ISTISAN CONGRESSI 26|C4

ISSN: 0393-5620 (cartaceo) • 2384-857X (online)

International Forum

Ocean and Human Health
International High-Level Forum

Istituto Superiore di Sanità
Rome, June 8, 2026

Edited by
L. Notargiacomo and A. Muratore

ISTITUTO SUPERIORE DI SANITÀ

International Forum

Ocean and Human Health
International High-Level Forum

Istituto Superiore di Sanità
Rome, June 8, 2026

ABSTRACT BOOK

Edited by
Lorenza Notargiacomo and Anna Muratore
National Centre for Water Safety, National Institute of Health (ISS), Rome, Italy

ISSN 0393-5620
ISTISAN Congressi
26/C4

Istituto Superiore di Sanità
Ocean and Human Health - International High-Level Forum. Istituto Superiore di Sanità, Rome, June 8, 2026. Abstracts book.
Edited by Lorenza Notargiacomo and Anna Muratore
2026, xvi, 31 p. ISTISAN Congressi 26/C4

The forum will examine the critical interconnections between ocean ecosystems and human health, positioning this relationship as an emerging priority in global public health. It aims to promote interoperable platforms for data exchange, environmental and health surveillance, antimicrobial resistance monitoring, and climate-related indicators, while also strengthening preparedness and scientific understanding of the health impacts of marine ecosystem change. Additionally, the event aims to promote science diplomacy as a means of fostering international cooperation, dialogue, and collective resilience. This initiative represents the initial phase of a broader strategy to engage stakeholders and knowledge holders in support of long-term collaboration and scalable, evidence-informed action.

Key words: Ocean and Human Health, Marine biodiversity, High Seas Treaty, One Heath, Science diplomacy

Istituto Superiore di Sanità
Ocean and Human Health - International High-Level Forum. Istituto Superiore di Sanità, Roma, 8 giugno 2026. Riasssunti.
A cura di Lorenza Notargiacomo e Anna Muratore
2026, xvi, 31 p. ISTISAN Congressi 26/C4 (in English)

Il forum approfondirà le interconnessioni essenziali tra ecosistemi marini e salute umana, riconoscendo tale rapporto come una priorità emergente per la sanità pubblica globale. L'obiettivo è promuovere piattaforme interoperabili per la condivisione dei dati, la sorveglianza ambientale e sanitaria, il monitoraggio dell'antimicrobico-resistenza e degli indicatori climatici, rafforzando al contempo la preparazione e la comprensione scientifica degli impatti sanitari legati ai cambiamenti degli ecosistemi marini. L'evento intende inoltre valorizzare la diplomazia scientifica come strumento di cooperazione internazionale, dialogo e resilienza collettiva, rappresentando la prima fase di un'iniziativa più ampia e partecipata.

Parole chiave: Ocean and Human Health, Biodiversità marina, Trattato sugli Alti Mari, One Health, Diplomazia scientifica

Scientific Coordinator: Luca Lucentini

For information on this document, please write to: info_ohhforum@iss.it

Quote this document as:
Notargiacomo L Muratore A (Ed.). *Ocean and Human Health - International High-Level Forum. Istituto Superiore di Sanità, Rome, June 8, 2026. Abstracts book.* Rome: Istituto Superiore di Sanità, 2026 (ISTISAN Congressi 26/C4)

Legale rappresentante dell'Istituto Superiore di Sanità: *Rocco Bellantone*
Registro della Stampa - Tribunale di Roma n. 119 del 16/5/2014 (cartaceo) e n. 120 del 16/5/2014 (online)
Direttore Responsabile della serie: *Antonio Mistretta*
Redazione*: Patrizia Mochi e Giovanna Morini*
La responsabilità dei dati scientifici e tecnici è dei singoli autori, che dichiarano di non avere conflitti di interesse.

Viale Regina Elena, 299 – 00161 Roma

TABLE OF CONTENTS

PROGRAMME

Monday, June 8, 2026

08.45 Registration

08.15 Opening Ceremony

Prof. Rocco Bellantone
President of National Institute of Health (ISS)

Prof. Andrea Lenzi
President of National Research Council (CNR)

Lt. Gen. Vincenzo Aglieri
Chief of the Italian Navy Health Inspectorate

Prof. Enrico Alleva
Academician of Lincei National Academy

10:00 Ministerial Remarks
Prof. Orazio Schillaci
Italian Minister of Health

Keynote lecture

THE FUTURE OF OCEAN & HUMAN HEALTH: SCIENCE, RISKS AND GLOBAL OPPORTUNITIES

Andrea Piccioli
Director General of National Institute of Health (ISS)

First session

THE OCEAN'S ROLE IN SAFEGUARDING HUMAN HEALTH

Moderators: **Luca Lucentini, Giusi Condorelli**

10.30 Life at the water's edge: the lancet commission on sea-level rise, health, and justice
Sandro Demaio

10.45 Protecting ocean resources: a public investment in future medicines and biotechnology
William Gerwick

11.00 Develop science-based approach via oceanic research to safeguard human health
Yuntao Wang

11.15 Human health and the anthropocene ocean
Jesse H. Ausubel

11.30 From source to sea: unep policies linking ocean health and human well-being - the mediterranean as a global model
Atila Uras

