CRISES

Doing more, in a more targeted and coordinated manner, changing perspectives by promoting Nature-based Solutions, considering a global ocean and regional ocean management, or a global fisheries surveillance platform... This is the approach developed in this transdisciplinary workshop which suggests, by generating ideas, to offset the *"imagination crisis"* we are experiencing, as diagnosed by Markus Reyman, Director of the cultural NGO Academy TBA21, advocating social and environmental justice.

5 SOLUTIONS IDENTIFIED FOR A MORE SUSTAINABLE OCEAN

- 1. Make sea protection the norm rather than the exception
- 2. Generalise the digital management of large fish populations
- 3. Implement agreements to end public funding for overfishing
- 4. Consider, in political decisions, microplastics like radioactive waste in the past
- 5. Set up regional ocean management organisations

46 SOLUTIONS FOR THE OCEAN / NATURE-BASED SOLUTIONS

NATURE-BASED SOLUTIONS

Socio-ecological challenges and role of marine sanctuaries

In addition to their action in protecting ecosystems, marine protected areas and marine sanctuaries appear to be a key response to the main societal concerns of our era, even an investment for the future. Throughout the 20th Century, nature conservation remained a secondary issue, outside national and global decisions and agendas, sometimes even deemed a barrier to development. Natural ecosystems are currently at the heart of society's concerns: Nature-based Solutions (NbS) are increasingly considered essential to resolve the bioclimatic crisis. The event organised by the permanent secretariat of the Pelagos Agreement and the Monaco Scientific Centre on 23 March 2022 turned the spotlight on the role of marine protected areas (MPAs) and marine sanctuaries in the protection of marine and coastal ecosystems, environments on which the sustainable future of our society truly depends.

KEY**FACT**

The Pelagos Sanctuary is a maritime area covering 87,500 km² pursuant to an agreement signed in 1999 between Italy, Monaco and France to protect the marine mammals found there. The Sanctuary is classified as a Specially Protected Area of Mediterranean Importance (SPAMI).

THE PELAGOS SANCTUARY, AN ECOSYSTEM UNIQUE IN THE WORLD

Moderated by Costanza Favilli, Executive Secretary of the Pelagos Agreement, the first panel focused on the bioecological characteristics of the Pelagos marine sanctuary and the impact of anthropogenic activities on this preserved area of the Mediterranean region. *"Although some types* of damage (pollution, overfishing) are reversible, others aren't (land urbanisation)" pointed out marine ecologist Paolo Guidetti from the Genoa Marine Centre before recommending making a portfolio of Nature-based Solutions available (green infrastructure, restored and/or protected ecosystems by means of effective and equitable MPAs, use of biotechnology) adapted to the types of ecosystems found in the Sanctuary.

OCEAN CURRENTS CONDUCIVE TO MARINE LIFE

Marine biologist Lars Stemmann, Professor at the Laboratory of Oceanography in Villefranche sur Mer, presented Mediterranean coastal circulation patterns: "Atlantic waters, with low salinity, enter via the Gibraltar Strait then divide into two branches: Northwest and East. This circulation is complemented by deep vertical currents which distribute the bodies of water from east to west." "Unique in the seas of the globe", it has a nerve centre: the Pelagos Sanctuary. That is why the latter hosts a concentration of various nutrients, especially in the Spring when phytoplankton blooms occur. These microorganisms withstand a greater diversity of species and a wide biomass of marine fauna and flora (from zooplankton to cetaceans) and sequester carbon to depths of up to 2,000 metres. However, the scientist warns that *"with climate change, water circulation in the Mediterranean may be adversely affected, which will modify marine organic production".*

CETACEANS UNDER PRESSURE

The Pelagos Sanctuary is one of the largest feeding habitats for the Mediterranean fin whale population. Consisting of 2,500 mature individuals, in a steady decline, the fin whale has moved from "vulnerable" to "endangered" species on the IUCN list. As Sabina Airoldi, Project Director at the Tethys Research Institute in Milan, points out, "in this extremely dense shipping area, one of the biggest threats weighing on this species is vessel collision". A hazard which also concerns sperm whales in the area, increasingly spotted in family groups: "Females and juveniles remain on the surface longer than solitary males, which increases the risk of collision". Sound and chemical pollution, together with driftnets add to the threats which hang over the 8 species of cetaceans observed on a regular basis.

DEFINING STRATEGIES

What strategy should be developed to secure the Sanctuary and limit the impact of human activities? Federico Niccolini, a researcher in political science at the University of Pisa, looked into the possibility of educational programmes and eco-volunteers to strengthen links between nature and society: *"With few resources, you can bring about substantial economic and social change in order to conserve natural spaces"*.

ACCOUNTING IMBALANCE

Moderated by Nathalie Hilmi, Head of the "Environmental Economy" section at the Monaco Scientific Centre, the second panel discussed the economic and financial role of marine protected areas and marine sanctuaries. To what extent can Nature-based Solutions become an investment which is beneficial to society?

Whales, seagrass, mangroves... What financial tools are available to reinforce the role of blue carbon sinks in carbon sequestration? What value should be given to blue carbon? "The markets are not taking it seriously because there is no identifiable owner or manager. In order for them to take it into consideration, we need a legal framework which will give nature rights", said Ralph Chami, economist at Blue Green Future, mentioning the pioneers in this field, namely Chile, New Zealand and the Czech Republic.

Questioning the limitations of a natural capital approach, Ekkehard Ernst, Chief Macroeconomist at the International Labour Organisation, insisted on the need for an assessment mechanism for this capital which takes into account environmental concerns and priority areas, particularly for developing countries.



Patricia Morales, Managing Director of the Chilean Foundation Filantropía Cortés Solari, pointed out the advantages of blue carbon, with the ocean sequestrating more carbon than the forest or earth, whilst highlighting an *"accounting imbalance"* to the detriment of the ocean: *"We need to make rational decisions after scientifically assessing the services rende-red by marine ecosystems"*, she put forward, praising science-backed strategies. A point of view endorsed by the seminar's conclusions.

<u>"When a marine protected</u> <u>area is created, we make</u> <u>a cultural choice to protect</u> <u>an environment and the</u> <u>ecosystems contained within."</u> <u>Paolo Guidetti, marine</u> <u>ecologist at the Anton Dohrn</u> <u>Zoological Station (Italy)</u>

in Figures

- 1 trillion dollars: the value of carbon sequestration ecosystem services provided by seagrass worldwide,
- 2 million dollars: the value of carbon sequestration ecosystem services provided by a whale.

(sources: N. Hilmi, R. Chami et al., "The Role of Blue Carbon in Climate Change Mitigation and Carbon Stock Conservation", Frontiers in Climate, septembre 2021).

INNOVATION

Technological innovation for the ocean's benefit



The final panel of the afternoon took place at the Monaco Scientific Centre. Coordinated by the MERI Foundation, it brought together 4 world experts with the focus on technological innovation for the entire benefit of ocean-based solutions and marine ecosystem services.

URGENCY TO FOCUS ON NATURE

Building on the data of the IPCC's sixth report, German climatologist Hans-Otto Pörtner, co-President of the task force for this report, points out the extent to which the ocean environment is being impacted by changes of unknown scale and the devastating consequences. In this critical context resulting from climate inaction, "Nature-based Solutions" seem to be a necessary way out for planetary health. They have the benefit of no longer dissociating initiatives to promote the climate and biodiversity, and of triggering long-term change.

A RANGE OF BLUE SOLUTIONS

Among the urgent measures recommended by the climate task force, formalised in 2016 by the International Union for the Conservation of Nature, Nature-based Solutions are growing, especially with regard to the restoration of marine ecosystems. These solutions, explains Nathalie Hilmi, economist at the Monaco Scientific Centre, involve various players and different sectors: blue carbon sequestration thanks to the regeneration of underwater and coastal vegetation, restoration of marshes and mangroves, among the most endangered habitats on the planet (particularly due to aquaculture and prawn farms)...

USING BIOACOUSTICS

Other initiatives are emerging, such as those guided by bioacoustics, a science able to diagnose an ecosystem's state of health. Providing a snapshot of the current situation, bioacoustician Michel André, Director of the Laboratory of bioacoustic applications in Barcelona, moreover showed the negative impact of sound pollution on communication between marine species.

"Ocean preservation depends on a precious equilibrium", adds the marine biologist Sonia Español-Jiménez, who presented the initiative *Blue BOAT*⁵. Sponsored by Chile's Ministry of the Environment and developed in cooperation with the MERI Foundation, of which she is the Executive Director, this innovative acoustic and oceanographic surveillance system designed for vessels, aims to conserve and protect whales, whilst monitoring the ocean and developing marine ecosystem services, in particular those relating to the role of whales in carbon sequestration, and therefore in climate change mitigation.

5. Buoy Oceanographic Alert Technology.



- 93%: the excess terrestrial heat absorbed by the ocean, (source: IPCC)
- 1 to 2%: the global annual rate of decline of mangrove coverage. (source: "Getting the shrimp's share. Mangrove deforestation and shrimp consumption, assessment and alternatives", IDDRI, 2019)

CLIMATE CHANGE

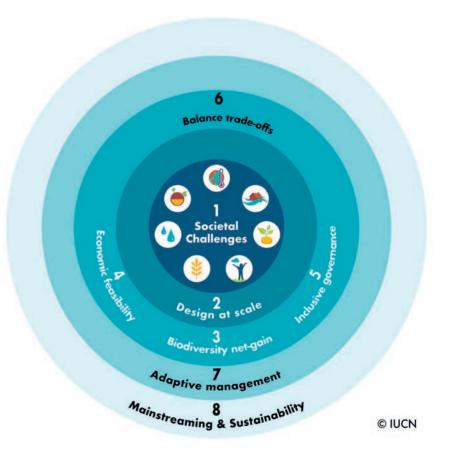
Nature-based Solutions in the Mediterranean

Rendered fragile by the climate crisis and loss of biodiversity, the Mediterranean Basin is counting on Nature-based Solutions, encouraged by the International Union for the Conservation of Nature (IUCN).

"Geostrategic challenges of the 21st century have placed the ocean at the heart of discussions again", pointed out HE Bernard Fautrier, Minister Plenipotentiary, Special Advisor to HSH the Sovereign Prince on environmental issues, at the beginning of the meeting on 25 March 2022, organised by IUCN. And what if the protection of marine and coastal ecosystems enabled us to combat the effects of climate change? And if the main challenges facing society in the Mediterranean were very closely tied to the health of this cradle of biodiversity? *Monaco Ocean Week* could not address the Mediterranean situation without encouraging the use of Nature-based Solutions.

A GLOBAL STANDARD

Governed by IUCN which developed an operational framework, the concept which was developed at COP 21 is anything but abstract. Nature-based Solutions now meet a global standard consisting of 8 criteria and 28 indicators. This standard is a practical tool which makes it possible to assess projects scientifically in very different situations and in the long term, and to ensure global coherence. Restoration of forest landscapes, integrated management of water resources, climate change adaptation and mitigation based on ecosystems that capture and store carbon, natural disaster risk prevention based on ecosystems that act as shock absorbers for drought, flooding and rising sea levels... "These proven practices should be used in the appropriate situations and meet the Standard criteria", stresses Sébastien Moncorps, Director of IUCN's French committee.





Nature-based Solutions could provide around 30% of cost-effective mitigation measures needed by 2030 to stabilise warming to below 2° C. (sources: UICN)

PROJECTS UNDER WAY

Risks relating to rising sea levels, soil salinisation, floodings, anthropogenic pressure along coasts, growing tourism... François Simard, IUCN's Senior Advisor for Fisheries, outlined the key Mediterranean issues before giving an overview of the initiatives to strengthen climate resilience in the Mediterranean thanks to Nature-based Solutions (NbS). Among the projects under way, the MedCités network, which is working of the application of NbS standards in 44 Mediterranean cities, and the Life programme's initiative, *Blue Natura Andalucía*, which promotes wetlands and seagrass in Andalucía as carbon sinks.

The Director of the Tour du Valat programme, Raphaël Billé, gave details on the case of ponds and marshes in Camargue's salt fields. How can this moving delta, still young, with an ageing diking system, cope with climate risks (coastal erosion, risk of submersion, soil salinisation...)? A hybrid solution seems close at hand, coupling the conservation of secondary dikes with an increased connection between the lagunes and sea, which needs to be taken on board by the players operating in a complex territory, involving both tourism and farming.



Nature-based Solutions (NbS) are actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature. (IUCN, 2016) Closing the session, the global network *Sea'ties* was in turn presented with an inspirational overview of adaptation solutions for coastal towns exposed to rising sea levels (see subject p.81) Spatial reconstruction efforts along the coastline in Sète and restoration of the dunes were given as examples by Lisa Devignol, Project Manager at the Ocean & Climate Platform, stressing the need to further integrate natural ecosystems in highly urbanised areas.

POSIDONIA MEADOWS, PROBLEM OR SOLUTION?

An emblematic species of the Mediterranean, Posidonia meadows form an ecosystem conducive to the maintaining of marine biodiversity, with repercussions on fish populations and stocks. These seagrasses also play a role in coastal conservation and carbon sequestration. These flowering marine plants lose their leaves each year, which wash up on beaches, often forming thick banks. Up to now deemed problematic for tourism, they are removed by heavy duty machinery which promotes erosion. However, through the lens of NbS, seagrass can be considered a carbon sink and a solution to protect coastlines and biodiversity. Effects that blue and sustainable tourism will consider positive.



INNOVATIONS

The Ocean Decade under the banner of innovation

After the One Ocean Summit in Brest, Monaco Ocean Week has established itself a landmark event for the United Nations 2022 calendar in the Ocean Decade's launch phase.

For this event, a steppingstone towards the objective of the United Nations Ocean Conference which will take place in Lisbon in June 2022, the Intergovernmental Oceanographic Commission of UNESCO set up an innovative panel of speakers from various sectors including industry, research, finance and philanthropy, with the focus on co-designing ocean solutions. On Tuesday 22 March, under the chair of Julian Barbière, Global Coordinator for this United Nations programme, several representatives were invited to the Monaco Yacht Club to present their innovation process and the benefits of such actions for the ocean.

INNOVATION OF ALL KINDS

Jamie McMichael-Phillips, Director of *The Nippon Foundation-GEBCO Seabed 2030 Project*, summarised the scope of the ten-year seabed mapping programme which he runs, and which generates key information for anticipating ocean-related hazards, among other things. Working for Odyssey, a global ocean observation project, Mathieu Belbeoch, Director of the Centre Ocean OPS, shared his ambition to involve a wide community of professional sailors, commercial ships and other sea users in the data collection phase which will complement the collection carried out by States. Open-mindedness of the scientific community, diversity of players able to contribute to data collection, types of technology used... The speakers represented various facets of the innovation.

A young coordinator for the *Citizens of Surf organisation*, also endorsed by the Ocean Decade, Natalie Fox focused her innovation on the integration of local communities and young researchers and professionals in the dynamics of civic science. Also, in view of improving the well-being and economy of local communities, Chief Scientist Climate & Oceans at the Norwegian Institute for Water Research, Richard Bellerby, spoke of successful collaborations with governments and local authorities in Norway and the United States, explaining the way in which data on ocean acidification were used to improve the management of aquaculture and seafood production in these regions.



United Nations Decadeof Ocean Sciencefor Sustainable Development

THE CONTEXT

The mission of the **Ocean Decade** (2021-2030) is to catalyse transformative ocean science solutions for sustainable development, connecting people and our ocean.

INVESTMENT, A KEY ELEMENT OF THE ECOSYSTEM

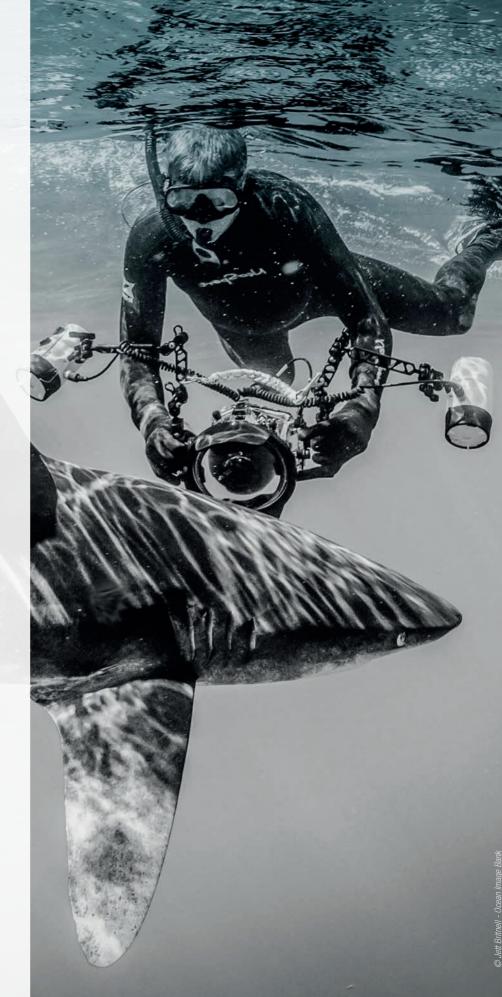
The second part of the conference focused on financial resources as the very foundation of innovation. Impact investing, which serves ocean science, is an emerging investment solution, as Jonas Skattum Svegaarden, Director of Katapult, demonstrated when presenting a coalition of 1,000 start-ups, all with the Ocean Decade seal of approval.

The private sector can in turn become a leader in innovation and Ocean Decade label facilitates the deployment of resources and innovation in terms of investment, as confirmed by Brian Tsuyoshi Takeda, at the head of *Urchinomics*, an accredited company which helps to restore kelp ecosystems.