11.45 *The new strategies for the oceans of the European Commission*
Elena Gissi

12.00 *Human and Ocean health relatedness: Focus in Patagonia*
Pedro Flombaum

12.15 *Bridging Ocean and Human Health: Addressing Critical Knowledge Gaps with a New Systematic Approach*
Fulvio Ferrara

Setting the scene

12.30 *Ocean health and public health prevention: integrated strategies for sustainable and resilient system*
Maria Rosaria Campitiello

12.40 *Ocean and Human Health*
Giovanni Leonardi

12.50 *Ocean and Human Health*
Annamaria Colao

13:00 *Vin d'Honneur at the Monumental Garden of ISS*

14.35 *Video Contributions from Italian associations and research centres*

Session II
OCEAN AND HUMAN HEALTH: CHALLENGES AND INNOVATIONS FOR RESILIENT FUTURE

Moderators: **Giuseppe Bortone, Flavia Riccardo**

14.45 Protection of marine environments and the new challenges and innovations for a resilient future
Riyong Kim

15.00 The oceanic seascape and its microbiome: a one health perspective
Daniele Iudicone

15.15 *The Italian Navy's strategy for safeguarding the seas: challenges in the ocean-human health nexus*
Filippo La Rosa

15.30 *Advancing the ocean-human health nexus: challenges and innovations at the sea study centre of the University of Genoa*
Marco Giovine

15.45 *Marine Strategy for Ocean and Human Health: ISPRA's Pivotal Rol*
Cecilia Silvestri

Conclusion
NEXT STEPS ON OCEAN AND HUMAN HEALTH

16.00 **William Gerwick**

16.15 **Jesse H. Ausubel**

16:30 *Closing Remarks*

SPEAKERS AND MODERATORS

Ausubel Jesse H.	Director of Program for the Human Environment at the Rockefeller University, New York, USA
Bortone Giuseppe	Director of the Environment and Health Department, National Institute of Health (ISS), Rome, Italy
Campitello Maria Rosaria	Head of Department Prevention, Research and Health Emergencies - Ministry of Health, Rome, Italy
Colao Annamaria	Full Professor of Endocrinology and Metabolic Diseases, UNESCO Chair, Federico II University, Naples, Italy
Condorelli Giusi	Head of the Internationalization and Promotion of Biomedical Research Infrastructures, Ministry of Health, Rome, Italy
Demaio Sandro	Director and Head of the WHO Asia-Pacific Centre for Environment and Health (WHO ACE) Seoul, Republic of Korea
Ferrara Fulvio	Head of the Coordination, Management and Data Access Area, National Centre for Water Safety, National Institute of Health (ISS), Rome, Italy
Flombaum Pedro	Director of Centro de Investigaciones del Maryla Atmósfera y Consejo Nacional de Investigaciones Científicas y Técnicas, Buenos Aires, Argentina
Gerwick William	SCRIPPS Institution of Oceanography, University of California (UCSD), San Diego, USA
Giovine Marco	Sea Study Centre, University of Genoa, Genoa, Italy
Gissi Elena	Marine Science Institute (CNR-ISMAR), Venice, Italy
Iudicone Daniele	Anton Dohrn Zoological Station (SZN), Naples, Italy
La Rosa Filippo	Italian Navy Health Inspectorate, Rome, Italy
Leonardi Giovanni	Head of the Department of Human Health, Animal Health, Ecosystem (One Health) and International Relations - Ministry of Health, Rome, Italy
Lucentini Luca	Director of the National Centre for Water Safety, National Institute of Health (ISS), Rome, Italy
Piccioli Andrea	Director General of National Institute of Health (ISS), Rome, Italy

Riccardo Flavia	Coordinator of External Relation Office and Centre for International Affairs, National Institute of Health (ISS), Rome, Italy
Riyong Kim	Head of the Department of Environment and Sustainability, European Environmental Agency (EEA) Copenhagen, Denmark
Silvestri Cecilia	Environmental Protection and Research (ISPRA), Rome, Italy
Uras Atila	Senior Scientific and Technical Programme Officer UNEP/MAP, Athens, Greece
Wang Yuntao	Director of International Collaboration Center Second Institute of Oceanography, Ministry of Natural Resources of China, Hangzhou, China

SCIENTIFIC BOARD

Enrico Alleva	Academician of the National Academy of the Lincei, Rome, Italy
Fulvio Ferrara	Head of the Coordination, Management and Data Access Area, National Centre for Water Safety, National Institute of Health (ISS), Rome, Italy
Flavia Riccardo	Coordinator of the External Relations Office and Centre for International Affairs, National Institute of Health (ISS), Rome, Italy

SCIENTIFIC SECRETARIAT

Fulvio Ferrara	Head of the Coordination, Management and Data Access Area, National Centre for Water Safety, National Institute of Health (ISS), Rome, Italy
Anna Muratore	Coordination, Management and Data Access Area, National Centre for Water Safety, National Institute of Health (ISS), Rome, Italy
Lorenza Notargiacomo	Coordination, Management and Data Access Area, National Centre for Water Safety, National Institute of Health (ISS), Rome, Italy

ORGANIZING SECRETARIAT

Federica D'Antonio	Directorate General, National Institute of Health (ISS), Rome, Italy
Catia Buschittari	Directorate General, National Institute of Health (ISS), Rome, Italy
Loredana Palone	Directorate General, National Institute of Health (ISS), Rome, Italy

TECHNICAL SECRETARIAT AND INTERNATIONAL RELATIONS

Benedetta Pieri	Technical Secretariat and External Relations, Directorate General, National Institute of Health (ISS), Rome, Italy
Giulia Sabatini	Directorate General, National Institute of Health (ISS), Rome, Italy

PRESS OFFICE

Mirella Taranto	Director of Press Office, National Institute of Health (ISS), Rome, Italy
Pier David Malloni	Press Office, National Institute of Health (ISS), Rome, Italy
Antonio Granatiero	Press Office, National Institute of Health (ISS), Rome, Italy
Gianfelice Martini	Press Office, National Institute of Health (ISS), Rome, Italy

TRAINING SERVICE

Alfonso Mazzaccara	Director of Training Service, National Institute of Health (ISS), Rome, Italy
Roberta Rossi	Training Service, National Institute of Health (ISS), Rome, Italy
Serenella Arecchi	Training Service, National Institute of Health (ISS), Rome, Italy
Silvia Venturini	Training Service, National Institute of Health (ISS), Rome, Italy

SCIENCE COMMUNICATION SERVICE

Antonio Mistretta	Director of Science Communication Service, National Institute of Health (ISS), Rome, Italy
Alessandro Mustazzolu	Training Service, National Institute of Health (ISS), Rome, Italy
Sandra Salinetti	Training Service, National Institute of Health (ISS), Rome, Italy

TECHNICAL MODERATORS

Stefania De Angelis	Chemical Risk Area, National Centre for Water Safety, National Institute of Health (ISS), Rome, Italy
Daniela Maresca	Chemical Risk Area, National Centre for Water Safety, National Institute of Health (ISS), Rome, Italy

NOTES FOR CONSULTATION

The present volume comprises the abstracts of all the contributions that were presented at the Ocean and Human Health - International High-Level Forum Held by Istituto Superiore di Sanità, Rome, June 8, 2026.

For ease of reference, the abstracts have been organized into distinct groups according to their respective sessions and presented in the sequence delineated in the official program. A list of all the authors of the various contributions is also included at the end of the work.

PREFACE

There are moments when science is called not only to observe change, but to help define its direction. The subject addressed in this ISTISAN Report belongs to that category. The relationship between the ocean and human health can no longer be regarded as a narrow specialist field, nor simply as a point of intersection between different disciplines. It now represents one of the most advanced frontiers of contemporary scientific thinking, because it compels us to recognize an essential truth: human health and the health of natural systems are part of the same equilibrium. For a long time, we viewed the ocean as a physical space, an economic resource, a geopolitical horizon, or an environmental object of study. Today, we know it is far more than that. The ocean regulates the planet's major biogeochemical cycles, influences climate, sustains biodiversity and food security, and shapes water quality, exposure to contaminants, microbiological dynamics, and, increasingly, the deeper determinants of global health. In this perspective, the conference "The Future of Ocean and Human Health: Science, Risks and Global Opportunities" represents far more than a scientific gathering. It expresses a clear cultural and institutional vision: that of a public health approach capable of understanding complexity, overcoming traditional disciplinary boundaries, and interpreting the profound connections between environment, health, innovation, and global governance. For the Italian National Institute of Health, this reflection lies fully within its institutional mission. A public scientific institution is not tasked only with producing evidence, but with transforming that evidence into tools for prevention, strategic guidance, and collective responsibility. In a time marked by climate change, new environmental vulnerabilities, growing pressure on ecosystems, and emerging health risks, the ability to anticipate challenges will be one of the defining measures of scientific institutions. But this is also a reflection on the future of public science itself. The Institute we envision for the years ahead is one that is increasingly open, interdisciplinary, and international, capable of integrating biomedical research, environmental sciences, technological innovation, advanced training, and science diplomacy. An institution that continues to serve as a national pillar of scientific authority, while also acting as an active node within global knowledge networks. Within this vision, younger generations hold a central place. Because the future of public health will require new skills, new languages, and a renewed ability to build bridges between fields of knowledge that until recently appeared separate. Through them, public scientific knowledge will continue to renew itself without losing its rigor or its civic mission. This Report accompanies and documents a dialogue that looks far ahead. Because understanding the future of the relationship between the ocean and human health ultimately means reflecting on the future of our own ability to prevent, protect, and govern health in a deeply interconnected world.