But more than anything else, given that the whole Decade is based on the idea of a necessary alliance between science, local communities, decision-makers, industrialists, and financiers, it is the co-design process which seems to be at the heart of all potential, as brilliantly demonstrated by Angela Bednarek, Director of *The Evidence Project, Pew Trusts* who is seeking to convince a network of philanthropists to invest in this process.

As this decade kicks off, the hopes are high, but the courses of action are being defined and organised. *"Solutions already exist that are based on ocean knowledge and there is room for many partners to join the momentum of the Ocean Decade"*, proclaimed Alison Clausen, Programme Specialist at the Marine Policy and Regional Coordination Section of the Intergovernmental Oceanographic Commission of UNESCO, which initiated the event.

SOLUTIONS FOR THE OCEAN / INNOVATIONS



OCEAN INNOVATORS Platform

"OCEAN INNOVATORS" DAY

A blue innovation ecosystem

The 2022 edition of *Monaco Ocean Week* featured a new flagship event which turned the spotlight on sustainable solutions and innovations to preserve marine life and accelerate the ecological transition.

On 23 March, within the walls of the Monaco Yacht Club, the Prince Albert II of Monaco Foundation invited world leaders involved in the areas of blue carbon, development and sustainable and blue investing, regenerative aquaculture, the fight against plastic pollution and coastal conservation, to present their initiatives. These individuals offering futureoriented solutions for the ocean took the floor during the 6 round table sessions throughout the day. As solutions and approaches converged, the change towards a true blue economy began to take shape, and with it, the possibility of building bridges between various players, of breaking silos and of learning to co-design. "We need to adopt ambitious multidisciplinary approaches commensurate with the alerts raised by the IPCC's latest reports, to link environmental challenges to the current economic situation, to upscale existing blue solutions", introduced Olivier Wenden, Vice-President of the Prince Albert II of Monaco Foundation. Julien Barbiere, Coordinator for the Ocean Decade launched by the Intergovernmental Oceanographic Commission of UNESCO, urged the attendees to "develop an ecosystem of action, a supportive environment based on ocean science".

ROUND TABLE 1

CLIMATE CHANGE MITIGATION AND BLUE CARBON

To address the climate emergency, many countries, institutions and companies have pledged to reach carbon neutrality by 2050. In addition to emission reduction, carbon sequestration is an important tool for reaching this goal. Often less factored in than terrestrial forests in this role, marine ecosystems can in fact absorb large quantities of carbon. Innovation plays a key role in the development of these highly efficient carbon sinks.

This round table presented a range of ocean-related technological innovations by the *Sustainable Ocean Alliance* and turned the spotlight on existing and extremely promising blue carbon projects based on the restoration of some marine ecosystems.

The kelp-based marine reforestation initiative developed by *The Climate Foundation* and the restoration of coral reefs and mangroves set up by *Tenaka* in the Indian Ocean are already showing results. *Whale Seeker* is supporting a carbon credit programme for whales and points out the need to export carbon credits to marine ecosystems and to use artificial intelligence. Finally, as the representative of *European Lead* pointed out, we should bear in mind that blue carbon initiatives also create jobs.

 1 whale sequesters
33 tonnes of CO₂
An ecosystem service provided by thousands of trees.

ROUND TABLE 2

THE IMPORTANCE OF BLUE FOOD

With global consumption increasing two-fold over the last fifty years, ocean-based food resources should be managed responsibly and sustainably. The session brought together innovative entrepreneurs selected among the best innovators taking part in *Uplink's Blue Food Challenge*. They shared their vision for the future of this industry, discussed food security issues and the way in which blue food could contribute to the advent of a global sustainable food system.

The importance of promoting small-scale fisheries, whose carbon footprint is very low, was stressed (*ABALOBI ICT4Fisheries*), as is the regeneration of the ocean's no man's land, areas damaged by pollution (*Urchinomics*) and the development of seaweed-based aquaculture (*Sea6 Energy*). And to have a positive impact on the supply chain, consumption patterns can be focused on sustainability thanks to the implementation of campaigns, such as "Mr. Goodfish", launched in the Southeast region by the Prince Albert II of Monaco Foundation following the success of conservation efforts regarding blue fin tuna fish stocks in the Mediterranean.



THE "MR. GOODFISH" CAMPAIGN

launched in 2010 by 3 major European

aquariums and coordinated by the Prince Albert II of Monaco Foundation

- 1 study on the status of fish stocks for 40 species in the Mediterranean,
- 2,450 professionals involved,
- 400 partner restaurants,
- 2,500 educational booklets distributed.



ROUND TABLE 3

BUILDING SUSTAINABILITY IN COASTAL AREAS

To address the significant impact of growing human and environmental pressures in coastal areas, the panel handed the floor to "ocean-entrepreneurs" who implement innovative solutions to promote the transition to sustainable coastal areas.

To protect against rising sea levels, new nature-based technology (*Blue Action Lab* which launched 8,000 hectares of mangrove restoration work in the Bahamas) or innovative materials such as biocompatible and eco-responsible concrete (*ECOncrete*), were showcased, insofar as they are used in several port, coastal and offshore projects across the globe. *Eco Wave Power* identified the development of clean wave power from existing infrastructure as a means of empowerment. Support for technological expertise is equally important with the monitoring of coastal ecosystems thanks to environmental DNA and big data (*NatureMetrics*). Moreover, priority should be given to coastal communities, the first to be affected by climate change, as pointed out by the moderator, the Director of *Ocean 14 Capital*.

<u>"We have a multitude of</u> <u>crises to manage (biodiversity,</u> <u>climate) which cannot be</u> <u>addressed separately, we need</u> <u>to prevent collapse thanks to a</u> <u>multitude of activities."</u> <u>Jeff Stoike, Director of</u> <u>International Operations</u> <u>at Blue Action Lab</u>

ROUND TABLE 4

ROUND TABLE 5

INVESTING IN OCEAN INNOVATORS

Although the number of innovative ocean-related businesses are on the increase, investors and their capital are still hesitant. Which criteria take precedence for investing in a niche sector? Under the auspices of Barclays, the 4th round table invited investors with a firm footing in blue investment with a view to encouraging current philanthropists and new investors to use their capital to develop innovative ocean businesses, including in their early phase.

The discussion focused on portfolio diversification, the importance of an ocean-entrepreneurs business model *(Katapult, Schmidt Marine Technology Partners)*, the role of investors *(Circulate Capital* and its plastic fund) and governments in the development of dedicated funds (Monaco's Minister of Finance and Economy). Last, the panel discussed the impact of environmental risks specific to the marine ecosystem, exposed to climate change, on investments.

<u>"We are impact investors: when</u> we meet a blue economy business, we consider it first and foremost a driver of innovation, working for the changes we are keen to support." Jonas Skattum Svegaarden, Director of Katapult Ocean

REGENERATIVE OCEAN FARMING

Can ocean farming be cost-effective whilst generating a substantial positive impact for global health? This is the standpoint upheld by the panellists of this session, showing the extent to which regenerative ocean farming can play a significant role in the resolution of the most urgent ocean health issues.

Canadian Bren Smith, an industrial fisherman turned seaweed farmer, founder of the NGO *GreenWave*, told his story about setting up this global network of regenerative ocean farmers who hopes to have 10,000 members within the next 10 years. Caroline Slootweg, Founder of *Kelp Blue* spoke about the creation of a farm for the cultivation of macrocystis, the largest kelp in the world, in Namibia, 80% of which is reserved for marine life, representing a substantial carbon sink. The discussions also focused on a factory to process seaweed into innovative products (*Oceanium*) and *FlexSea*'s promising sustainable bioplastic made from red seaweed and presented by the youngest entrepreneur of the day, the engineer Thibault Monfort.

"We have launched a centre for ocean regeneration through farming open to all, which offers our community of farmers easily replicable infrastructure models, funding options, and also a mentoring system, even a kelp climate fund... We are focusing on the redistribution of production, a concept for the 22nd century! We need to be more creative and inclusive so that people feel engaged as if it were a world war."

Bren Smith, Founder of GreenWave (Climate Change Award 2021) presented by the Prince Albert II of Monaco Foundation)

ROUND TABLE 6

THE PLASTIC ISSUE: FROM POLLUTION TO INNOVATION

Plastic pollution mitigation does not only require the impetus of international leaders and businesses, it also depends on the development of technology and disruptive solutions to help curb it. The session shed light on the work accomplished by innovative companies, all selected among over 1,000 clean and cost-effective solutions identified by the Solar Impulse Foundation to address the environmental crisis.

New recycling systems are already in place, such as the alternative to plastic created by *UBQ Materials*, based on household waste, a system which limits methane emissions. *Arqlite*, a company that transforms non-recyclable plastic waste into building materials for buildings, is another example. The concept of small recycling plants (*Replace Plastics*) or microplastic free water (*Wasser 3.0*) are among the many solutions deployed and supported by the Solar Impulse Foundation.



CONCLUSIONS

"Why haven't we got these solutions everywhere?", asks the Swiss explorer and environmentalist Bertrand Piccard, who advocates a more proactive future in terms of looking for solutions, stressing the importance of a profusion of tangible and trustworthy solutions, but the need for innovation in the field of governance too: "There is a need for political exploration, for new laws. In Monaco, we have a Head of State who knows that regulations need to be modernised in terms of the environment, and who talks about this to other Heads of State, and this helps us to make headway."

In the presence of HSH Prince Albert II of Monaco, the panel representatives then outlined the main ideas emerging from this event dedicated to ocean innovation and regeneration, before passing the floor, for his concluding remarks, to Olivier Wenden, Vice-President of the Prince Albert II of Monaco Foundation: "We have to show that these ecological solutions exist and can help regenerate increasingly damaged ocean ecosystems. And to do so, we need science, governance and sustainable and responsible business."



This event was an opportunity to finalise **the memorandum** of understanding between the Solar Impulse Foundation and the Prince Albert II of Monaco Foundation (PA2F). Sharing a common goal – to work for environmental protection and the promotion of sustainable development - the purpose of this collaboration is to pool and intensify the efforts of both foundations and their networks. The promotion of clean and innovative solutions and the deployment of sustainable economic opportunities that help protect biodiversity, as well as improved resource management form part of the terms of the partnership signed during *Monaco Ocean Week*.



<u>"We need to shift from</u> <u>a society of waste to a society</u> <u>of efficiency."</u>

Bertrand Piccard

Swiss explorer and environmentalist, initiator and President of the Solar Impulse Foundation.

In just a year, you have exceeded your goal of accrediting 1,000 ecological and cost-effective solutions. Were you expecting such an abundance of successful solutions?

I was sure that many solutions existed, even if we weren't aware of them. There are a huge number of companies, innovators, start-ups, and SMEs working on these innovations. What was needed was exploration work in all areas, and this is exactly what I like. At the beginning, we had to win the trust of innovators, explain to them the purpose of the Solar Impulse label. Today, our Foundation is recognised as being "the" foundation for solutions and our label is being given to an increasing number of solutions. We reached 1,000 solutions in April 2021. Since then, we have accredited one solution every day, which has resulted in 1,400 solutions having our support at the moment.

What is the specificity of the Solar Impulse label?

It is the only label in the world that certifies the cost effectiveness of systems, products and materials that protect the environment. Supported by a commission of independent experts, the labelling process is certified by the auditors Ernst & Young. To obtain the label, the solution must exist, it must protect the environment and must be economically viable for both the person producing it and for the person using it. And we take into consideration the entire life cycle when assessing these solutions from an ecological point of view.

What does this *Monaco Ocean Week* event dedicated to innovators mean to you?

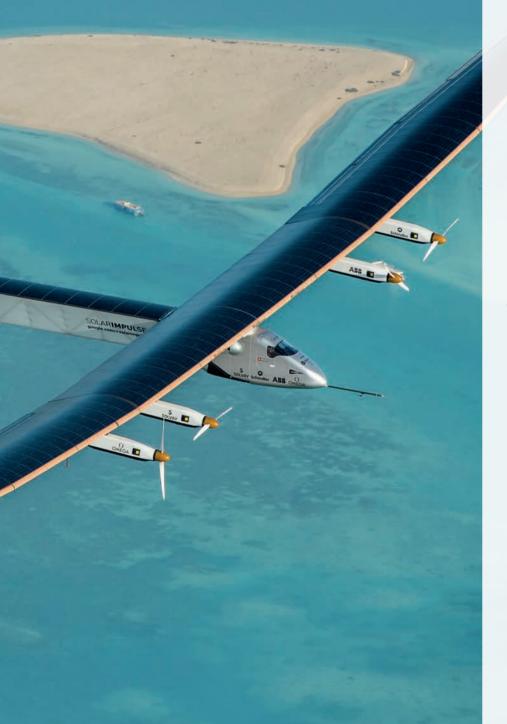
It has made it apparent that all the solutions exist for not one single piece of waste to end up in the ocean or on public wasteland. It is possible to take household waste from a town and to turn it into building material or plastic to make furniture, any plastic bottle can be recycled infinitely, and its transparency maintained... This event has presented many concrete solutions that are available and economically viable. The focus was on actual action and not simply on a pipe dream for change.

Did you advocate in this respect at COP 26 in Glasgow?

Absolutely. At COP 26, I demonstrated that countries often fear making environmental commitments because they imagine that this will be detrimental to their economic development. Yet, it is exactly the opposite that happens: if we shift from a society of waste to a society of efficiency, we will generate enough additional profit to be able to cover the initial investment. Consequently, the more countries commit to environmental protection, the more they will create jobs, the more they will generate a profit margin, and the more they will boost their economy.

PROFILE

Issued by the Solar Impulse Foundation, the **Solar Impulse Efficient Solution** Label is designed to highlight existing solutions which are both clean and costefficient and which have a positive impact on quality of life.



Do you feel that our society is sufficiently mature to speed up the shift towards the ecological transition?

We can now see that solutions exist, that they are cost-effective and of interest to States. The next stage is to update regulations and laws. However, administrations are used to working vertically, based on the silo mentality, each specialised in its own area. If we really want to adopt a sustainability approach and combat climate change, we need to adopt a horizontal mode of

operation at government level and to streamline the decision process, including procurement contracts.

Your target of 1,000 solutions has been reached, what are your foundation's prospects for the future?

We are continuing the labelling process for efficient technical solutions. At the same time, we are working on their implementation. We have created solution guides for countries and businesses, we are selecting solutions for cities. We are also promoting the testing of these innovative solutions in three French regions: the Grand Est, the Île-de-France and the Pyrénées Atlantiques.

Are there priority geographical regions or countries for implementing these solutions?

As cities are responsible for approximately 75% of CO_2 emissions, we need to focus our efforts there and adopt appropriate solutions to act at every level: habitat, energy, construction, mobility, food, smart management of resources and waste...

Furthermore, it is obvious that high CO_2 emitting countries are priorities for implementing these solutions, as are the developing countries which need to be able to develop in a clean and efficient manner. If not, they will build coal-fired power plants and make the same mistakes as we did.

IN FIGURES

- 1,400 solutions accredited,
- 1 international label,
- 350 to 420 experts,
- 9 sectors of innovation.

ECONOMY AND OCEAN

Valuing marine ecosystem services

For many years an economic blind spot, the value of ecosystem services must fully integrate the financial markets. A shift that must be accompanied by regulations, analysed the experts assembled by the MERI Foundation at the Monaco Scientific Centre on 23 March 2022.

NATURAL VALUE

What criteria can be used to value the ecosystem services the ocean provides to human society? The first of the three afternoon talks organised in hybrid format by the MERI Foundation highlighted the need to integrate the value of marine ecosystem services into economic analysis and public policies. The aim was to improve the rationality of decision making and to progress towards sustainable development and climate change mitigation.

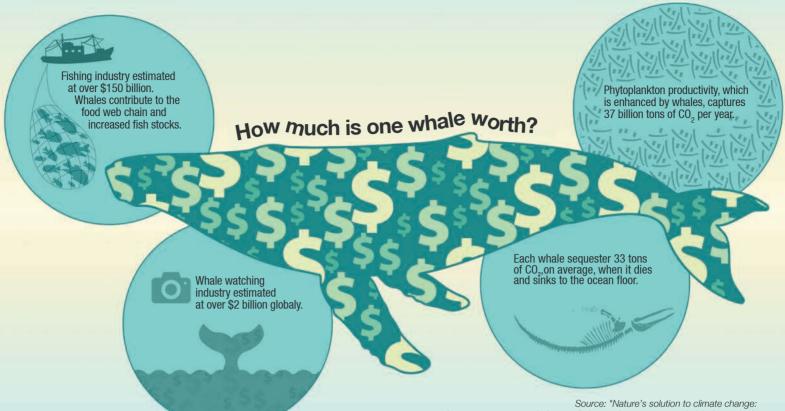
The development of a natural capital market should, argue the speakers, be coupled with strict regulations, at risk of seeing distorted effects. Well managed, this market, the focal point of the suggestions put forward during the conference, could be a winwin model: protected and even regenerated ecosystems, beneficial carbon equivalent selling parties and purchasing parties that reduce their carbon footprint and improve their public image.

THE WHALE'S SALARY

Financial economist at the International Monetary Fund, Ralph Chami, spoke at length about the challenges regarding the economic sector's contribution to the climate and protection of the ocean environment, presenting the "carbon offset service".

Substantial, the carbon sequestration service provided by whales is now recognised by the International Monetary Fund: throughout their long lives, these marine mammals accumulate a significant amount of carbon in their bodies. When they die, they sink to the bottom of the ocean; each great whale sequesters 33 tons of CO_2 on average⁶, taking that carbon out of the atmosphere for centuries, contrary to most terrestrial organisms which release the carbon into the atmosphere. Moreover, they fertilise the ocean and promote the development of phytoplankton, responsible for the production of half the earth's oxygen and storing approximately 40% of all the CO_2 produced (i.e. the value of 4 Amazon forests).

6. "Nature's solution to climate change: A strategy to protect whales can limit greenhouse gases and global warming", Ralph Chami & al., Finance & Developpement, december 2019.



MOBILISING THE ECONOMIC FABRIC

In addition to ensuring greater protection of the natural environment, the private sector can provide several guarantees to attain goals: assurance as to resources, new services, partnerships with the public sector, as well as the provision of new technology for the benefit of environmental issues.

Thanks to its *Ocean Disclosure Initiative*, the *One Ocean Foundation* is seeking to encourage, via lobbying efforts, private investors to invest in eco-responsible projects to promote the preservation of marine and coastal ecosystems. Supporting the deployment of measures to monitor the impact of the private sector on the ocean, this Foundation has also established a sustainability framework based on over twenty different criteria.

The carbon equivalence scheme, often criticised, was also analysed by the experts who once again underlined the role of the private sector in the protection of the ocean environment. Source: "Nature's solution to climate change: A strategy to protect whales can limit greenhouse gases and global warming", Ralph Chami & al., Finance & Developpement, 2019

IN FIGURES

2 million dollars

Estimated mean value of a great whale, based on the various services rendered. (source: Finance & Developpement, 2019)

IN SIGHT

<u>"Ocean health will benefit from the</u> introduction of a measurement standard concerning the environmental pressure on the ocean by society." Jan Pachner, Secretary General of the One Ocean Foundation



Over the last 50 years, **the ocean absorbed over 95% of the total heat** added to the climate system (source: Levitus et al, 2005)

OCEAN RESEARCH

One Argo takes the ocean's pulse

Fast growing, Argo's fleet of underwater robots is revolutionising ocean and climate research. This global network's latest innovations are increasingly documenting the alarming evolution of a fast-changing ocean.

During the week dedicated to the ocean in the Principality, thirty or so international experts involved in the steering committee of the *One Argo* programme met in the offices of the International Hydrographic Organisation (IHO) for an intense 3-day workshop. This year, high-level scientists and engineers involved in the project chose Monaco for their annual meeting to review and coordinate their work to establish a specific ocean monitoring system.

The session led to a number of positive developments in the deployment of the global ocean observatory which presents a picture of the ocean consumed by increased heat at its deepest levels. After a downturn due to the pandemic in 2020 and 2021, this initiative is now continuing to gain momentum, supported by the technological advances presented by the project's industrial partners.

The workshop also included a talk for the general public, as well as a half day of collaborative science where promoters of *One Argo* interacted with their colleagues in charge of scientific programmes that recently obtained the "United Nations Decade of Ocean Science for Sustainable Development" label.

1 PROGRAMME, 3 MISSIONS

Complementary, One Argo's three missions are deployed on a large scale and give an increasingly accurate assessment of the way in which the ocean beyond depths of 2 kilometres are warming up, but also the disturbances to ocean currents, changes to the water cycle, rising sea levels and the evolution of ocean characteristics, such as acidification and deoxygenation, as well as its ability to absorb carbon dioxide (CO_{2}).

PROFILE

Initiated in 2000, the international programme **One Argo** collects information on the High Seas using a fleet of robotic instruments that drift with the ocean currents at a depth of 1,000 metres and move up and down in the water column, between the surface and depths of 6 kilometres.

THE HISTORIC MISSION "CORE ARGO"

Distributed across all the ocean regions and connected by satellite to data management centres, Argo's network of some 4,000 robotic floats represents the most abundant and most accurate source of underwater temperature, salinity and pressure profiles. Twenty-two years after the programme was first launched, Argo's fleet of autonomous instruments has revolutionised the ways to acquire ocean data, previously dependent on campaigns conducted by ocean vessels: thanks to Argo floaters, the number of temperature and salinity profiles currently collected every year has increased from 5,000 to 130,000. This remarkable growth has enabled Argo to improve the accuracy of the models and to document the evolution of the ocean's physical status over the first two kilometres of the water column and over close to 70% of the planet. Thanks to technological improvements in the floaters, including ice sensing algorithms, the network now includes seasonal sea ice zones as well as the Polar regions.

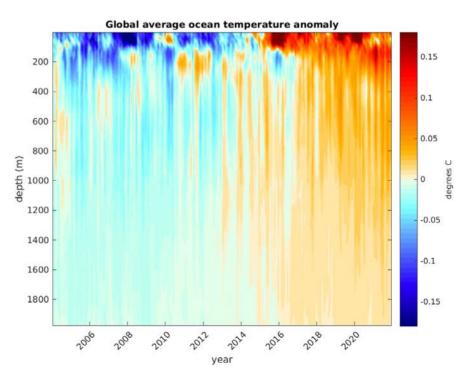
The deployment of floaters in coastal currents and equatorial regions also means that the spatial coverage of the Argo fleet has improved: *"It is urgent that we begin measuring in highly changeable regions of the ocean"* warns Australian oceanographer Susan Wijffels, from the *Woods Hole Oceanographic Institution* during the public presentation organised in cooperation with the IHO.

BGC ARGO DEDICATED TO BIOGEOCHEMISTRY

By equipping the floaters with additional sensors to measure key chemical and biological properties, the new mission BioGeoChemical-Argo (BGC Argo) provides an opportunity to extend the scope of ocean observations to new areas. It now measures 6 key biogeochemical parameters: light, pH, oxygen concentration, nitrate, phytoplankton and particles. All these measures will make it possible to document biological and ecosystemic resources, and the carbon cycle within the context of climate change.

2016, A CRITICAL YEAR

Thanks to Argo data, scientists have noted abnormal temperatures at depths of up to 2,000 metres for the past ten or so years. 2016 marked a significant acceleration in this warming trend, particularly in the North Atlantic subpolar region. According to the observations of the Argo network, this is the result of a massive absorption of heat and disruption to ocean circulation which reinforced penetration towards the Northeast of warm salty waters coming from Eastern subtropical regions.



HEADING TO THE DEPTHS WITH DEEP ARGO

Surpassing the initial technological limitations, this latest generation of floaters is now capable of acquiring data from the deep ocean, 6 kilometres below the surface: thus monitoring abyssal warming, estimated at 10% of global climate system warming, and deep ocean circulation.

The report on the *Deep Argo* mission's pilot areas attracted the attention of specialists during this meeting: in the Southwest Pacific Basin, deep floaters detected new acceleration in the warming trend of deep waters from the Antarctic.

OPEN DATA

The system provides 90% of Argo profiles to users via 2 global data centres within 12 hours of their issue (10% of profiles are unusable). Pioneers in the *open science* movement, these data, shared for the last 20 years, are made available to the entire international scientific community as well as the public, including the education sector. They fuel various applications, such as the modelling of ocean circulation and the prediction of tropical cyclones.

IN FIGURES

One Argo

- ~ 4,000 Argo floaters in operation in the ocean, i.e. 1 floater every 300 km²,
- > 5,000 scientific articles using Argo data,
- 45 countries involved,
- 500 to 600 floaters / year have to be deployed to keep the network active,
- goal: 4,200 floaters deployed for all 3 missions.

The Prince Albert II of Monaco Foundation provided funding in 2017 for the implementation of 6 BGC Argo trackers to take chemical and biological measures in the ocean.

AN ARGO FLOATER

50 kg,

- lifetime: 5 years (target: 7 years),
- activity cycle: 9 days/10 spent at a depth of 1,000 m. On the 10th day, it descends to 2,000 m before returning to the surface to transfer the data acquired via satellite, before redescending to 1,000 m and drifting with the currents.



PUBLIC CONFERENCE – AN IHO EVENT

High-definition mapping of ocean bed

While, at the time of the first oceanographic campaigns conducted by Prince Albert I, ocean mapping was primarily designed to improve the safety of navigation, these marine data are today used to inform decision-making in a large range of disciplines, including improved climate models and the development of the blue economy. Continuing to support knowledge enhancement, the International Hydrographic Organisation (IHO) actively promotes seabed mapping, which contributes to sustainable ocean development. In cooperation with the Australian Hydrographic Office and based on Argo data, a large-scale project was presented at the public conference organised during *Monaco Ocean Week* on Wednesday 23 March 2022.

When they reach the ocean floor, *Argo* floaters provide us with information on depth, enabling us to improve ocean bed mapping. After analysing 2.7 million profiles collected in these ocean regions, it was established that this approach could be used to take 216,000 new depth measurements across the globe. In Norway and New Zealand, the new data collected as part of this project are accurate within the range of 7 to 8 metres.

To take things further, it was announced during the workshop that an Argo pilot floater specifically designed for bathymetry was being produced. A welcomed development for this project in which various partners are involved. After an overview of current research programmes, cooperation projects showing promise between hydrography and oceanography were discussed by eminent specialists. Ocean mapping was at the heart of the topics addressed by the IGO, the organiser and host of the conference in partnership with the Argo project bureau and the Laboratory of Oceanography in Villefranche (LOV/CNRS). An update was given on progress in regard to the Nippon Foundation GEBCO Seabed 2030 project, launched by the IHO with the support of the Intergovernmental Oceanographic Commission of UNESCO. As IHO Secretary General, Dr Mathias Jonas, explained, this major project, the purpose of which is to map the ocean bed in high definition by 2030 is fully in line with the open data approach.

"At sea, each of us can play a role in improving ocean knowledge: by facilitating the sharing of data, science is strengthened, safety is improved and quite simply we start to gain a better understanding." **Dr Mathias Jonas,** IHO Secretary General





Has the programme already allowed you to observe ocean changes which have not occurred for hundreds of thousands of years?

Yes, absolutely. The changes we have observed, all related to increased levels of CO_2 and greenhouse gases in the atmosphere, have never occurred in the history of humanity. That is why it is vital to have an observation network which can document the effects of these disturbances to the ocean. We are already in a critical phase, but it is only by increasing observations and measurements that we will be able to provide both regional and global information with increasing accuracy, and thus help to raise the alert more effectively about the changes under way.

What is the role of the Laboratory of Oceanography in Villefranche-sur-Mer in the One Argo adventure?

The laboratory became involved approximately ten years following the launch of Argo in 2010. We gradually added biogeochemical sensors to robots measuring water temperature and salinity between the surface and 2 kilometres deep, which document ocean health status, the functioning of ocean ecosystems and their impact on the carbon cycle. By diversifying the measurements using 6 new parameters within the framework of the BGC Argo mission, we are begin-



Hervé Claustre

Oceanographer at the Laboratory of Oceanography in Villefranche-sur-Mer, CNRS Silver Medal, Co-Manager of the BGC-Argo biogeochemical mission of the One Argo programme (BGC Argo)

ning to gain an increasingly better understanding of the ocean's living dimension, always with the aim of enhancing our expertise on how it functions. An international leader, our laboratory was involved in the technological development of the new sensors, the science conducted thanks to these measurements and in the organisation of this international programme.

One of the parameters of BGC Argo is the colour of the ocean. Are satellite data not sufficient?

The greener the ocean, the richer it is in chlorophyll which is the characteristic pigment of phytoplankton (or plant plankton). The bluer it is, the poorer it is in phytoplankton. By analysing this parameter, we can therefore determine if we have a desert ocean or one rich in plankton, and therefore potentially in food resources via the food chain for which it is the starting point. Satellites can only observe the first 20 to 30 metres of the ocean. Subsequently, BGC Argo floaters are complementary to satellite observation because they give us information on the amount of chlorophyll.

<u>"Thanks to the Argo</u> programme, we have realised that the ocean absorbs over 95% of excess heat related to human activities."



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The ocean absorbs part of the excess CO_2 in the atmosphere, resulting in a noticeable impact, such as rising sea levels. Have you documented less noticeable effects that have an impact on ocean biology?

If the ocean is warmer, it moves around less, and the deep waters come back to the surface less often. Yet to grow, phytoplankton, which is the ocean's prairie, although definitely needing sunlight, also needs natural fertilisers (nitrates) reinjected to the surface from the deep layers of the ocean. Because of this, we believe that ocean warming will prevent this source of natural fertiliser rising to the surface, potentially leading to a shortage of phytoplankton, which could disturb the marine food chains in the long term.

What happens to an Argo floater at the end of life?

A floater arrives at the end of life when its batteries are empty. In the middle of the Pacific or in Antarctica, we cannot retrieve them. Five years after it is put into the water, it falls to the bottom of the ocean. In the Mediterranean, 30 to 40% of floaters are retrieved thanks to a network of boats: we change the batteries, renew and recalibrate the sensors and then put them back in the water for a new cycle of measurements. Our Chinese colleagues have also started to develop a partnership with fishermen in the West Pacific in order to recycle the instruments. It is clearly evident that we need to minimise as far as possible the environmental impact of our own observations, which are aimed at gaining a better understanding for better protection. A system is therefore being set up, initially at European level.

How long is this programme scheduled to last?

Ad vitam aeternam! It is observation of the future! The aim of this programme is sustainability, thanks to the platforms and technology that will develop over time. Moreover, a new generation of BGC floater is currently being developed: we will shortly be putting thirty floaters equipped with on-board intelligence cameras, capable of recognising groups of zooplankton and transferring via satellite the results of these "in situ" findings. In the long run, One Argo will play an extremely important role in characterising ocean biology.

ADOPT A FLOAT

For the last 10 years, this educational programme created by the Laboratory in Villefranche-sur-Mer has enabled French school classes, from the overseas departments and other countries to adopt an underwater robot, to monitor the data sent in real time and to receive scientific support which raises their awareness of ocean issues. In 2022, 40 French classes adopted an Argo floater.



MONACO YACHT CLUB EVENT Monaco at the forefront of advanced yachting

Sustainable marinas, charter of excellence, responsible innovation, alternative propulsion... Thanks to the 6 events taking place over the day, hosted by the Monaco Yacht Club, a concerted and collective solution to address ecological challenges is taking shape, making Monaco the capital of advanced yachting.

On the occasion of the 5th *Monaco Ocean Week*, organised by the Prince Albert II of Monaco Foundation, the Monaco Yacht Club celebrated the 10th anniversary of "Monaco, yachting capital" on Thursday 24 March. Initiated in 2012, this annual project whose ambition is to consolidate the position of the Principality as a centre of excellence in the sector, now has an international flavour becoming "Monaco the capital of advanced yachting". Innovation and sustainability shape this initiative run by the Monaco Yacht Club and its President, HSH Prince Albert II of Monaco. "Through the commitment of this collective and international umbrella brand of advanced yachting, we are encouraging and fostering our tradition for innovation which draws on technological progress to create responsible yachting, in line with the UN sustainable goals that I promote via my Foundation", announced the Sovereign during the event, addressing the Monegasque personalities and various yachting stakeholders present, reminding them of the carbon neutrality objectives for his country for 2050.

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A CHARTER OF EXCELLENCE AND SUSTAINABILITY

The Principality has made its mark over the course of the last decade as a key port of call and a centre of excellence in the yachting sector, thanks to a high concentration of services necessary for this industry. To assert Monaco's position as a centre of excellence and exemplary model in terms of environmental protection, but also from a societal and educational point of view, key players in Monaco's financial market signed a charter of excellence as testimony of their involvement in this ethical and collective approach for sustainable and innovative yachting. HSH Prince Albert II of Monaco and the Minister of Public Works, Environment and Urban Planning, Céline Caron-Dagioni, were accompanied by the signatories of the charter.

"Yachting is undergoing a major transformation and 'retrofitting' is at the centre of discussions regarding the sector's future. Within 5 to 10 years, several areas, including coastal ones, will no longer be accessible to ships running on conventional diesel. Those involved

SOLUTIONS FOR THE OCEAN / INNOVATIONS 69

in the yachting industry are taking action to start the modernisation process", welcomed Bernard d'Alessandri, Secretary General of the Monaco Yacht Club and President of the "Yachting Monaco" cluster.

In the face of challenge, the picture is becoming clear: "Achieving a sustainable future is no longer a blank page on which to write. Both on and offshore, many projects have been initiated" adds Thomas Battaglione, Director of the Société Monégasque de l'Électricité et du Gaz. Quayside amenities, power supply for yachts... Pragmatic solutions are being implemented whilst innovations and energies of the future are gaining ground: "By 2023, we will have the capability of supplying hydrogen", added this player in the energy transition in Monaco. Objectives shared by Olivier Wenden, Vice-President and CEO of the Prince Albert II of Monaco Foundation, for whom this event "is above all designed to unite various sectors and players from various disciplines whilst focusing on issues relating to the sustainability and protection of the marine ecosystem".

ANTARCTICA IN THE SPOTLIGHT AT THE 11TH ENVIRONMENTAL SYMPOSIUM "LA BELLE CLASSE SUPERYACHTS"

Various players involved in the yachting industry and ocean protection drew attention to the fragility of the Antarctic region. How can we channel the growth of tourism in this Polar region which is being made more accessible by technical innovation? Yacht owners, captains and scientists discussed this issue at two round table sessions. Other issues included the data collected by superyachts during navigation, data that the International Hydrographic Organisation is trying to consolidate using simple applications. New potential solutions, such as bioacoustic monitoring of the Polar regions were also discussed.



"We have built the first ice-breaker cruising ship, Polar Class 2, capable of breaking through 3 metres of ice. This does not mean that we need to go all over the place. We need to set limits for where we can and can't go." **Étienne Garcia,** Captain of M/M Le Commandant Charcot (149 m) IN SIGHT "I intend to encourage responsible yachting from an environmental, societal, educational and economic point of view. Only a collective and concerted response will be able to address such challenges." HSH Prince Albert II of Monaco

SMART AND SUSTAINABLE MARINAS

On the occasion of a TV show broadcast live on the Monaco Yacht Club's new Web TV, the 2nd edition of the *Monaco Smart & Sustainable Marina Rendezvous* (25 and 26 September 2022) was announced. Supported by the Prince Albert II of Monaco Foundation, Extended Monaco and the Monaco Yacht Club, via its "La Belle Classe" certification, this event will bring together 250 key players in the yachting industry in order to encourage responsible innovation for the design and management of virtuous marinas.