Rocco Bellantone
President of National Institute of Health

Andrea Piccioli
Director General of National Institute of Health

INTRODUCTION

Present, past, and future of a planetary science unifying knowledge, environmental and socio-health resilience, and peaceful cultural exchange

The issue I have the honor and pleasure of introducing deals (in an extremely original way) with a highly delicate topic that is finally achieving a unity of purpose and of scientific objectives, as well as of moral responsibility and appropriate global governance. Indeed, it is a primary duty of an Institution as ISS, entrusted with promoting research, education, and citizenship dissemination in the field of public health, to oversee important developments even in sectors that have traditionally been (partially) neglected. It may seem like a sadly fashionable remark to emphasize the growing and unifying importance of the "One Health" perspective, a term that intrinsically aspires to a unity of interpretative aims. Unfortunately, alongside this resounding contemporary emphasis on "One Health," likely stemming from the recent global pandemic, the subject is often approached with an insufficient and incomplete style, above all because it is expected to represent a homogeneous and harmonious synthesis of historically diverse disciplinary and technical-scientific sectors, ranging from Veterinary Sciences to Virology, from Ecology and the changing dynamics of the environment to the prevention of those "species jumps" that have, in fact, made the topic tragically relevant in the recent past. Here, instead, a finally concrete, synergistic, and self-sufficient vision is being developed. This editorial initiative combines the demands of scientific relevance with a renewed, yet also profoundly innovative, contribution from different groups within the ISS, centered around new and highly dynamic structures. Here, a harmonious overall development is being created and consolidated, thanks to the lively and distinguished institutional and national representatives who provide its framework while establishing its operational guidelines for the near future. This issue contains, as both an avenue for interpretation and, above all, for future collective reflection a focus that recognizes humanity as an inseparably interconnected whole. It works as well as for individual contemplation of ethical and technical arguments. It includes some of the most recent and innovative perspectives available today at the international level. Centered on the theme of "Ocean and Human Health," it encompasses several major lines of inquiry, from challenges and innovations for a resilient future to the role of seas and oceans in safeguarding human health. The looming Oceanic Anthropocene, rising sea levels, Mediterranean perspectives that illuminate global trends, the protection of plant and animal biodiversity and of the biome, and the necessary evolution of regulatory activities are only some of the topics explored in the present text. The volume addresses ecosystem and socio-health resilience, emerging risks, widespread infectious threats, and above all the resources originating from marine waters, including that still-hidden treasure of agents and molecules with potential therapeutic applications, toward which important and collaborative efforts are currently being devoted at both the national and European levels. What is proposed to the readers of this issue, therefore, is an undertaking far more forward-looking than a mere analysis of the remote or recent past. Given the times in which we live, I feel compelled to recall as is also discussed among these writings how the legislation and the formal and informal rules protecting oceanic spaces are

inspired by a form of “internationalization” upon which it is extremely worthwhile to reflect, especially when addressing young people across all five continents. The oceans are the heritage of all humanity; they recognize no national jurisdictions, nor do they support nationalistic intents. Rather, they foster and establish a pacifying brotherhood, in which shared interests such as those framed by the “UN Sustainable Development Goals” continue to play a fundamental role. For millennia, navigation across the waters has enabled easy exchange, serving as a privileged route of contact, mutual knowledge, and appreciation. The ISS has also played an important role in other contexts where cultural and scientific internationalism transcends and dissolves borders, such as the Antarctic Commission and, more generally, the Polar Sciences. Another example in which the Institute has been particularly active is Aerospace Sciences, once again underscoring how “frank” domains such as the oceans, the polar extremities of the planet, and even the Moon and the Universe as a whole, constitute a unique and almost playful freedom of research possibly capable of transcending boundaries. I conclude by emphasizing how the sciences in general - including those urgent fields explored and encouraged in the present volume - represent a solid and constructive foundation for that common denominator capable, precisely through intellectual exchange and the pursuit of progress in human knowledge, of promoting broad collective aspirations: aspirations that make humanity a structurally humanitarian whole.

Enrico Alleva
Academician of Lincei National Academy

Keynote Lecture

THE FUTURE OF OCEAN & HUMAN HEALTH: SCIENCE, RISKS AND GLOBAL OPPORTUNITIES

Piccioli Andrea
Director General of National Institute of Health (ISS), Rome, Italy

This work presents an advanced and systemic vision of the relationship between the ocean and human health, proposing a definitive shift beyond the traditional separation between environmental and health domains. The ocean is no longer interpreted as a mere ecological context, but as a structural and dynamic component of global health, capable of directly influencing the biological, chemical, and social determinants that shape human well-being. In this perspective, it plays a fundamental role in regulating biogeochemical cycles, sustaining primary productivity and global food security, while also affecting water quality, exposure to contaminants, and microbiological dynamics. The intervention is framed within the theoretical paradigms of Planetary Health and the concept of One Water, which redefine health as an emergent outcome of the interaction between natural and human systems. This framework highlights how transformations in marine ecosystems - driven by climate change, ocean warming and acidification, eutrophication, and the spread of microplastics and emerging contaminants - are profoundly altering ecological balances, with direct and indirect consequences for public health. In particular, aquatic environments are emphasized as reservoirs and vectors of antimicrobial resistance, representing one of the most significant global threats to health systems. In the face of this growing complexity, the lecture underscores the need for a paradigm shift from reactive to predictive approaches, based on the real-time integration of oceanographic, climatic, and health data. This requires the development of advanced surveillance infrastructures and analytical models capable of detecting early warning signals and translating them into preventive action. In this context, science increasingly functions as a decision-making infrastructure, supporting governance and policy development. Within this framework, the Sea Care project is presented as an integrated platform and an innovative operational model. It combines advanced ocean observation, biomedical research, and environmental monitoring systems to generate actionable knowledge for risk anticipation and public health decision-making. Sea Care thus represents a concrete example of the integration of science, technology, and governance, functioning as a distributed infrastructure for prevention. At the same time, the lecture highlights the opportunities offered by the ocean in terms of scientific innovation and sustainable development. The so-called blue economy emerges as a strategic domain, not only for its economic potential but also for its capacity to integrate growth, environmental protection, and health. However, this transformation raises significant ethical considerations: the impacts of environmental degradation are unevenly distributed, disproportionately affecting vulnerable populations, coastal communities, and low- and middle-income countries. In conclusion, the lecture emphasizes the crucial role of science diplomacy as a tool to address global challenges that transcend national boundaries. Building resilient and anticipatory systems requires international cooperation, interdisciplinary integration, and a

renewed awareness of the deep interconnection between humans and the environment. The future of global health is thus framed as a shared responsibility, grounded in the ability to understand, govern, and enhance the interconnections that define our living system.

Session I

The Ocean's Role in Safeguarding Human Health

Moderators:
Luca Lucentini and Giusi Condorelli

THE OCEAN'S ROLE IN SAFEGUARDING HUMAN HEALTH

Lucentini Luca (1), Condorelli Giusi (2)
(1) National Centre for Water Safety, National Institute of Health (ISS), Rome, Italy
(2) Internationalization and Promotion of Biomedical Research Infrastructures, Ministry of Health, Rome, Italy

The ocean role goes well beyond the pillar of planet's ecology; it is a fundamental determinant of human health. Covering more than 70% of the Earth's surface and regulating major biogeochemical and climate processes, the ocean sustains the environmental conditions on which human life depends. One of most important health functions is climate regulation. The ocean absorbs more than a quarter of anthropogenic carbon dioxide emissions and around 90% of the excess heat generated by global warming, thus controlling climate-related health impacts such as heat stress, extreme weather events, infectious diseases. Yet this protective role is under growing pressure from warming, acidification, and deoxygenation, all of undermining marine ecosystem stability and increasing risks to human populations. The ocean plays a pivotal role in food security and nutrition. Marine fisheries and other blue foods provide essential proteins and micronutrients for more than 3 billion people worldwide, including omega-3 fatty acids, iodine, zinc, iron, and vitamin D. These benefits are especially important in low- and middle-income countries, where small-scale fisheries represent a major public health asset. On the other hand, overfishing, climate change, and export-driven food systems can reduce local access to these resources, making water diplomacy and equitable governance increasingly important to health security. Marine biodiversity outcomes extraordinary biomedical value. Ocean organisms such as sponges, tunicates, cyanobacteria, and deep-sea microorganisms produce unique bioactive molecules and compounds that have already led to many important medicines, including anticancer agents such as the plant-derived secondary metabolites cytarabine, trabectedin, and eribulin. Continued research is essential, not only for drug discovery but also for understanding how marine ecosystems may support prevention, resilience, and innovation in public health. Healthy coastal and marine environments can support mental and physical wellbeing, and this is why interdisciplinary collaboration among environmental science, medicine, public health, and policy is now indispensable. By contrast, degraded sea and ocean environments are associated to direct and indirect health threats. Pollution from plastics, persistent chemicals, and harmful algal blooms can move through marine food webs, contaminate seafood, impair water quality, and expose coastal populations to toxic effects. Safeguarding ocean health is not only an environmental priority but a public health imperative. Current frameworks, including One Health, Planetary Health, and the BBNJ Agreement, increasingly show that protecting the ocean also requires interdisciplinary research, international cooperation, and new forms of science-based diplomacy.

LIFE AT THE WATER'S EDGE: THE LANCET COMMISSION ON SEA-LEVEL RISE, HEALTH, AND JUSTICE

Demaio Sandro (1), Figueres Christiana (2), Bowen Kathryn (3), Cha Jiho (4)
(1) World Health Organization, Seoul, Republic of Korea.
(2) Global Optimism, Costa Rica
(3) University of Melbourne, Melbourne, Australia
(4) National Assembly of the Republic of Korea, Seoul, Korea