For the 1st edition, 55 innovative start-ups from 30 countries were selected and listed in an e-catalogue which registered over 10,000 views, spurring emulation in the yachting industry.

Developers of existing marinas or those under construction and architects are joining the selection process which fosters networking and will designate the awardees of the *Smart & Sustainable Marina Awards* 2022.

A 3D MARINA

The event also provided an opportunity to project oneself virtually into the yachting world of the future, with a presentation of a Metaverse draft proposal of the Monaco Yacht Club marina, the first digital universe dedicated to superyachts.

LOW CARBON STRATEGY IN LINE OF SIGHT FOR THE MONACO ENERGY BOAT CHALLENGE

Identifying the issues at stake as far as innovation in the yachting industry is concerned, a dedicated round table at the 2022 edition of the *Monaco Energy Boat Challenge* (international event for innovative solutions in the yachting sector) addressed 2 environmental challenges: the development of marine protected areas and evolution of the International Convention for the Prevention of Pollution from Ships (MARPOL). The next rendez-vous will be the 10th edition from July 3 to 8, 2023.

SEA INDEX SUPERVACHT ECO ASSOCIATION

SEA INDEX®, PHASE II

Launched in 2020 by the Monaco Yacht Club, the SEA Index® tool continues. The first carbon footprint calculator for superyachts over 40 metres, targets environmental objectives to reduce CO₂ emissions in the yachting sector. The founders of the *Superyacht EcoAssociation* (SEA), led by Bernard d'Alessandri, Secretary General of the Monaco Yacht Club, announced the launch of phase II of SEA Index® in cooperation with Lloyd's Register. *Monaco Ocean Week* provided the opportunity to present "the Friends of SEA Index", a new category of "SEA" members.



3 LAUREATES OF THE YCM EXPLORER AWARDS 2022

Created in 2018, the YCM Explorer Awards organised by the Monaco Yacht Club honour ship owners who have set themselves apart due to their commitment to marine environment protection. A jury comprising experts and presided over by Richard Wiese, President of the Explorer's Club, gave out 3 awards which were presented by HSH Prince Albert II of Monaco and President of the Monaco Yacht Club, and explorer-oceanographer Sylvie Earle:

- TECHNOLOGY & INNOVATION AWARD M/Y Artefact (80 m)
 Owner Mike Lazaridis
 Nobiskrug (2020)
- MEDIATION & SCIENCE AWARD M/Y Gene Machine (55 m) Owner Jonathan ROTHBERG Amels (2013)
- ADVENTURE & ENVIRONMENTAL ETHICS AWARD
 M/Y Dragonfly (73.3 m) Captain Mike Gregory Hanseatic Marine (2009-2019)

WISAMO, wind innovation

Let's imagine a fleet of container ships moving forward under sail, without emitting any noise or any greenhouse gases. Is this vision of decarbonised and sustainable shipping on the verge of becoming a reality? At the last talk of the day, the latest advances regarding the *Wing Sail Mobility* (WISAMO) project were presented by Michelin Group's Research & Development team.

This inflatable futuristic sail, adapted to all shipping routes, is equipped with a telescopic mast, which facilitates port manoeuvres, sailing through bridges and various sea conditions. It can be used alone, but it is also possible to install several of them in order to maximise wind-driven performance. According to engineers, it could be adapted to ro-ro vessels, bulk carriers, gas carriers and tankers, huge vessels which require a significant propulsive capacity. "The system will help save up to 20% of fuel, which will contribute to the reduction of CO_2 emissions related to maritime transport", explains Fabien Monin from Michelin.

IN FIGURES

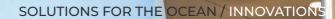
CONCLUSIVE TEST RUNS

Convinced by the project and now a consultant for the Group, sailor Michel Desjoyeaux commented on his first tests on Lake Neuchâtel and the winter waters of the Bay of Biscay: *"Wind energy is clean, free and universal. Furthermore, sail power is not a controversial issue. Its use is more than promising for improving the environmental impact of merchant ships"*, commented the skipper, ambassador of this technology which will be installed on the ro-ro container ship "MN Pelican" belonging to the Nantes-based shipping company and which will be sailing between Spain and the English coastline (end of 2022).



The maritime market represents 90% of global trade and is estimated to increase three-fold by 2050. It is responsible for 3% of CO₂ emissions worldwide and 11% of CO₂ generated by the transport sector.

- 20% of fuel



WISAMO

HSH Prince Albert II of Monaco, alongside (from left to right) : Sandrine Porcheret (Communication & Marketing Michelin Wisamo), Fabien Monin (Wisamo Business Developer) and the sailor Michel Desjoveaux, who is working with Michelin on this project. © YCM - Mesi





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RESILIENCE OF SMALL ISLANDS

Advocating for small islands

Resilient small islands, a key challenge against an unsettling climate backdrop. This is the imperative fixed by the meeting organised by the NGO Green Ross and the Monaco Scientific Centre on the premises of the latter on Tuesday 22 March 2022.

The meeting provided an opportunity to discuss the ability of small islands to demonstrate resilience. Faced with the growing threat of climate change, in particular rising sea levels, many experts were invited to highlight the urgent situation of small islands, under the chair of Nicolas Imbert, Executive Director of Green Ross.

IN SIGHT <u>"Small Island Developing States are</u> particularly vulnerable to climate change." **Nathalie Hilmi,** environmental economist at the Monaco Scientific Centre.

CAPITALISING ON ISLAND KNOW-HOW

Often ignored and neglected, small islands stand out primarily for their extraordinary wealth. Emile Mene, Secretary General of the Loyalty Islands Province in New Caledonia, presented the resilience plan put into place with the aim of reducing the number of importations and their impact on an ecosystem which is increasingly exposed to cyclones (5 a year on average). It is based on the capitalisation of traditional knowhow, just like agroforestry. Recognition of the cultures and traditions inherent to small islands is also showcased by Maxime Prodromides, via his organisation SMILO. Based wherever possible on local traditions, the organisation implements projects for the protection of small islands: management of waste, water, energy, preservation of landscapes, biodiversity and governance.

Traditions exist on which players can build in terms of resilience. SMILO operates in the Sao Tomé et Principe archipelago in the Gulf of Guinea, restoring mangrove fields, promoted by sustainable tourism with the creation of itineraries. On the Island of Sifnos in Greece, work is being carried out in regard to dry stone walls, olive trees and water sharing arrangements. Capitalising on existing traditions on small islands means that the local population is supportive, while remaining in step with international agendas.

ACTION AT A HUMAN LEVEL

The fact remains that small islands are in the front line in the face of climate disruption, an emergency situation which demands immediate action as recommended by Nathalie Hilmi, based on the various reports produced by the IPCC, of which she is a member. Action at a human level: this is the purpose of the project "Locavore" run by Stéphane Linou, an advocate for eating local, an initiative attracting the interest of many local authorities.

Action at a human level was the overriding theme of this round table, both with the SMILO and Locavore projects, but also those implemented by the NGO *Green Cross*. Its Executive Director, Nicolas Imbert, insisted on the importance of making an onsite visit to explore the local island contexts and explain the actions to be implemented to the population, particularly when it is a matter of climate migration.

There are many future challenges facing the island territories, including pollution related to mobility: as demonstrated by Maxime Prodromides, 75% of carbon emissions on the Island of Porquerolles are produced by the sea shuttle services that arrive there. The stakes are high, as are the number of players mobilised to turn the situation around.

THE CONTEXT

For SIDS, the Exclusive Economic Zone - the ocean under their control - is, on average, **28 times** the country's land mass. Thus, for many of these countries, the majority of their natural resources comes from the ocean.



SIDS⁷ represent 2/3 of the countries that suffer the highest relative loss due to natural disasters, i.e. between 1 and 9% of their GDP every year. (source: OCDE-Bangue mondiale, 2016)

7. Small Island Developing States.

RISKS AND SOLUTIONS

What are potential ways of climate adaptation for the atolls?

Whether urban, rural or artificial, islands and atolls cannot adopt the same climate change adaptation trajectories. Experts from OACIS are assessing the most relevant adaptation scenarios.

How can the future habitability of atolls be envisaged on the basis of climate scenarios? The assessment of climate risks to the future habitability of the atoll islands, in addition to adaptation measures, formed the focus of the international expert panel that met during *Monaco Ocean Week* brought together by the initiative *Ocean Acidification and other Ocean Changes – Impacts and Solutions* (OACIS).

In the offices of the International Atomic Energy Agency (IAEA), behind closed doors, the experts worked over a 3-day period (22-24 March 2022) to define the foundations of the methodological approach for this interdisciplinary study. Coordinated by Alexandre K. Magnan, a geographer specialising in vulnerability and adaptation issues at the Institut du Développement Durable et des Relations Internationales (ID-DRI-Sciences Po), the working sessions involved a dozen experts employed by laboratories in France, Australia, Canada and the United Kingdom, some participating remotely. The discussion was in line with the previous work carried out by experts of *The Ocean Solutions Initiative* group (2016-2020 and the *Atoll Futures* group (2019-2021), supported by the Prince Albert II of Monaco Foundation, the IAEA and the initiative *Ocean Acidification and other Ocean Changes – Impacts and Solutions* (OACIS).

In addition to island erosion and submersion, researchers identified a whole series of risk factors related to the climate (storms...), to society (density of building, use of resources...) and to the differences between ocean basins or the types of islands. All these elements need to be combined to be able to assess the future risks to atoll habitability.

FROM RISKS TO SOLUTIONS

The objective of this high-level workshop, based on the experience of several members of the expert panel, is to shift from risks to solutions, and thus create various adaptation paths for the atoll islands. In order to do so, archetypal islands (islands with a high or low population density, islands predominated by nature) need to be defined: the two main regions, namely the Indian Ocean and the Pacific Ocean, where atolls are located need to be considered; contrasting climate risk scenarios based on IPCC's latest data need to be considered. In a second phase, in order to provide decision makers and communities with a clear idea of the possible adaptation options, the experts will develop a systemic approach to the problem and a combination of appropriate measures for the short, medium and long term.

At the end of this first workshop, the groundwork was laid for assessing adaptation measures. Next steps for 2022 for the OACIS expert panel: carrying out the assessment, followed by a second workshop devoted to discussing the initial results and identifying concrete adaptation trajectories.

ATOLL HABITABILITY UNDER THREAT

"Unless technological, human and financial capacities are significantly improved on a timely basis to offset the effects of climate change effectively, the cumulative effects of climate stress factors within the context of a moderate adaptation scenario will have repercussions in the second half of the 21st century that will probably exceed the adaptation capacity of the atolls in the Western and Central Pacific and Indian Ocean", assert Virginie K. E. Duvat, Alexandre K. Magnan & Co, at the end of their article "Risks to future atoll habitability from climate-driven environmental changes" published in WIREs Climate Change in December 2020. "Our results indicate that there will be significant spatial variations in risk between the ocean basins and between islands", comment the members of the Atolls Future group, highlighting the high vulnerability of islands in the Western Pacific.



QUESTIONS DISCUSSED BY EXPERTS DURING THE WORKSHOP:

- What criteria should be selected to assess the potential of various solutions to reduce the climate risk?
- How can we consider various time scales over the course of this century and various global warming scenarios (de + 2°C à + 4°C, or even beyond)?
- How can we consider the variability of the situations between highly urbanised islands and more rural islands, but also located in ocean basins, therefore in different climate contexts?
- How can we move from evaluating individual solutions to climate change adaptation trajectories at 21st century level?

5 MAJOR CLIMATE RISKS

- rising sea levels,
- changes in precipitation,
- ocean-atmosphere oscillations,
- intensity of tropical cyclones,
- ocean warming and acidification.

5 INTERCONNECTED HABITABILITY PILLARS

- access to land,
- fresh water supply,
- food supply,
- settlements and infrastructure,
- economic activities.

CONTRIBUTION OF THE OCEAN SOLUTIONS INITIATIVE

The team also referred to the work conducted in 2016-2020 by the international expert panel *The Ocean Solutions Initiative*. Supported by the Prince Albert II of Monaco Foundation and the IAEA, researchers made a systematic assessment of 13 ocean-based climate change mitigation and adaptation measures at global and local levels. The objective of this audit of solutions was to help shape the development and implementation of technologies and actions towards a sustainable result.

As stipulated in an article published in *Frontiers in Marine Science* in October 2018, as well as a video geared towards the general public, one of the results of this experts' report shows that the greatest benefit is obtained by combining global and local solutions. The authors are already recommending to political communities and marine scientists to *"take into consideration the uncertainty and limitations of climate and ocean management systems currently available"*, whilst promoting the most promising.



The Ocean Acidification and other Ocean Changes – Impacts and Solutions (OACIS) initiative was created

PROFILE

in 2021 on the instigation of the Prince Albert II of Monaco Foundation in order to expand the scope of the work carried out by the Association Monégasque sur l'Acidification des Océans (AMAO), which now includes, in addition to acidification, other climate stressors weighing over the ocean. Within OACIS, focus is placed on their characterisation and the solutions to counter them. At the crossroads between high-level research and climate policy, the initiative follows on from the Monaco Declaration on Ocean Acidification signed in 2009 by 150 scientists from 26 countries.

OACIS brings together several partners: the Prince Albert II of Monaco Foundation, the Government of Monaco, the IAEA environmental laboratories, the Monaco Scientific Centre and the Oceanographic Institute, as well as representatives of the International Union for the Conservation of Nature and of CNRS.



RESILIENCE

Ocean and cities, pathways to coastal resilience

The Prince Albert II of Monaco Foundation is organising a technical day devoted to the issue of coastal resilience. Coming from Small Island States and urbanised coastlines, the international speakers presented their vision for this topic of the future which involves coastlines and cities across all the continents.

From the insight of scientific and governmental experts to the consortium of coastal city mayors, not to mention the exploration of new narratives and analysis of blue investment strategies, the day-long event on 25 March 2022 featured five particularly dense sessions. Almost two thirds of the world's population are concentrated on the coastal strip of land areas which have been made vulnerable by changes to the climate situation. New risks are threatening the habitability of this area of high productivity, refuge and amenities, which nonetheless is demonstrating resilience.

This was the introduction made by Monica Medina, Assistant Secretary for Oceans and International Environmental and Scientific Affairs at the United States Department of State, with coastal resilience being at the forefront of climate change. Rising sea levels, increased water temperatures, intensification of extreme weather events, erratic rainfall... these emerging phenomena amplify the economic, social and environmental vulnerability of coastal areas, including their towns. How can we prepare to address these risks? Between adaptation and mitigation, they are seeking and finding solutions, mainly nature-based ones.

82 RESILIENT COASTS

Because when they are protected, coastal ecosystems provide key services that improve climate resilience and safeguard both the blue economy and human well-being. The habitability of the world's cities and coastlines is more than ever tightly connected to the destinies of coastal habitats, which are capable of storing blue carbon, protecting communities from storms, and improving water quality as well as fish production.

Placed under the presidency of HSH Prince Albert II of Monaco, the conference brought together thirty or so high-level speakers and many partners of the Monaco Yacht Club on 25 March 2022. Throughout the conference, recommendations were put forward for coastal resilience, which could be used by governments, industry and civil society, as well as mayors. Organised by the Prince Albert II of Monaco Foundation in cooperation with the Stimson Centre and the Ocean & Climate Platform, the conference was officially approved by the United Nations as an Ocean Decade event.

COASTAL RESILIENCE DEMANDS A NEW NARRATIVE

FOUNDED ON SCIENCE...

"Rising sea levels are a threat multiplier", as indicated by the Vice-President of the second IPCC taskforce⁸, Hans-Otto Pörtner, who presented the latest climate report. Experts recommend various mitigation and adaptation measures depending on the climate scenarios specific to each region.

The context of cities, "with a concentration of these issues and having a key role to play" drew the experts' attention who prioritise measures specific to the urban context: building upwards, creating biostructures, urban planning, moving away from the coast, but above all protecting marine ecosystems to increase their capacity of services rendered to society, such as their protective role in relation to extreme climate events.

8. Intergovernmental Panel on Climate Change.

(sources: IPCC)

- 17 cm: the increase to the ocean level in the course of the 20th century
- 570 cities threatened by rising sea levels worldwide

ESTIMATIONS

FIGURES

IN

- 60 to 110 cm: the estimated increase in the ocean level by 2100 depending on greenhouse gas emissions, i.e. an increase rate 2 x faster on an acceleration curve
- 1 billion people will be exposed to coastal risks by 2050
- 600,000 cities affected by rising sea levels by 2050 (source ORRA)



... A CHANGE IN PHILOSOPHY

"We need to identify options for the long term and offer flexibility", adds marine biologist Hans-Otto Pörtner. A stance shared by the speakers of the first panel, including the Director of Enviromer, Tanya Brodie Rudolph, who is calling for a new narrative inspired by nature and based on interdependence at all territorial levels, from the locality to the "global village". She provides the example of the new urban planning scheme for San Francisco Bay: "They created a secure coastal area and people who decide to live there have to pay a tax". In Camargue, the partial rewilding of the Rhone Delta, with the disuse of the sea dike, is significant.

"Adaptation can help us to alleviate certain pressures, such as soil loss and climate emigration", adds Robert Nicholls, Director of the Tyndall Centre for Climate Change, who qualifies the process as a "marathon". "We should consider the current limitations of territories as signs of mitigation", said Senegalese PhD student, Awa Bousso Drame, responsible for the coastal resilience programme at the West African Regional Coastal Observatory.

The question of scale was also raised by Samantha Box, Team Leader at *Coastal Partners*, who is working on the implementation of adaptation measures on the English coastline: *"With an effective partnership we have been able to deliver more results, be more collaborative and more efficient for our communities"*. This same question concerns the positioning of island territories, as confirmed by the representatives of the Seychelles and Saint Kitts and Nevis: *"In our reflection, we have moved from the status of Small Island State to that of Large Ocean State"*, summed up the Minister of Environment of the smallest State of America, Eric Evelyn.