Rising seas are rapidly redrawing the boundaries between land and ocean, reshaping the lives and health of populations around the world. Sea-level rise is emerging as one of the defining environmental determinants of health in the 21st century, yet its health implications remain insufficiently recognized in global policy and research. Coastal flooding, saline intrusion, ecosystem degradation, and land loss are already affecting communities across low-lying coastal regions and Small Island Developing States. These changes threaten drinking water and sanitation systems, disrupt food and nutrition security, increase the risk of waterborne and vector-borne diseases, and expose populations to injury and displacement during extreme weather events. At the same time, the loss of land, culture, and identity is generating profound psychological and social impacts. Recent elevation modelling indicates that up to 410 million people may live on land below the high-tide line by 2100 under high-emissions scenarios, highlighting the scale and urgency of the challenge. These risks fall disproportionately on coastal and island communities that have contributed least to climate change, making sea-level rise not only an environmental and health crisis but also a question of global justice. In response, the Lancet Commission on Sea-Level Rise, Health, and Justice has been established by WHO Asia-Pacific Centre for Environment and Health to provide the first comprehensive assessment of how rising seas are transforming health, wellbeing, and equity. The Commission brings together multidisciplinary expertise from six continents, including public health scientists, ocean and climate researchers, legal scholars, economists, Indigenous leaders, and community representatives. Three principles guide the Commission's work. Connection recognizes that health, culture, ecosystems, and place are deeply intertwined in coastal environments. Imagination encourages responses that move beyond existing policy and disciplinary boundaries to identify new pathways for adaptation and resilience. Justice ensures that the voices and rights of communities living at the water's edge remain central to decision-making. Five transdisciplinary Working Groups structure the Commission's work, focusing on: ocean modelling and epidemiology; culture, connection, and place; law, policy, and justice; economics and technology; and ethics and values. Through integrated modelling, evidence synthesis, and engagement with affected communities, the Commission will generate actionable recommendations for governments, multilateral institutions, and civil society. The Commission will report its findings in 2028, providing a roadmap for responding to sea-level rise in ways that protect health, strengthen resilience, and advance climate justice.

PROTECTING OCEAN RESOURCES: A PUBLIC INVESTMENT IN FUTURE MEDICINES AND BIOTECHNOLOGY

Gerwick William
Scripps Institution of Oceanography and Skaggs School of Pharmacy and Pharmaceutical Sciences, University of California San Diego, La Jolla, San Diego, California, USA

The marine environment harbors an extraordinary diversity of life, ranging from microscopic algae to massive whales. Nowhere is this biodiversity more pronounced or more competitive than in tropical reef ecosystems, where organisms must contend for space, nutrients, and protection from predators. This intense evolutionary pressure has driven the development of a wide array of unique chemical, biochemical, and physical adaptations, many of which hold significant value for human society. One striking example is dolastatin 10, a linear, highly modified peptide produced by marine cyanobacteria. Believed to serve as a defense mechanism against herbivorous fish, dolastatin 10 also inhibits cell division with remarkable potency. Derivatives of this compound now serve as the cytotoxic "warhead" in several of the most advanced anticancer therapies known as Antibody-Drug Conjugates (ADCs). As of 2024, global sales of seven FDA-approved dolastatin 10-derived ADCs exceeded $4 billion, demonstrating both their clinical impact and commercial success. Another example of marine-inspired innovation comes from diatoms, whose intricate silica frustules are incorporated into solar panels to enhance light capture and energy efficiency. This webinar will present case studies from the pharmaceutical and biotechnology industries, illustrating how innovations from the ocean are improving human health and quality of life. These successes, and the many discoveries still to come, show why protecting marine ecosystems is vital for the next generation of medical and technological breakthroughs.

DEVELOP SCIENCE-BASED APPROACH VIA OCEANIC RESEARCH TO SAFEGUARD HUMAN HEALTH

Wang Yuntao , Fang Yingxia
Second Institute of Oceanography, Ministry of Natural Resources, Hangzhou, *China*

Developing a science-based approach through oceanic research is essential for translating marine science into actionable policies that protect human health. The Second Institute of Oceanography, Ministry of Natural Resources (SIOMNR), leads multidisciplinary research, engaging in marine scientific studies of China's seas, oceans, and polar regions, as well as the development and application of advanced technologies for marine environmental protection and sustainability. Under the frameworks of the UN Ocean Decade and the UN Science Decade for Sustainable Development, SIOMNR leads three programs that exemplify how targeted research can inform governance strategies to reduce ocean-derived health risks while enhancing ecosystem resilience. The research focuses on mitigating anthropogenic pressures—including chemical pollution, marine debris, and deep-sea mining—that directly affect human health and environmental sustainability through air quality and atmospheric deposition, climate-related extreme weather events, and deep ocean typical habitat. This science has strengthened marine monitoring networks, supported land-based pollution controls, deep-sea exploration, and fostered cross-sectoral collaboration between oceanic ecosystems and environmental conditions, embedding scientific evidence into advisory practice. The institute advances predictive capabilities for ecosystem and deep-sea habitat resilience, enabling digital twin platform, early warning systems and adaptive management that anticipate ecological shifts before they manifest as public health threats. Investments in ocean observation infrastructure, integrated modeling, digital twin tool, ecosystem-based management and capacity building demonstrate a commitment to using predictive science as a foundation for proactive governance. The experience of SIOMNR illustrates that a science-based approach, grounded in robust research programs, can effectively safeguard human health by addressing both immediate risks and long-term environmental change.