... NETWORKING

Local, regional and global networks are endeavouring to speed up the resilience process, which is worth considering from an interdependence point of view. Since 1990 the ICLEI⁹ network groups together 2,500 cities and governments from 125 countries, around a United Nations backed nature-based programme.

Other networks are being developed, such as *CitiesWithNature* (216 cities from 61 countries), a platform promoting green infrastructure and ecosystem protection, and the Climate and Ocean Risk Vulnerability Index (CORVI), which quantifies the various risks at urban level.

Engaged by the Ocean & Climate Platform, the Sea'ties network connects 88 pilot sites concerning coastal resilience, creating inspiring and powerful synergy at global level. Last, the Global Covenant of Mayors for Climate & Energy includes close to 12,000 cities worldwide involved in climate leadership (See interview page 86).

... AND APPROPRIATE FINANCIAL MECHANISMS

The focus of the 4th session looked at the different mechanisms for blue investments (accelerators, incubators, carbon credits...) to foster territorial resilience. The speakers in turn stressed the importance of science's contribution in promoting a low-risk investment approach for Nature-based Solutions, and cooperation opportunities with the private sector in the context of ecosystem restoration. The conference finally addressed concerns regarding climate justice and access to funding for developing countries, temporality, as well as a new type of return on investment.

9. The International Council for Local Environmental Initiatives.

DID YOU KNOW?

WHY ARE SEA LEVELS INCREASING?

By absorbing the large majority of surplus heat due to greenhouse gas emissions, the ocean heats up, which results in thermal expansion. In addition to this, there is an increasing amount of water as a result of the melting of polar ice caps and glaciers.

COASTAL CITIES, RESILIENCE LEADERS

"Coastal cities are the nexus of these issues", declared Karen Sack, Director of the Ocean Risk and Resilience Action Alliance (ORRAA) who is helping to drive investment into Nature-based Solutions. The floating city of the future, presented as a video by Robin Kemper, engineer and risk consultant at Zurich Resilience Solutions, showed a turning point: "Based on nature, urban innovation currently hinges on an alliance between engineering and science. We need reliable data and interactivity to design appropriate buildings".

"Cities need to take a leadership role: they have many solutions to reverse the trend", believes Policy Manager Ocean at WWF International, drawing on the solutions explored in the World Economic Forum's report "BiodiverCities by 2030" (January 2022). According to the report, cities of the future need to make 3 systemic shifts: adopt a systems approach and protect natural ecosystems, whilst taking into account measures so that a "city's natural capital" becomes an attractive investment for financial markets and private funds.

The Stimson Centre, which is conducting an assessment of 11 coastal cities, promotes a sectoral approach for urban issues, *"as cities have to face various threats, all of which are interdependent"*, added Sally Yozell, during the second panel.

IN FIGURES

- 75% of global carbon emissions are generated by urban areas,
- Nature-based Solutions for coastal protection are 50% cheaper than "grey" solutions, the goal is to associate the two for more impact and sustainability,
- 59 million jobs in the cities of the entire world could be created by investments that are "positive for nature".

SEA & THE CIT

Civil Protection Department Director, Matosinhos City Hall, Portugal

Municipal Advisor, Sub-delegate to the Littoral, Sea and Ecology, Metropolitan Council of Nice Côte d'Azur

SEA 8

Mayors' round table

The 5th session of the day focused on the operational approach of mayors. Representatives of the cities of Sausalito (California), Matosinhos (Portugal), Biarritz and Nice in turn presented the specific context of their territory and the adaptation measures undertaken.

Janelle Kellman, Mayor of Sausalito (California - 500,000 inhabitants)

Climate-related risks: floods, currents, storms, forest fires

Strategy and challenges: "I set up a working group on rising sea levels. It is vital to have access to excellent experts. We have produced a report and created an interactive map which shows the vulnerabilities of the territory, issued many recommendations, including on the management of areas prone to flooding and habitat protection, a major issue in the State of California which faces a housing crisis. We are also working with insurance policies on the concept of 'risk waterfall' on flooding."

Maider Arosteguy, Mayor of Biarritz (26,000 inhabitants, 150 000 in summer)

Climate-related risks: submersion, erosion, storms, quality of bathing water

Strategy and challenges: "In Biarritz, we have 4,500 linear kilometres of cliffs in the public domain. Since 1984, we have invested in a programme to consolidate our cliffs which house all our economic infrastructure.

To counter the risk of submersion, we have implemented a system to protect against the waves. We are working to improve the quality of the bathing water thanks to high-quality water treatment plants. We are particularly careful about the development of toxic microalgae encouraged by global warming. We are working with an innovative laboratory on these issues."

Aurore Asso, Environmental Advisor for the City of Nice (340,000 inhabitants)

Climate-related risks: floods, storms, forest fires

Strategy and challenges: "Nice has launched an extensive climate plan (2019-2026). In terms of adaptation, we are working on revegetation projects for the city and the creation of a marine protected area. As far as the direct reduction of the city's carbon emissions is concerned, we have introduced a second electric tram line, are developing a cycling plan, are financing electric buses for 2026. We are also considering a green hydrogen sea shuttle which could serve as a model in the Mediterranean. Furthermore, we are monitoring changes to the coastline on the Promenade des Anglais, even though we are relatively unaffected by rising sea levels."





Susana Sousa Gonçalves Head of Civil Protection Department from the City of Matosinhos (Portugal)

How does the city of Matosinhos stand in this network, the Global Covenant of Mayors for Climate and Energy?

Matosinhos joined this network in 2017. Our city is extremely committed to the resilience pathway and to natural risk mitigation. Moreover, it has reached an extremely high level on this United Nations platform of resilient cities, where many cities encountering coastal risks can connect. Since 2017, the year we joined this programme, we have been sharing our experience with other cities that sometimes face the same problems as ours and which become partners.

Do the other cities in the network inspire you?

Without this network it would be impossible to acquire different risk approaches, different solutions in terms of resilience. The cities in the network have been a source of great inspiration in raising public risk awareness. Because our main goal is to keep our population safe from risk and be capable of taking action to prevent risk and protect them from danger. This is a crucial point and an area where we have learnt a great deal from other cities, we have been inspired by the great diversity of approaches. We have improved our messages and the way in which we address the population.

With this type of network, coastal communities can also take part in the programmes implemented by other communities, and even find funding, which is essential in the resilience approach, particularly in the technological field.

Has this network changed your city's relationship with the ocean?

The ocean is an integral part of Matosinhos's DNA. We live on the edge of the ocean and wouldn't know how to live far from it! Working with cities that also have a very strong connection with the ocean has been fantastic because we feel much less isolated and have the opportunity to grow and to learn from all these different approaches to address changes related to rising sea levels.

What are your highest expectations, for this year for example?

This is going to be an extremely intense year. We have just emerged from a two-year global health crisis which has led to an economic crisis, and we cannot ignore that. On top of that there is the war in Ukraine. Our expectations need to be revised upwards because we are entering difficult times. And at critical times, resilience is more important than ever before, it can really make a difference to people's lives. Consequently we are extremely committed to improving our capacity for resilience over the next year.

<u>"If we want to become more</u> <u>resilient, we need to start by</u> <u>working on cities."</u>

What are your main needs to improve coastal resilience?

I think that our priority is to become more technological so that we can introduce resilience into our cities in an attractive and constructive manner. We need more technological companies to invest in the fields of prevention, well-being, adaptation and all the sectors of resilience defined by the United Nations.

The other "area of fragility" in regard to resilience, if I may so, are the inhabitants themselves, who are not always aware of the climate risk. They become aware when the danger is there and very often, they take action that puts them at risk, or, a few years after a disaster, they have forgotten or minimise the risk. As political leaders, it is up to us to remind them that the climate risk exists and to contemplate future risks. And this is really an extremely tough job.

It is action that requires a long time, which doesn't always tally with the political agenda...

We need to be committed to resilience however much political time we have. That is why this network is so important: the commitment to coastal resilience is made by the cities themselves. It is a way of obliging political representatives to commit to this issue, however long their mandate or whatever their political orientation.

What are the next steps in regard to resilience in your opinion?

We, the cities, are the entity which must find solutions to urgent issues, but we can only do so provided we receive support at all levels of governance. For this, municipalities need to gain a stronger voice and be listened to at every international conference. Moreover, Matosinhos is hosting the United Nations conference on 25 June. If we want to become more resilient, we need to start working on cities.



MATOSINHOS (175,000 inhabitants - PORTUGAL)

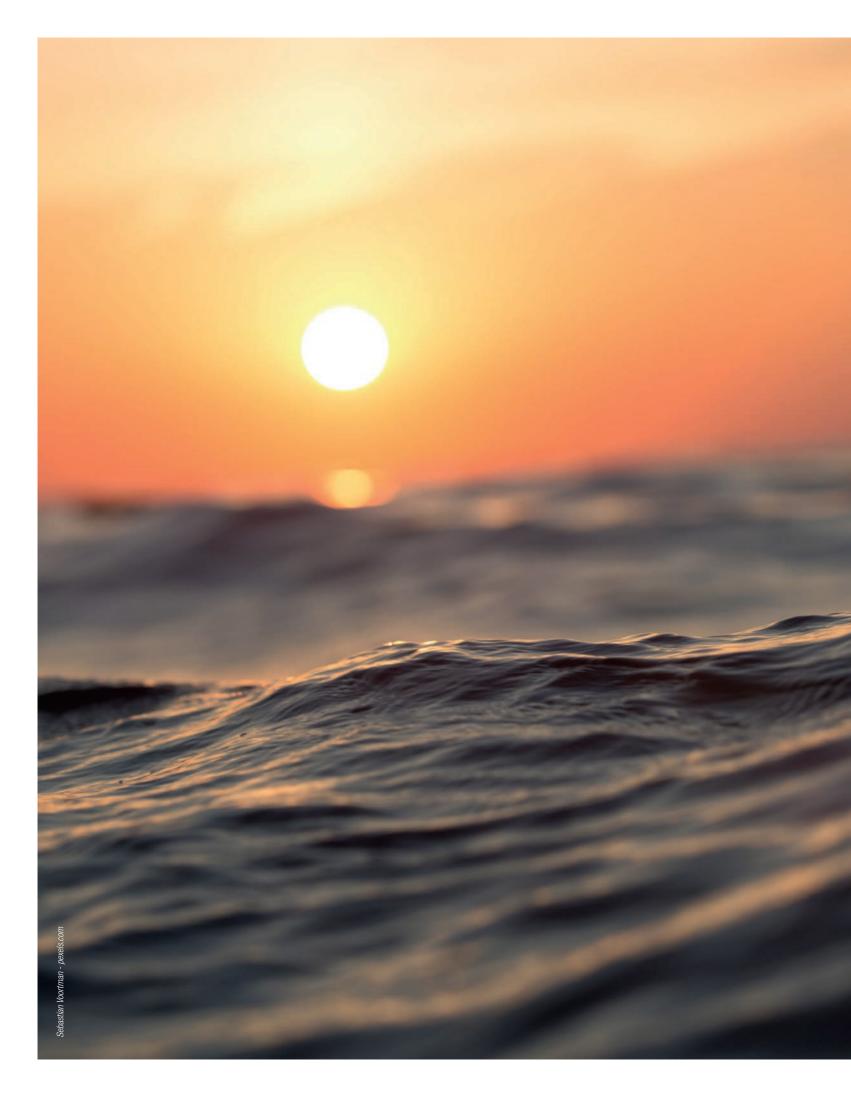
Bordered by the Atlantic Ocean, Matosinhos, a port and fishing town, and seaside resort, lies adjacent to the city of Porto, and is part of the Greater Porto district. It is a member of the Global Covenant of Mayors for Climate and Energy.

Climate change related risks: floods, submersion.

<u>Strategy</u>: georeferencing of sensitive areas, awareness, global network.

PROFILE

The largest global alliance for urban climate leadership across the globe, the **Global Covenant of Mayors for Climate and Energy** is a network comprising 11,759 cities worldwide (including Matosinhos).



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MARINE PROTECTED AREAS

Roadmap for a better protected Mediterranean

Following the 3rd Forum on Mediterranean Marine Protected Areas, which was held in Monaco at the end of 2021, the roadmap established for the 1,087 marine protected areas in the Mediterranean region marks a further step towards greater efficiency.

Monaco Ocean Week provided the opportunity to bring together the main players involved in the protection of Mediterranean marine ecosystems, the Regional Activity Centre for Specially Protected Areas (RAC/SPA) of the Barcelona Convention, the network of Mediterranean MPA mangers (MedPAN), the World Wildlife Fund (WWF) and the Prince Albert II of Monaco Foundation which initiated the event, as well as their partners and the participants of Monaco Ocean Week, in order to define the content of the roadmap for marine protected areas in the Mediterranean discussed in November 2021. The session on 22 March 2022, held at the Monaco Yacht Club, focused on the priorities identified, as well as the recommendations and common solutions to protect a sea under pressure yet still inadequately regulated. Only 8.3% of the Mediterranean is covered by MPAs, yet the target currently being discussed at international level is 30% of MPAs and other effective area-based conservation measures (OECM) by 2030. How can this level of effective protection be reached, strongly encouraged by the international context in one of the most sensitive areas in the world in terms of marine biodiversity? How can we ensure that Mediterranean MPAs are efficient, and no longer merely "paper areas"?

IN FIGURES

- In 2020, 1,087 MPAs covered 8.33% of the Mediterranean, 2/3 of which in the Western Mediterranean (2 times greater than in 2014),
- 275 MPAs have national designations, which only represents 3.18% of the Mediterranean,
- strictly protected areas (no access, no sampling, no fishing) represent 0.04% of the Mediterranean.

😵 KEY**FACT**

- 2012: 1st MPA Forum and 1st roadmap drawn up in Antalya (Turkey),
- 2016: 2nd MPA Forum in Tangiers (Morocco) / assessment and update of the roadmap for 2020,
- 2020-2021: 3rd MPA Forum in Monaco / finalising of a new roadmap for the post-2020 period, in line with the Convention for Biological Diversity's global framework.



TARGETED PRIORITY ACTIONS

Resulting from a process initiated in 2012, in line with the global biodiversity framework, the roadmap discussed at the Mediterranean MPA Forum, targets priority actions and synergy to be implemented for the benefit of Mediterranean marine protected areas, as explained by Khalil Attia, Director of RAC/SPA: "The roadmap is made to stimulate the implementation of political commitment to marine protected areas, with the support of all the actors involved at local national, and international levels".

htt

Orchestrated by Asma Kheriji, Project Manager involved in RAC/SAP and Marie Romani, Executive Secretary of MedPAN, the presentation focused on key challenges, structured around the central themes of the roadmap:

- Improving MPA management by strengthening capacity and limiting the sectoral approach, identified as an obstacle to effective management;
- Increasing the number and size of MPAs and extending reinforced protection areas;
- Developing and supporting more sustainable financial mechanisms, such as MedFund;
- Communicating the values of MPAs to wider external audiences in order to find new partners (general public, private sector, fishermen, players involved in tourism...);
- Taking measures to address emerging threats hanging over MPAs, such as invasive species;
- Strengthening the networks of MPA managers and their synergy with networks of other stakeholders (NGOs, cities, agents...);
- Fostering biodiversity conservation beyond MPAs thanks to other effective sectoral and spatial tools.

And so that these objectives do not remain vague recommendations, the post-2020 process for the Mediterranean MPA roadmap will set up a mechanism to monitor and assess the implementation of the selected actions, with key indicators to be followed. ■



"There is no longer the time for pilot projects, we need to take action if we hope to make small steps forward. I believe in the value of example. We should all be hummingbirds, to set an example, not weaken and not lose hope." Leila Chikhaoui, Minister of the Environment of Tunisia

TROPICAL EASTERN PACIFIC

For reinforced marine protection in the Galápagos

An overview by the *Galápagos Conservation Trust* with details on the conservation efforts made to protect one of the most fascinating laboratories of evolution.

After supporting the establishment of the new Hermandad marine reserve, which has just extended the Galápagos protected area with the addition of a large migratory corridor where fishing will be partially prohibited, the *Galápagos Conservation Trust* (GCT) is supporting its partners to measure the impact of this new reserve and to ensure it is respected. The talks during *Monaco Ocean Week* on 23 March 2022 provided an opportunity to review the scientific efforts made and to advocate what underlies the new marine protected areas in the Tropical Eastern Pacific. The innovative tools necessary for the effective management of pollution and overfishing were also explored.

The ambassador of the *Galápagos Conservation Trust* (GCT), Sarah Darwin, a descendent of the eminent scientist, opened the event by celebrating the creation of the Hermandad marine reserve set up in January 2022, before introducing a short video of the Ambassador of Ecuador to the United Kingdom, Sebastian Corrál, showing the importance of strengthening the resilience of these ocean territories to negative climate impacts. Jen Jones, Project Manager at GCT, then provided an overview of the action nurturing the vision of Galápagos for 2030: marine biodiversity protected from unsustainable fishing and pollution, better prepared to build climate resilience. An objective largely shared, as confirmed in a video by local figures in the Galápagos, calling for action to protect their thirteen islands. But this regional objective must be based on broader involvement since the ocean knows no boundaries. "To protect the biodiversity of the Galápagos marine reserve, global cooperation is necessary. Measures must be taken in the marine protected areas, exclusive economic zones and the High Seas, currently unprotected", said Jen Jones before concluding: "We are honoured that the voice of the Galápagos is being heard on the Monegasque arena and to be sharing the results of our work on sharks and plastics, generously supported by the Prince Albert II of Monaco Foundation".