HUMAN HEALTH AND THE ANTHROPOCENE OCEAN

Ausubel Jesse H.
The Rockefeller University, New York, USA

I will consider the oceans and human health in two ways. First, I will speak of the natural oceans as a source of risk and trauma, even death, for those who work or travel on or below the ocean surface. The good news is humanity has greatly reduced the danger of the natural oceans to our health. The pillars of healthy maritime practice are safety, environment, education, and working conditions. Many opportunities exist to reduce illness, fatigue, and accidents further. A promising strategy is through expanding the range of wearable devices and other mechanisms for assessing sailor health and to improve related analytic capabilities. In addition to smart watches and smart rings, we should be employing the wide and powerful range of 21st century biomonitoring technologies. These include rapid immunological and microbiological tests (as used for diagnosing COVID-19), analysis of sewage (also pioneered in response to COVID-19), and acoustic monitoring systems that can assess illness from variations in the character and frequency of audible coughing. Individually these technologies are on the market, in homes, and in civilian workplaces, and they can be tailored and integrated for settings at sea. Second, I will speak about ways humans are changing the oceans, creating an "Anthropocene Ocean" full of products and by-products of human industry. The worrisome news is that we may be introducing and lifting threats to our well-being, especially through pollution coming from land-based and atmospheric sources and from the sea itself. Major maritime nations need to lead in identifying and accelerating development and adoption of technologies to promote a clean ocean. These could range from cleaner, more efficient motors and fuels to new forms of remediation and waste management; better ways to monitor, track, and map marine pollutants and progress toward a clean ocean such as aerial remote sensing, genomics, and hydrophone arrays; and better technologies for emergency cleanup.

FROM SOURCE TO SEA: UNEP POLICIES LINKING OCEAN HEALTH AND HUMAN WELL-BEING THE MEDITERRANEAN AS A GLOBAL MODEL

Uras Atila
UNEP Mediterranean Action Plan, Barcelona Convention Secretariat, Athens, Greece

The accelerating convergence of environmental degradation and public health risks in marine and coastal systems has brought the oceans–human health nexus to the forefront of global policy agendas. Pollution originating from land-based and sea-based sources continues to compromise ecosystem integrity, food security, water quality, and human well-being. Against this backdrop, UNEP's "Source to Sea" approach offers a comprehensive, science-policy framework to address pollution across the entire continuum from terrestrial sources to marine environments. This presentation will examine how UNEP policies operationalize this approach, with a particular focus on the Mediterranean region as a replicable global model. The Mediterranean Sea, a semi-enclosed basin with intense coastal population pressures, maritime traffic, and diverse economic activities, is highly vulnerable to cumulative pollution impacts. Through the UNEP Mediterranean Action Plan and the Barcelona Convention system, Contracting Parties have established one of the most advanced and legally binding regional governance frameworks for marine and coastal protection. Central to this framework is the Land-Based Sources Protocol, which directly addresses pollution from land-based activities, alongside integrated policies under the Ecosystem Approach and the Integrated Monitoring and Assessment Programme. The presentation will highlight how UNEP's policy instruments translate the "Source to Sea" concept into concrete actions, including reducing nutrient loads, controlling hazardous substances, tackling marine litter, and strengthening wastewater management. It will further explore how these measures directly contribute to improved human health benefits by mitigating the impact of pressures on marine ecosystems caused by their exposure to persistent organic pollutants and contaminants of emerging concern, with subsequent bioaccumulation and biomagnification in food webs, and nutrients over-enrichment and safeguarding seafood safety and bathing water quality. A key dimension of the Mediterranean model lies in its integration of science and policy to enhance monitoring of the marine and coastal environment and to increase confidence in status assessments. Through harmonized monitoring of indicators, their use in the regional assessments, and regional and national action plans, countries are able to track progress toward Good Environmental Status while linking environmental indicators to health-related benefits. The presentation will also underline the importance of cross-sectoral coordination, particularly through emerging frameworks such as the Water–Energy–Food–Ecosystems Nexus, which reinforces the interconnectedness of environmental and human health objectives across the Source-to-Sea continuum. In addition, the Mediterranean experience demonstrates the value of regional cooperation, legal frameworks, and sustained investment in capacity-building and data systems. It provides practical lessons on how to bridge fragmented governance structures, align national and regional priorities, and leverage partnerships with international organizations, financial institutions, and scientific networks. By positioning the

Mediterranean as a living laboratory, this presentation will argue that UNEP's Source-to-Sea policies offer scalable solutions for other regions facing similar challenges. It will conclude by identifying key success factors and forward-looking priorities, including strengthening pollution prevention at source, enhancing data integration between environmental and health sectors, and accelerating implementation through innovative financing and partnerships. Ultimately, the presentation aims to demonstrate that protecting ocean health is inseparable from protecting human health, and that integrated, policy-driven approaches such as those advanced by UNEP are essential to achieving sustainable and resilient societies.