"Charles Darwin described the Galápagos Islands as 'a little world within itself' characterised by the large number of unique plants and animals. We now have a better understanding of the interrelationship between the Galápagos and the outside world. Never has it been more urgent to call upon a wide-ranging collaboration to help us find solutions to protect this archipelago." **Sarah Darwin,** Ambassador for the Galápagos Conservation Trust.



FLAGSHIP ACTIONS

- developing sustainable fisheries with artisanal fishermen and managers in order to guarantee future livelihoods,
- protecting migratory species, especially declining shark populations, threatened by overfishing,
- reducing plastic pollution in cooperation with local partners and the *Pacific Plastics: from Science to Solutions* (PPSS) network across the whole Eastern Pacific region (developing tools to clean the marine environment, raising awareness and mobilising a wide range of players).

IN FIGURES

- 60,000 km² extension of the Galápagos marine reserve,
- 19% of Ecuador's waters protected,
- **7 species** of migratory sharks and fish monitored.

94 OCEAN GOVERNANCE

* RELAY4 NATURE by The Ocean Race

Giving the ocean a voice in its own right, in the lead up to the UN Ocean Conference

THE OCEAN RACE

menaco ocean week

What if the ocean had rights?

On the qui-vive, *The Ocean Race* brought together experts, seamen and decision makers to explore a new approach to ocean status: to consider it as an international legal entity.

Inspired by the contemporary philosophical movement granting rights to nature, the workshop organised by The Ocean Race on Thursday 25 March, in the presence of HSH Prince Albert II of Monaco. examined the possibility of granting rights and a voice to the ocean. Could ocean rights help to alter the perception of this unique ecosystem? Could a universal declaration on ocean rights ensure it is adequately protected? These key questions formed the basis of the debate. The renowned American oceanographer Sylvia Earle, an advocate for ocean health, took the opportunity to launch a solemn and urgent appeal to world leaders: "Protect the ocean as if our lives depended on it, because that is the case". "Long considered a resource to be used and exploited, it is time to consider the ocean as a vital and complex system which feeds all life on Earth", said Richard Brisius, Chairman of The Ocean Race.

Michelle Bender of the *Earth Law Centre* and Mumta Ito, Founder of *Nature's Rights*, provided their expert insight on the issue, underlining the importance of a legal framework based on responsibility and interdependence.

Just after the Seychelles, the Monaco event is part of the series of summits organised by *The Ocean Race*. At the finish line of this diplomatic race, a single awardee: the ocean. A trophy? Rights that could be the key to its future. *The Ocean Race* will therefore strive to obtain the support of the main decision-makers and advocates for the ocean. The Sovereign Prince testified his steadfast support for this initiative.



HANDOVER

Like a relay baton for the ocean, Nature's Baton was passed between the stakeholders involved in COP26 negotiations in Glasgow, in Brest during the One Ocean Summit followed by the Seychelles a few days later prior to Monaco Ocean Week, during The Ocean Race, where it was handed over to the President Wavel Ramkalawan who in turn passed it on to young Seychelles champions of the sea. Having just arrived from the Indian Ocean. Ambassador Peter Thomson did not break the "blue thread" created by the initiative Relay4Nature. As a conveyor of this symbolic voice of the ocean, the United Nations Ambassador handed over the Nature's Baton to skipper Boris Herrmann, a passionate advocate for the ocean, leading one of the IMOCA teams taking part in the 2022-2023 edition of The Ocean Race.

"It is a race that we must win. We want to inspire ambitious climate actions through our sport", declared the finalist of the Vendée Globe holding the famous relay in front of his original sailing club, the Monaco Yacht Club.

The next stop is Italy, where the first innovation workshop will be held within the framework of the "Genova Process" which is responsible for drawing up a list of principles on which the Universal Declaration of Ocean Rights will be based.

PROFILE

The Ocean Race is hosting a series of 12 summits (2019-2023) bringing together high-level seamen and global decision makers with the aim of creating a global collective effort to implement new policies and thus protect the seas sustainably.



"The very first phase on the path towards a Universal Declaration of Ocean Rights is to agree to a list of principles on which the Declaration will be based."

Antonio Di Natale, marine biologist and Scientific Advisor on Ocean Affairs, Minister of the Sea of the Virtual State of Garbage Patch (recognised by UNESCO), a symbolic representation of the problem created by plastic in the ocean

UNITED NATIONS CONFERENCE

Blue route to Lisbon

25 high-level participants took part in a working breakfast whose purpose was to prepare for the upcoming United Nations Ocean Conference and prioritise ocean issues.

What priorities should be defined for the United Nations Ocean Conference which is being held in Lisbon from 27 June to 1 July 2022? This new chapter in global action for the ocean is opening under the auspices of innovative science-backed actions, pursuant to Sustainable Development Goal 14 (SDG 14). The extension of marine protected areas, the withdrawal of subsidies harmful to fisheries and the fight against climate change and ocean acidification are the key topics being addressed in the course of a series of multilateral preparatory meetings prior to the Lisbon event. An important milestone in the Decade of action to reach the United Nations Sustainable Development Goals.

Organised by the Oceano Azul Foundation, the Monaco round table, which took place in the morning of 22 March within the stimulating context of Monaco Ocean Week, brought together 25 representatives of institutional partners, as well as scientists and civil society players to elicit opinions and contributions. In the Turtle Conference Room at the Oceanographic Museum, Ricardo Serrão Santos, Minister of Foreign Affairs opened the session with a recap of all the challenges to be addressed in view of the calendar of international ocean negotiations.

DEFINING AN IMPROVED FRAMEWORK

Among the priorities of the conference, the participants stressed the need to allocate more funds to SDG 14. However, more than the shortage of funding, what came to the fore was the lack of agreements and tangible projects able to receive funding.

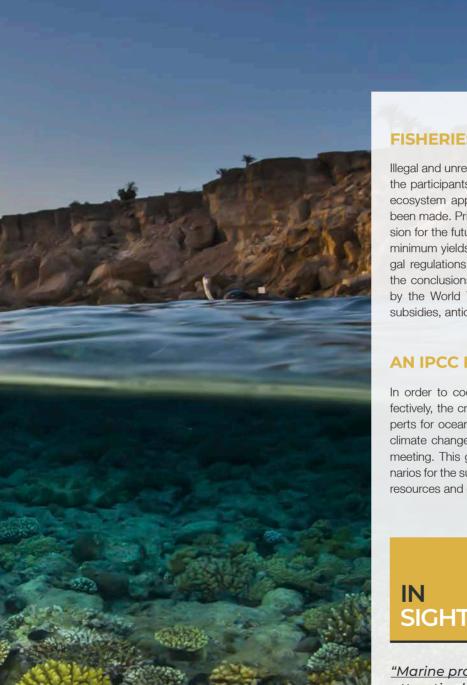
Moreover, consensus was reached on the need to make the United Nations Conference more compliant and voluntary commitments more responsible, by means of appropriate assessment and monitoring, including the assessment of progress. The participants stressed the need to guarantee a contribution from stakeholders and citizens to the Declaration of Lisbon. Developing a clear roadmap for the restoration of the main marine ecosystems was also discussed.

IN FIGURES

TOWARDS MORE SUSTAINABLE

- 170 billion / year would be necessary to reach the targets of SDG14,
- 2,7% of the marine environment is under high protection in 2022, still far from the 30% target for 2030.





FISHERIES

Illegal and unregulated fishing received attention from the participants, pointing out despite 20 years of an ecosystem approach to fisheries little progress has been made. Priorities should include a sustainable vision for the future of fisheries, a review of sustainable minimum yields and the reformulation of obsolete legal regulations. The Lisbon Conference could echo the conclusions of the long negotiations carried out by the World Trade Organisation (WTO) on fishery subsidies, anticipated in June 2022.

AN IPCC FOR THE OCEAN

In order to coordinate ocean governance more effectively, the creation of an international panel of experts for ocean sustainability, similar to the IPCC for climate change, was suggested during the Monaco meeting. This group of experts would examine scenarios for the sustainable use and protection of ocean resources and ecosystems.

SIGHT

"Marine protected areas must be attractive both in economic terms and from a social and environmental point of view." Philippe Cury, marine biologist specialising in fisheries at the Institut de recherche pour le développement

SCIENCE AND GOVERNANCE

IPOS, future expert panel on the ocean

Inspired by expert panels on the climate and biodiversity, the Ocean & Climate Platform is supporting the creation of an international panel specialised in ocean sustainability. The workshop organised during *Monaco Ocean Week* led to a new phase in the creation of this consensus of knowledge.

How can we provide decision-makers with the foundations for reliable and shared governance regarding the changes affecting the ocean? How can we build a transversal knowledge base to inform United Nations Ocean Sustainability policies? All these issues were addressed at the workshop on 25 March 2022 - the second phase of a first event organised during Monaco Ocean Week 2021 on ocean governance. Constructive discussions introduced by biologist and oceanographer Françoise Gaill, Vice-President of the Ocean & Climate Platform, were held during this Intergovernmental Panel on Ocean Sustainability (IPOS¹⁰), which is still in the set-up stage. Salient points were discussed, such as the issue of defining and co-producing "knowledge" and the legal possibilities of setting up a framework for polycentric ocean governance.

10. International Panel for Ocean Sustainability (IPOS).

IN SIGHT

<u>"What we need is a change in the way we</u> conduct oceanography and a genuine social contract for oceanography." **Vladimir Ryabinin,** Executive Secretary of the International Oceanography Commission of UNESCO





FROM KNOWLEDGE...

Ocean knowledge is now one of the key issues at stake in the fight against climate change and loss of biodiversity. Several players in the workshop, including *Mercator Ocean International* and *The Nature Conservancy*, are developing the concept of operational oceanography and are therefore questioning the role of data at an international level. The speakers presented how monitoring and predicting ocean variables could serve to alert States on changes to the marine and coastal environment.

Key issues raised during the discussions included the decompartmentalization of science and the integration of subjects from local communities – an issue taken up by the chief of the traditional Karelian village of Selkie (Finland), Tero Mustonen. This researcher and militant, a member of IPCC, upholds the importance of indigenous worldviews. The role of youth was also brought to the fore by two young scientists giving thought on how to "conceptualise ocean knowledge which we need for the future". Intergenerational justice is indeed a key point for IPOS.

... TO GOVERNANCE

The focal point of the future panel of experts for the ocean is the desire to bridge the gap between knowledge and action. According to the speakers of this second working session, the role of IPOS should be to share knowledge, mobilise civil society and citizens and to influence decision makers, whilst strengthening ties between the scientific community and policy makers. A debate opened by Louis Meuleman, Vice-Chair of the UN Committee of Experts on Public Administration, who presented the concept of ocean "meta-governance", and Andrei Polejack, oceanographic diplomacy researcher at the World Maritime University in Sweden, focused on current challenges as far as ocean governance is concerned. These questions helped to better define the objectives of IPOS in order to launch a feasibility study soon. This event is in line with the strategy for action initiated last year, presented at the One Ocean Summit in Brest (February 2022), worked on during this Monaco Ocean Week, with the aim of proposing the launch of an initial (or several) international working groups at the United Nations Conference in Lisbon (June 2022).





TION I CENERATION BLUE 1 TT

Nautical Knots and scientific data

Ocean Challenge"

In the vendée Clobe 2021 ranking

Bod 14h 59m 455

IOI BIODIVERSITY PROTECTION

/ 102 Exhibitions & Events
/ 108 Generation Blue
/ 112 Steering Committees

EXHIBITIONS & EVENTS

Arktic Circle

ARKTIC

A polar bear on the sea ice, a boat amid the broken ice, the blue eyes of an Arctic wolf... The result of three expeditions to the Arctic and leading on from a book published in partnership with the Prince Albert II of Monaco Foundation, the images of the exhibition conducted by Olivier Anrigo, "Arktic Circle, Memories of the North", became the setting for all the events taking place during Monaco Ocean Week which was held in the Yacht Club's conference room. "These vast natural areas, still little marked by the imprint of humankind, make us feel very small and reveal wildlife that is virtually intact", says the photographer committed to Arctic protection. Having seen up close the retreat and breakup of the sea ice, he is drawing attention to the fragility of these surveillance ecosystems, a true ocean compass: polar bear, Arctic wolf, reindeer, but also sea ice, glaciers

and rivers join in unison to alert the spectator about their vulnerability.

EXHIBITION / CONFERENCE

Arktic Interactions: experts' opinion

"As a privileged witness to all this beauty and seeing it disappear so quickly due to

global warming convinced me to share not only photos, but also to go a step further by mobilising collective intelligence around an ambitious programme to protect these regions", explained Olivier Anrigo, at the conference on Friday 25 March, alongside experts from the *Arktic Interactions* project team.

Following an excerpt from Jason Roberts' film on the

polar bear, glaciologist Leo Decaux pointed out water-related issues in the Arctic Circle, marine currents under glacier dynamics, focusing on exchanges between fresh water and salt water.

After crossing, with 3 other explorers, 450 kilometres towing a pulka to take samples of snow from Spitsbergen, the scientist Heidi Sevestre is seeking to determine the origin of *black carbon*, pollution emanating from industrialised countries which is migrating towards the poles and casting a shadow on the snow. Last, Deborah Pardo, an ecologist specialising in the albatross,

pointed out how marine birds are valuable indicators of marine biodiversity.

These experts, familiar with the health status of the Arctic regions, shared their data and concerns regarding the consequences of our actions on the poles, in the spirit of accessibility that characterises the *Arktic Interactions* project, deployed in schools in the Principality.



<u>"MEDITERRANEAN,</u> THE ODYSSEY OF LIFE"



On the evening of Thursday 24 March, the Beaux-Arts cinema in Monaco hosted a preview screening of the first opus of the series "Mediterranean, the odyssey of life", directed by Frédéric Fougea for France 2. After the film, in the presence of the director, the producer Gilles Dufraisse and the famous free diver Guillaume Néry, an informal and constructive exchange took place with the public, captivated by the film.

Crossed destinies

The 90-minute feature-length film threw the spectators into the waters of the Mediterranean where they become mesmerised by the migratory adventures of a loggerhead turtle, a young white stork, a school of bluefin tuna, a couple of seahorses and a pod of sperm whales. Through the chaotic destiny of these animals braving all sorts of dangers to perpetuate their species, many questions are raised, and the director does not shy away from pointing out the increasing impact of human appropriation of this space. Inviting spectators to enter the intimacy of rare animal scenes, the sovereign beauty of the photography makes this breath-taking journey a source of wonder tinged with a sense of unease, even revulsion. Is the Mediterranean still a habitable sea for the species that live there?

Cherish our common property

In a film of great style produced with the support of a network of experts, Frédéric Fougea and his team paint the picture of a Mediterranean Sea that is damaged yet resilient, alive yet endangered. The final sequences head to the depths, following the silent descent of free diver Guillaume Néry, returning to the location of the greatest ecological disaster in the Mediterranean: on the wreck of the oil tankers that sunk off the coast of Genova 30 years ago, bacteria progress as patches of orange, initiating the slow restoration of life, including in these deep waters rendered hostile. "The Mediterranean is dressing its wounds", assures the documentary which opens onto a fascinating landscape of gorgonian corals, the veritable lungs of a sea continually reinventing itself...Provided that, as uttered movingly by the voice of Camélia Jordana at the end of the film, we "cherish our common property, our sea. the Mediterranean". A necessary stance that Nice-born free diver Guillaume Néry encouraged during the Monaco Ocean Week evening event open to the public, demonstrating his steadfast commitment to "protecting the marine life of this global treasure".

IN BRIEF

NORDIC INSPIRATIONS

Wild fjords, deserted beaches, windy dunes bordered by a sea of foam, shimmering waters, lone boats, rare bathers... the unique landscapes of the North Sea were displayed on the purple walls of the prestigious conference room at the Oceanographic Museum of Monaco for the inauguration of the *Northbound* exhibition, on the evening prior to *Monaco Ocean Week*. Taken from collections of the Museum Kunst der Westküste on the Island of Föhr in Germany, 24 historical and contemporary works offering a voyage comprising 4 ports of call around this epicontinental sea in Northwest Europe.

The blue-grey colours of the Dutch coastline dominate the paintings of the late 19th century whilst the compositions by Danish painters of this period dialoguing with contemporary photographs, celebrate the famous "blue hour" specific to the atmosphere of the Nordic coast. The Norwegian port of call offers a romantic immersion into intact fjords. Then the cultural peculiarities of the Island of Föhr are unveiled, guardian of the Friesian culture, questioning the transmission and identity of the island.

Immortalising maritime scenes of bygone days, the selected works by artists of the North are bound to provide an inspirational change of scenery, whilst heightening our desire to better protect the coastline of a sea currently threatened by climate change, pollution and overfishing. (Exhibition from 19 March until 19 June 2022).

ECO-CITIZENSHIP

<u>SEA ANGELS</u> TO THE RESCUE OF THE MEDITERRANEAN



An eco-citizen kayak trip organised by the Monegasque association *Let's Free The Sea* mobilised twenty or so participants along the Monegasque coastline.

In the summer of 2021, Valentina Agnesi, the President of the association, launched a series of sea trips with the aim of getting as many people as possible involved in ocean protection. During the kayak trips, the participants, called *Sea Angels*, collected floating waste and cleaned the beaches they visited.

During *Monaco Ocean Week* 2022, twenty or so individuals met on Larvotto Beach to become Sea Angels for one afternoon, making them aware of their ability to take action to protect the seabed and coastline. Over the course of an hour, in their double kayaks, our angels made their way along an almost perfectly blue sea: leaving the Monegasque beach, they passed the Monte Carlo Bay to reach the coast of Roquebrune, before returning to their starting point, tracking down plastic waste.

Fun civic engagement

Let's Free The Sea cooperates with port authorities so that they can implement action to clean the seabed with divers, to remove large items of waste, such as in the marine protected area of Milazzo in Sicily. But what can we do to make everyone feel concerned by ocean protection? "Thanks to the kayak trips, participants get to discover the seacoast while having fun and staying fit. Once we learn to appreciate, we learn to respect", affirms the President of the environmental association.



An Eureka moment

This time, the kayakers returned from their excursion with just a small amount of plastic waste. "With the prevailing currents and as a result of the commitments made by the Principality, the area has been spared", says one of the campaigners. The sea patrollers came back with breath-taking photos of the Mediterranean

coast and its wildlife. An awareness session then followed focusing on plastic pollution which affects this sea under great anthropogenic pressure.

Following the success of this event which prompted very positive feedback, the community of Sea Angels is likely to spread its wings again.

the state of the sea. These trips show how much people really want to get involved."

Valentina Agnesi

IN BRIEF

A RING IN THE COLOURS OF THE OCEAN

The Repossi jewellers opened its doors, Square Beaumarchais, during Monaco Ocean Week, to unveil the latest creation by Gaia Repossi: a ring for the ocean. Three bands floating in the void, an "aqua blue" lacquer reminiscent of a lagoon, set on sustainably sourced rose gold. Sold as a limited edition, the magnetic Berbere Chromatic Ocean is created to order, by hand, in the jeweller's prestigious workshops. Another particular feature? All sales proceeds will go to the Prince Albert II of Monaco Foundation, in support of the ocean cause. "Together for a healthy ocean", this is the message engraved on one of the bands, like a secret pact. "Wearing this ring is a bit like wearing the ocean on the end of your fingers", said the Artistic Director, for whom this is not the first creation in support of a cause. As someone who cherishes the ocean, keen to work for its protection, she has proven once again the amazing scope of art that celebrates beauty.



GASTRONOMY

TOWARDS THE SUSTAINABLE SEAFOOD PLATE



A festive and gastronomic evening dedicated to the ocean at Stars'N'bars brought together talented scientists and a Michelin-starred chef with a passion for the sea, alongside 150 guests who came to celebrate the flavours of the sea.

ocean a genuine reservoir of biodiversity", explained Professor Denis Allemand in his introduction, plunging the auditorium into the meanderings of evolution.

Tomorrow, a blue plate?

In line with the conferences-debates-cocktails dedicated to marine biodiversity proposed at previous editions of Monaco Ocean Week, the event proposed by marine biologist Michèle Barbier, Executive Director of the Institut de Sciences et Ethique and Professor Denis Allemand, Scientific Director at the Monaco Scientific Centre, focused this time on exploring the relationship between gastronomy and marine biodiversity. "While the number of marine species is far inferior to the number of terrestrial species, the ocean nonetheless offers remarkable diversity: of the 36 animal groups known to date. 23 are exclusively marine and have never left the environment in which they were born. This makes the What does the sea-based plate consist of? The professor took us on a journey into the phylogenetic tree of the ocean, from the first organisms that appeared 600 million years ago (sponges), to marine mammals, not to mention the 50,000 species of mollusc, deep-water annelids and crustaceans... showing the great diversity of the sea-based plate, richer than the landbased plate. A plate which is not a recent phenomenon, points out the speaker who talks of the Neanderthal's partiality for seafood, steps back to the Roman era when shellfish and garum, a fermented fish, were highly prized, before roaming down the festive times of the 18th century when oysters were considered aphrodisiacs.

Will the food of the future be blue? "This would still depend on the sustainable use of marine resources, taking into account seasonality, stocks and the impact of climate change on the distribution of fish", cautions the scientist, referring to the recent multidisciplinary study produced by CLIM-ECO² which was funded by the Prince Albert II of Monaco Foundation¹¹. "Our future Mediterranean fisheries will need to adapt because they will perhaps no longer be able to fish or farm the same species", continues the alert-raiser adding that by extrapolating current uses, the disappearance of fish in the Mediterranean has been modelled for 2100, i.e. a faster collapse of fish resources than in the Atlantic Ocean.

11. The Climate and Mediterranean Fisheries: environmental and economic assessment project (CLIM-ECO²) was coordinated in 2020-2021 by ECOSEAS *"Ecology and Conservation Science for Sustainable Sea"* at the University Côte d'Azur and the Monaco Scientific Centre.



Cooking with full awareness

Having just obtained his 2nd star in the Michelin Guide 2022, Martinique Chef Marcel Ravin looked back at his gastronomic itinerary, from his native Caribbean to the Principality where he creates a cuisine of excellence at his Mediterranean restaurant, the Blue Bay. A cuisine which is none other than a declaration of love to the sea: "I want my menu to reflect my region, the perimeter within which we are, the products of my fellow fishermen and artisans. I try each of their products, and sometimes it's love at first taste!" A 17-year culinary quest which has propelled him to the pinnacle of gastronomy, but the Michelin-starred chef is still guided by the island philosophy he inherited from his family: "*My grandfather taught me that when you remove a species from its environment, you should use every bit of it*". Waste is banned, and instead acknowledgement is given to the living. The proof: among the dishes proposed for the evening, exceptional fish skin crackers, parts that are often left aside.

Food as medicine?

Stéphane Schneider, gastroenterologist and nutritionist at the CHU in Nice, took up the baton, focusing on the nutritional benefits of sea produce on human health: "The benefits of the ocean come firstly from Omega-3 fatty acids which limit cardiovascular risks, inflammatory disease and some neuro-degenerative disorders such as Alzheimer's disease", noted the specialist, adding that these well-known Omega-3s come from the plankton absorbed by fish. The speaker pointed out that *"climate change could jeopardise this food chain"*, and in doing so affect the quality of blue food, already prone to certain contamination (pathogens, heavy metals, chemicals...).

Towards responsible consumption

"We need to think and make choices". emphasises the artist Agnès Roux, founder of Logoscope, during her poetic performance "La bourse ou la vie" which highlighted the current ecological and humanistic challenges, against a marine-themed musical background. Then it was the turn of marine biologist Manuel Marchioretti to take a fascinated look at jelly fish and their astonishing ability to multiply, and even delighting the tastebuds of the audience with jelly fish fritters which he himself invented. Finally, aquaculture specialist Brice Cachia, the owner an aquaculture farm and seafood restaurant in Fontvieille, the Perles de Monte-Carlo, spoke about the potential and risks of aquaculture. In the setting of Star'N'Bars, embellished with aquariums containing luminescent jellyfish, plates of gastronomic appetizers created by Marcel Ravin followed one after the other, giving the evening a delicious and flavoursome appeal. All these sensory experiences prompt us to question our choices with regard to our consumption of marine resources.



- close to 2,400 species caught at sea are used in cooking across the globe,
- the 7 foods richest in nutrients are marine,
- **5g of fatty fish** (mackerel, black cod, salmon, tuna...) eaten / day **reduced human mortality by 5%.** (source: Mohan et al. JAMA Intern Med 2021)

GENERATION BLUE



Launched in 2020 by the University of Edinburgh and supported by the Prince Albert II of Monaco Foundation, **Ocean Leaders** is the only leadership programme designed specifically for young professionals working on the ocean. It combines leadership, mentoring and networking support with international fieldbased experiences.

IN FIGURES

- 24 ocean leaders,
- 19 countries.

BECOMING PART OF THE SOLUTION

And what if the ocean of the future was in the hands of the younger generations? At the core of *Monaco Ocean Week*, this inspirational event gave voice to young leaders and ocean professionals, uniting communities across the globe.

"An appraisal of our global ocean has revealed different perspectives on exploration and exploitation trajectories, and this requires multi-level leadership and new ears open to various accounts and opinions" introduced Meriwether Wilson, Co-Founder and Director of the Ocean Leaders programme, to launch this event designed to shed light on the scope of this programme run by the University of Edinburgh and supported by the Prince Albert II of Monaco Foundation.

In the Oceanographic Museum's conference room, addressing the Sovereign Prince and an audience of fifty or so students from the International University of Monaco and the *Green Management School* in Nice, Meriwether Wilson pointed out the key ambitions of the 24 Ocean Leaders. Then the Australian researcher Harriet Harden-Davies from the University of Wollongong, moderator of this event whose aim is to prompt interest among the young generation, invited four ocean leaders from 2020-2021 to share their own story and the way in which they have developed their skills and leadership.

4 stories around the world

The panel enjoyed listening to stories woven in all corners of the world, starting with llena Zanella, involved in setting up a shark sanctuary in Costa Rica between the Cocos Islands and Malpelo, a reserve which has transpired to be a source of blue carbon as well as an opportunity for the local communities, especially women, to combat climate change. Yolanda Sanchez, from Spain, then spoke about the development of an ocean education programme created in Chile, now involving a network of around fifteen countries in Latin America. Biologist Shirley Binder, who supports the development of marine protected areas in Panama, stressed the need to call upon players in science, political governance and finance with a view to reaching the 30% target for protected ocean areas by 2030. Meanwhile, Hugo Tagholm, in the United Kingdom, has mobilised a community of over 100,000 surfers and sea-goers who have proven to be valuable alert-raisers concerning water quality and marine pollution. During the discussion, these charismatic ocean leaders spoke in depth about their experiences and shared their opinions, underlining the main challenges encountered in their actions.

Joining the community

Demonstrating the inclusive approach of this event, the panellists then identified key advice to become an ocean leader, drawing from their own experience. "There are different type of leadership and I learnt to accept my own style. A leader is an 'inclusive' individual, both among the local communities and in international organisations", said llena Zanella. "There is no competition when fighting for the ocean", summed up Sandy Tudhope, Co-Founder and Co-Director of the programme, eager to inspire the younger generation. Encouraging the students to consider themselves as leaders in their current lives, the teacher mentioned a few of the key ingredients of the Edinburgh programme focused on coaching:

- understand your own style of leadership and emotional intelligence to seek solutions based on the specificity of the economic, social and cultural context of your region;
- develop sensitive intelligence and listen to others;
- cultivate the value of courage to be a player in ocean change at all levels, from local level to international level;
- create a global network of ocean leaders.

Ocean Leader, the tipping point

Invited to join the Ocean Leaders community on stage, HSH Prince Albert II of Monaco expressed his support for this initiative which places the younger generation not as inheritors of problems but as leaders to bring about change. In the second part of the event, the ocean leaders took on the role of facilitator, conducting various round tables on leadership with all the participants. The dialogue focused on the questions and concerns of a younger generation determined as much as concerned about the future of the ocean, sharing their experience and discovering that action can begin here and now...



ONCE UPON A TIME, THERE WAS A BABY POLAR BEAR CALLED ICE...

"This is the story of a baby polar bear: Ice. He lives in the North Pole in a country called Clear Water. But this country is in danger" recounts Valentina Agnesi, the dynamic President and Founder of the association Let's Free The Sea, to two Year-2 classes from Monaco's François d'Assise-Nicolas Barré catholic school, at the Monaco's Multimedia Library. Why in danger? asks the storyteller. Because *"it is increasingly hot, so the ice melts, because of global warming*", answer the children already attached to the hero of this climate tale, who decides to set off to New York to plead the case of polar bears at UN headquarters. At each stage of his trip, the main character encounters an environmental issue and helps, never losing heart, the animals in difficulty he meets on the way.

Thanks to this story featuring endearing characters, Valentina Agnesi raises child awareness of marine pollution, the fate of ghost nets and the effects of plastic in the ocean: *"Tips and advice are also given so that the children can feel they are agents of change"*, comments the organiser of this event which places focus on constructive discussions with schoolchildren. *"We need to take action so that every human-being understands that all waste must be picked up"*, declares one of the children, showing the early signs of helping to bring about change. As the story goes: *"Jumping Jellyfish! It's never too late!"*

TEAM MALIZIA

A RACE AGAINST THE CLOCK FOR THE CLIMATE

At an event dedicated to youth, Boris Herrmann, an ecologically minded skipper looked back at the highlights of the Vendée Globe, a solo race coupled with a scientific challenge.

In the afternoon of Wednesday 22 March, a clearly eager public gathering, largely represented by fifty or so children from the Monaco Yacht Club's sailing school and Monegasque schools awaited expectantly in front of the Monaco Yacht Club. On his arrival, the finalist of the Vendée Globe 2020, Boris Herrmann, accompanied by his "Team Malizia" handed out to each child a postcard with a picture of the monohull IMOCA Sea Explorer - Monaco Yacht Club, personally signed by him. With the talisman in their pockets, the young participants then took their seats in the conference room, their imagination already on board the boat that braved the ocean for 80 days, sailing along the most dangerous maritime routes. At the helm, the solo sailor: "What is the most difficult cape to sail across?", he asks, retracing the adventure of his first Vendée Globe, sporting the colours of the Principality. In the room, little hands are held up: Cape Horn. "What do we call the part of the boat which enables us to 'fly' over the water?" The young audience is reactive and curious about all the steps of preparation needed to compete in such a race, from the choice of itinerary to the boat's equipment, not to mention how to organise sleep and food.

Unite behind the science

Boris Herrmann then welcomed a guest of honour, an invaluable support for this adventure in his capacity as President of the Monaco Yacht Club, HSH Prince Albert II of Monaco. "The loop around Antarctica is longer than the one around the equator". remarks the high-level sailor, as impressive pictures are displayed on the projection screen. On the sail, among the partner logos, a slogan: "Unite behind the science", whispered by Swedish activist Greta Thunberg who, in August 2019, boarded the boat in Monaco for New York, where the United Nations Climate Action Summit was being held. A carbon neutral crossing for this figure in the fight against climate change.





Nautical knots and scientific data

The Vendée Globe sports challenge was indeed coupled with a high-precision scientific adventure created in partnership with internationally renowned research institutes: thanks to the onboard laboratory, the Oceanobox, invaluable ocean data was collected, including CO_2 concentrations in the inaccessible Southern seas. "These measurements can only be taken with a boat", says the skipper, who would like to document the impact of climate change on his favourite environment, the ocean.

"My Ocean Challenge"

The educational programme created by Team Malizia with the support of UNESCO, was then presented to the children who discovered a world focused on solutions and actions to be implemented on a daily basis to help - at their own level - protect the ocean.

The event ended with pictures of the new monohull that the team is currently building with the support of the Principality. A more curved hull, for a 60-foot boat, more flexible when crossing the waves, particularly in the difficult waters of the South, which will optimise the average speed. A new slogan: *"A race we must win"*. And this *"race that we must win"* is first and foremost the race against global warming. *"Stay curious!"* urges the sportsman. Was the world not discovered thanks to sailing?



© JeanMarie LIOT

Yacht Club de Mon

- 5th place in the Vendée Globe 2021 ranking
- 80d 14h 59m 45s

STEERING COMMITTEES



MONITORING OF THE PELAGOS INITIATIVE

On 21 March 2022, the coordinating committee meeting for the Pelagos Initiative took place in the offices of the Prince Albert II of Monaco Foundation. Created in 2021 by the Foundation, WWF, IUCN and MedPAN, the purpose of this Initiative it to act as a lever to increase the protection of the Mediterranean sanctuary (87 500 km²) and its marine mammals.

The members of the coordinating committee met to give an update on the 7 initial cross-border projects funded following the call for projects last year. The procedure for the next call for projects (June 2022) was also defined. Although it was decided that the selection criteria and various levels of support would be maintained, the committee was keen to adapt the priority issues to the new management plan of the Pelagos Agreement (2022-2027). The committee also agreed on the need to develop a communication strategy (creation of a communications pamphlet and a website).

Focus was placed on the first action of the Pelagos Initiative, namely the organisation of a webinar in May dedicated to all the players involved in the Sanctuary. This will provide an opportunity to present the initiative, explain how the call for projects works and give an overview of the Agreement's new management plan. This webinar will also provide the opportunity to stress the importance of creating a coalition between these players and to offer technical support to the project managers who so wish.

NEW PLAYERS WITHIN BEMED

The Board of Directors of Beyond Plastic Med (BeMed), followed by the association's General Meeting, took place on Tuesday 22 March 2021. An overview of 2021 activities was given, and the provisional calendar of 2022 activities was approved by the directors and board members, representatives of the Prince Albert II of Monaco Foundation, the Tara Ocean Foundation, the MAVA Foundation and the Surfrider Europe Foundation. The International Union for the Conservation of Nature (IUCN), which became a member of the Board in its capacity as Secretary General of BeMed was also represented.





MEDFUND ENHANCES THE EFFECTIVENESS OF MARINE PROTECTED AREAS IN THE MEDITERRANEAN

Currently protecting 3,700 km² of marine and coastal areas in the Mediterranean. MedFund has created a new funding window dedicated to marine protected areas benefitting from a high degree of protection. Supported by the MAVA Foundation, a partner of the Mediterranean environmental fund, the Highly Protected Mediterranean Initiative is aimed at limiting anthropogenic pressures leading to the degradation of ecosystems, including a sharp decrease in fish populations and a decline in emblematic species. Several scientific studies have shown the positive impact on biodiversity of a strong and sustainable protection status.

Consequently, the 20th MedFund Board of Directors meeting, which was held during *Monaco Ocean Week* 2022, under the presidency of Tunisia, represented by its Minister of the Environment, Leila Chikhaoui-Mahdaoui, focused on the conduct of this initiative. The directors analysed candidate applications for marine protected areas (MPAs) in Croatia, Turkey, Albania and Morocco that responded to the call for expression of interest launched at the end of 2021 in Monaco. The members of the board also reviewed the progress made in the implementation of activities by 8 MPAs benefitting from the environmental fund in the waters of Tunisia, Albania, Turkey and Morocco. Discussions also focused on the opportunities offered by the new support provided by the Global Environment Fund (The GEF) for MPAs in 6 Mediterranean countries for the period 2022-2026, in partnership with the MedPAN network representing a sum of 5 million dollars.

IN FIGURES

75% of fish stocks in the Mediterranean are overfished

(source: FAO Report on the global situation of fisheries and aquaculture 2020)

PATRONS OF NATURE FOCUSED ON THE OCEAN

On Thursday 24 March 2022, with *Monaco Ocean Week* in full swing, *Patrons of nature* met alongside the Sovereign Prince for a working lunch in Monaco. This exclusive group of personalities from the world of business, philanthropy and conservation, founded in 2010 and inspired by the mission of the International Union for the Conservation of Nature, took up the cause of the ocean on this occasion. Anse Capucin. Southwest of Mahé - Seychelles © Timon - Adobe Stock

ROADMAP FOR MONACO EXPLORATIONS

The Steering Committee for the "Indian Ocean" mission prepared by the company Explorations de Monaco met at the Oceanographic Museum on 23 March to put forward recommendations on the scope and conduct of this collaborative project at the intersection of science, mediation, awareness and governmental cooperation. Under the presidency of scientist Carl Gustaf Lundin, Director



General of Mission Blue, the 14 committee members, from Australia, France, South Africa, Sweden, and the United States and remotely from Mauritius and the United Kingdom, agreed on the finalisation of the situation of target maritime species.

Discussions focused on the goals and implementation of 3 projects from the mission's scientific programme with their respective managers. The priority target, the joint management area between Mauritius and the Seychelles, the Saya de Malha Bank located beyond the exclusive economic areas of the two States, especially retained the attention of the committee, the challenge being to collect scientific information likely to help consolidate the shared governance of an area that potentially has exceptional universal value. This mission run by Explorations de Monaco, scheduled for the autumn 2022, will also focus on a selection of refuges (islands and seamounts) for the biodiversity of this region with the aim of helping to protect them in the face of impacts from anthropogenic pressure and climate change.

Lastly, the committee discussed communication actions that could accompany the mission and the dissemination of its results.

A MORE REPRESSIVE LEGAL ARSENAL FOR THE OCEAN

Spotlight on law, a neglected but no less essential component of environmental protection: the 1st legal workshop of *Monaco Ocean Week*, organised by the Prince Albert II of Monaco Foundation. On 25 March, the foundation stone of an event expected to develop was laid by eminent specialists in the law of the sea brought together to examine a key issue: How to reinforce and develop sanction mechanisms in marine environmental law?

Leading lawyer Alexander Knoops, Professor of International Law at the University of Amsterdam, began by talking about the challenges and the need for more coercion in marine environmental law, analysing the first major judgments relating to environmental law. As such, the professor suggested – based on specific and objective criteria – creating the crime of ecocide, and more specifically of oceanocide, which would become the 5th international crimes of the Rome Statute of the International Criminal Court.

Then Philippe Weckel, Professor of International Law at the University of Nice Sophia Antipolis, shed light on the complexity of law enforcement in the marine sector, due to overlap between the strata of legislation (Port State Law, Territorial Waters Law, Flag Law). Grégoire Leray, Professor of Environmental Law at the University of Nice Sophia Antipolis, presented the criteria for assessing the performance of international environmental protection conventions.

In conclusion, other than the need to tighten sanctions in environmental law, especially marine, the panel suggested supranational solutions, such as the idea of an international marine intervention force for marine protection.

RENEWED COMMITMENT TO THE MEDITERRANEAN MONK SEAL

On 22 March 2022, during *Monaco Ocean Week*, the members of the *Monk Seal Alliance*, renewed their commitment to the protection of this endangered species. In the presence of HSH Prince Albert II of Monaco, the members of this organisation signed a 3-year extension of the Memorandum of Understanding formalising their partnership.

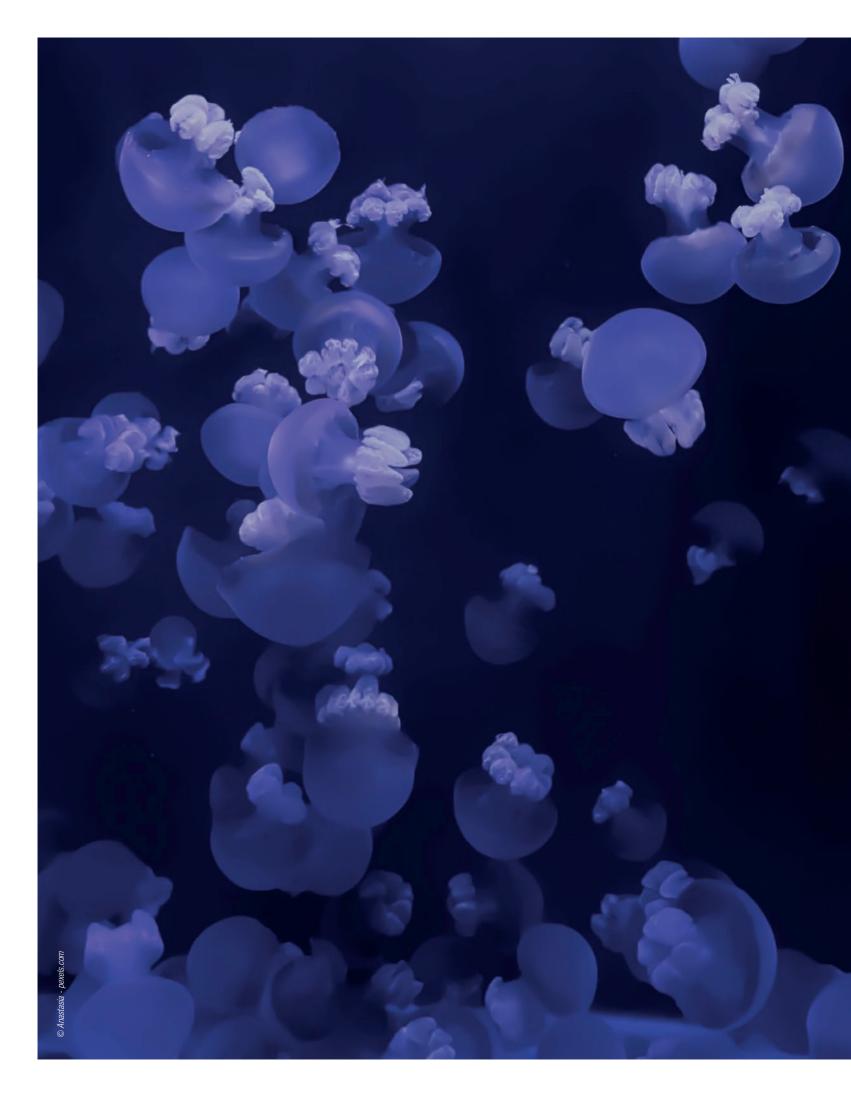
A *Monk Seal Alliance* steering committee also took place in hybrid format in order to offer all the members the opportunity to hone the action plan for the upcoming years. Focus was placed on the mobilisation of players in the monk seal community with the setting up of workshops at the beginning of 2023 and the selection of themes for the Alliance's next call for projects. A concerted approach was encouraged, through capacity building activities, coalitions, exchange of information and knowledge transfer between players.

Furthermore, the strengthening of concrete actions adapted to anthropogenic threats to the species (fishing, tourism, etc.) was identified as a priority, as was the strengthening of marine protected areas. An overview was given on data monitoring, the current situation of monk seal populations in each of the Alliance's countries, the various funding streams (public, private, green and blue Funds...) as well as future challenges and opportunities. A presentation was also given on progress made in terms of communication, such as the launch of a website and the production of an institutional video, providing a foretaste of this new chapter in the history of the Alliance.





(from left to right): Olivier Wenden, Vice-President of the Prince Albert II of Monaco Foundation / Vera Alexandropoulou, Vice-President of the Thalassa Foundation / HSH Prince Albert II of Monaco / Paule Gros, Director of the Mediterranean programme at the MAVA Foundation / Auriane Pertuisot, Coordinator of the Monk Seal Alliance.







THE PRINCE ALBERT II OF MONACO FOUNDATION

HSH Prince Albert II of Monaco decided to create his Foundation in June 2006 as a response to the concerning challenges facing our planet's environment. For 15 years, the Prince Albert II of Monaco Foundation has carried out actions in three main geographic areas: the Mediterranean, the Polar Regions, and the Least Developed Countries (according to the United Nations list) in order to limit the effects of climate change and encourage renewable energies, protect biodiversity, manage water resources and combat desertification. Active at an international level, the Foundation involves citizens, political officials, scientists and economic stakeholders to defend nature, a common good of humanity.

www.fpa2.org



THE MONACO GOVERNMENT

HSH the Sovereign Prince has made sustainable management of the seas, oceans and their resources a priority area of Monaco's national and international policy. The Monaco government works tirelessly to this end, and particularly within the framework of the 2030 Agenda for Sustainable Development adopted by the United Nations.

That is why the Government is now involved in events for *Monaco Ocean Week* supported by the Prince Albert II of Monaco Foundation, in which all Principality stakeholders are involved.

www.gouv.mc/Action-Gouvernementale/L-Environnement



OCEANOGRAPHIC INSTITUTE, PRINCE ALBERT I OF MONACO FOUNDATION

The Oceanographic Institute aims to raise awareness of the wealth and fragility of the oceans, and to promote sustainable management and thoughtful and effective protection. To do this, it mediates between scientific and socio-economic stakeholders, the general public and policy-makers. It carries out this mission by promoting the exceptional heritage of Prince Albert I and the exemplary commitment by HSH Prince Albert II of Monaco to: "Raise awareness, love and protect the oceans".

www.institut-ocean.org



MONACO SCIENTIFIC CENTRE

The Monaco Scientific Centre (C.S.M.) is an autonomous public Monegasque institution created in 1960 by Prince Rainier III. Its aim: to give Monaco the means to carry out scientific research and support the action of government and international organisations responsible for protecting and conserving marine life. The Centre attracts candidates from all over the world: since its move to new headquarters at Quai Antoine Ier in 2013, more than 50 specialists have arrived from 15 countries (Europe, the USA, Japan, Australia, New Zealand, Palau, Brazil, the Caribbean, Canada, Oman, Saudi Arabia...).

www.centrescientifique.mc



THE YACHT CLUB OF MONACO

Founded in 1953 by Prince Rainier and chaired since 1984 by HSH Prince Albert II of Monaco, the Monaco Yacht Club has 1,200 members from 60 nationalities. Home to some of the most prestigious private yachts in the world, the YCM now enjoys a unique position in the world of international yachting and sailing.

www.yacht-club-monaco.mc



MONACO TOWN HALL

The Town Hall is the oldest institution in Monaco, with over 650 people working in 19 municipal departments, in areas of expertise like the Environment and Sustainable Development. Deeply mindful of the environment, based on guidelines given by HSH Prince Albert II, the Monaco Town Hall has been committed to protecting the environment for many years; a commitment which is reflected in tangible and sustainable actions in the Principality.

www.mairie.mc



THE PELAGOS AGREEMENT

The Pelagos Sanctuary is a 87,500 km² marine area subject to an agreement between Italy, Monaco and France to protect its marine mammals. What makes the Pelagos Sanctuary unique is the fact that it is managed by three different authorities, and it includes coastal areas and international waters which form a huge ecosystem of major scientific, socio-economic, cultural and educational interest.

www.sanctuaire-pelagos.org



ACCOBAMS

ACCOBAMS (Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contiguous Atlantic Area) is a cooperative body working to conserve marine biodiversity in the Mediterranean and Black Sea. Its primary objective is to reduce the threats to cetaceans in this geographic area, and improve our knowledge about these animals. ACCOBAMS is the first agreement binding countries from two sub-regions and allowing them to collaborate on a general interest topic.

www.accobams.org



THE RAMOGE AGREEMENT

The RAMOGE area includes the maritime areas of the Provence-Alpes-Côte d'Azur region, the Principality of Monaco and the Italian region of Liguria, forming a pilot area to prevent and combat marine pollution. The RAMOGE agreement is an instrument of scientific, technical, legal and administrative cooperation allowing French, Monegasque and Italian governments to carry out actions for integrated coastal management.

www.ramoge.org



THE MEDITERRANEAN SCIENCE COMMISSION (CIESM)

CIESM has supported multilateral research in the Mediterranean and the Black Sea since 1910, the date it was founded. It is a unique forum for scientific discussion and dialogue, bringing together thousands of researchers who, together, use the newest technologies and approaches to understand, monitor and protect a very exposed sea. The Commission is able to define the Mediterranean's priorities in terms of marine and environmental research with greater impartiality, consolidated by the political support of its 23 Member States.

www.ciesm.org



THE INTERNATIONAL HYDROGRAPHIC ORGANISATION (IHO)

The International Hydrographic Organisation (IHO) is the intergovernmental body responsible for ensuring that all seas, oceans and navigable waters are hydrographically surveyed and mapped through the coordinated efforts of national hydrography services. The IHO has been hosted by the government of Monaco since its creation in 1921 and currently has 93 member states worldwide.

www.iho.int



INDEMER: THE INSTITUTE OF THE ECONOMIC LAW OF THE SEA

The Institute of the Economic Law of the Sea, founded in 1985 as an approved Monegasque association, whose patron is HSH the Sovereign Prince of Monaco. Its primary goal: to carry out studies and research concerning legal, economic, social and environmental issues raised by the use of the ocean and the marine environment.

www.indemer.org



INTERNATIONAL ATOMIC ENERGY AGENCY

The IAEA Environmental Laboratories, located in Monaco and Seibersdorf, Austria, work with Member States to develop strategies for sustainable management of their land, marine and atmospheric resources. Together, they apply nuclear and isotope science to understand and mitigate the environmental impact of radionuclides, trace metals, organic contaminants (PCBs, hydrocarbons), as well as to study the impacts of climate change, habitat destruction and the loss of biodiversity. This includes inspecting and monitoring contaminants in the oceans, such as mercury or plastics, as well as biotoxins linked to microalgae, and studying how they are transferred to marine animals.

www.iaea.org



MONEGASQUE ASSOCIATION FOR THE PROTECTION OF NATURE (AMPN)

The Monegasque Association for the Protection of Nature (AMPN) manages two Marine Protected Areas (MPA) in Monaco, which it created in 1976 and 1986.

It regularly develops monitoring and research programmes. This includes work carried out on 3D printed artificial reefs submerged in the Larvotto MPA. These lead to the development of innovative tools to protect or reinforce biodiversity. AMPN also created the Monaco Educational Marine Area for which it plays a central role. Its expertise contributes to its success, and guarantees that children can play their part in environmental protection.

www.ampn-nature-monaco.com



BEYOND PLASTIC MED - BEMED

With over 3 trillion microplastic particles, the Mediterranean is the most polluted sea in the world. Faced with this finding, the Prince Albert II of Monaco Foundation asked the Tara Océan Foundation, Surfrider Foundation Europe, and the MAVA Foundation to join forces and launch the Beyond Plastic Med (Be-Med) initiative during the international conference "Plastic in the Mediterranean: what next?" which was held in Monaco in March 2015.

In January 2019, the Beyond Plastic Med (BeMed) association was founded and is now led by a large group, as the IUCN wanted to get involved alongside the founding members. As BeMed's goal is to act at the source of the problem, the association aims to support and network stakeholders committed against plastic pollution in the Mediterranean, implement sustainable solutions, encourage the research of new alternatives and rally stakeholders and the general public through knowledge and sharing best practices.



THE MEDFUND ENVIRONMENTAL FUND FOR MEDITERRANEAN MARINE PROTECTED AREAS (MPAS)

The MedFund is an environmental trust fund based in Monaco, specifically dedicated to funding marine protected areas (MPA) in the Mediterranean. Founded in 2015 by Monaco, France and Tunisia with the support of the Prince Albert II of Monaco Foundation, MedPAN network and SPA/RAC, the MedFund realises the commitment by several Mediterranean countries and international environmental organisations who believe that immediate action is required to protect the future of the Mediterranean and its populations.

The environmental fund partially relies on an innovative funding mechanism which aims to capitalise a solid financial amount whose regular profits are reinvested sustainably in MPA support. Transparent and secure, The MedFund observes a responsible investment policy which helps address the issues of a new, more sustainable Mediterranean economy.

www.themedfund.org



OCEAN ACIDIFICATION AND OTHER OCEAN CHANGES - IMPACTS AND SOLUTIONS - OACIS

Ocean Acidification and other ocean Changes – Impacts and Solutions (formerly the Monegasque Association for Ocean Acidification - AMAO) is a Monegasque association founded in 2013 on the initiative of the Prince Albert II of Monaco Foundation to study the impact of climate change on the ocean, such as acidification, as well as potential solutions to mitigate its impacts. It is hosted by the Prince Albert II of Monaco Foundation.

OACIS involves several stakeholders: the Prince Albert II of Monaco Foundation, the Monaco Government, the IAEA environment laboratories, the Monaco Scientific Centre and Oceanographic Institute, as well as representatives from the International Union for Conservation of Nature (IUCN) and the French Scientific Research Centre (CNRS).



STARS'N'BARS

A Premier Sports Bar and family restaurant in Monaco since 1993, STARS'N'BARS (founded by Kate and Didier) decided to make environmental awareness, well-being and personal development a priority, whilst continuing to offer a diverse menu based on home-made, organic dishes.

STARS'N'BARS is a vital player in the sustainable development of the Principality, and plays an active role in events such as *Monaco Ocean Week*, Ever Monaco, the Eco Race...

www.starsnbars.com

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Coordination | The Monaco Ocean Week team of the Prince Albert II of Monaco Foundation: Philippe Mondielli, Nadège Massé, Céline Vacquier-Bekkari Graphic design and creation | Grégory Cheyroux - greg.cheyroux@gmail.com Editing | Caroline Audibert / Prince Albert II of Monaco Foundation

monacooceanweek.org



Villa Girasole 16, Boulevard de Suisse 98000 MONACO Tél : +377 98 98 44 44 Fax : +377 98 98 44 45 www.fpa2.org