THE NEW STRATEGIES FOR THE OCEANS OF THE EUROPEAN COMMISSION

Gissi Elena, Sprovieri Mario
CNR-ISMAR, Marine Science Institute, Venice, Italy

This talk presents a forward-looking vision for the future strategies of European ocean sciences. Anchored to the evolving framework of *The European Ocean Pact* and the EU's *Research and Innovation* priorities, the presentation will focus on the two central pillars of a policy cycle: shaping scientific and technological innovation and securing long-term financial support. This strategic vision, also aligned with the outcomes and recommendations of the *2025 One Ocean Science Congress in Nice*, builds on the foundational values of the *Treaty on European Union (TEU*), which recognises healthy ecosystems as central to human well-being, and is further supported by the ambitions of the *European Green Deal*. The *European Ocean Pact* marks a significant effort to strengthen governance at the EU level. The Pact recognises the ocean as a strategic, ecological, and economic pillar of Europe's future and lays the groundwork for a potential European Ocean Union. The Pact makes an important attempt to integrate environmental sustainability, economic competitiveness, and social equity. The Ocean Pact adopts a holistic, cross-cutting approach to ocean governance, recognising the ocean as an interconnected system rather than a collection of sectoral competences. By prioritising the protection and restoration of marine ecosystems as its first pillar, it places ecological sustainability at the core of the EU's oceans and seas agenda and reflects the growing recognition that environmental health underpins human health and well-being and socio-economic prosperity. The future *Ocean Act* scheduled for 2027, integrated to the recently launched initiative of the *Ocean Eye*, should serve as a foundation, offering a coherent legal and policy framework that consolidates Europe's ocean commitments into a single strategic instrument. By harmonising objectives across key EU instruments and embedding cross-cutting principles-such as the ecosystem-based approach and the use of best available science-the Act would strengthen coherence, accountability, and effectiveness in ocean governance. This alignment is essential to better reconcile the environmental ambitions of the MSFD with the spatial and economic objectives of the MSPD.

HUMAN AND OCEAN HEALTH RELATEDNESS: FOCUS IN PATAGONIA

Flombaum Pedro (1,2,3), Richter Paula (1,2).
(1) UBA/CONICET, Centro de Investigaciones del Mar y la Atmósfera, Buenos Aires, Argentina
(2) UBA/CONICET/IRD/ CNRS, Institut Franco-Argentin d'Études sur le Climat et ses Impacts Buenos Aires, Argentina
(3) Departamento de Ecología Genética y Evolución, Facultad de Ciencias Exactas y Naturales (UBA), Buenos Aires, Argentina

The relationship between human health and ocean health is inherently bi-directional, characterized by complex feedback loops. While human health benefits from seafood consumption, it is simultaneously vulnerable to marine-borne toxins. Conversely, ocean health is being degraded by anthropogenic pollution and ecosystem transformation, even as societies increasingly adopt stewardship and management practices aimed at marine sustainability. These intricate relationships manifest differently across scales, ranging from local communities to global systems. Patagonia is a unique case study: despite its low population density, the surrounding ocean exerts profound influence on the health of both local and distant populations. The Patagonian marine dynamics acts as a massive "pipeline," transporting waters from the Pacific and Southern Oceans northward to meet subtropical currents flowing from the north into the South Atlantic. This convergence fertilizes the Southern Atlantic Ocean waters, creating one of the most productive marine regions on Earth. This productivity supports a vast diversity of life-from microscopic copepods and shrimp to apex predators like sea lions, penguins, and whales, many of which migrate thousands of kilometers. Seafood-a primary benefit to human health-is consumed by local coastal communities and exported in massive quantities to Asia and Europe, effectively linking remote global populations to Patagonian productivity. However, these waters also harbor risks; phytoplankton blooms in the region can produce potent toxins that sicken both marine mammals and humans. Consequently, Patagonian seafood serves as a source of both nutritional benefit and health risk on a global scale. Human activities, in turn, leave a significant footprint on ocean health, with tourism serving as a prime example. Patagonia's rugged beauty attracts visitors from across the globe seeking wilderness and remoteness. The annual influx of tourists for whale watching and penguin colony tours now exceeds the local population fivefold and continues to grow. As tourism and coastal populations expand, so does the volume of human waste, leading to increased pollution. Paradoxically, this growth has also fostered a stronger sense of stewardship. Local NGOs are increasingly advocating for conservation and Marine Protected Areas (MPAs), while municipalities strive for international sustainability certifications. Understanding these local and global intersections between human and ocean health requires a coordinated international effort. To date, however, no systematic, wide-scale initiative has been established. To fill this gap, CIMA/IFAECI (the Franco-Argentine Institute for the Study of Climate and its Impacts) integrates ocean dynamics and marine biology using both numerical modeling and observational data. Our team comprises experts across the social, biological, and Earth

system sciences who actively engage with stakeholders ranging from local communities to national governments. As such, CIMA/IFAECI is uniquely positioned to serve as a strategic "ideas hub" for advancing ocean-human health sustainability.

BRIDGING OCEAN AND HUMAN HEALTH: ADDRESSING CRITICAL KNOWLEDGE GAPS WITH A NEW SYSTEMATIC APPROACH

Ferrara Fulvio (1), Muratore Anna (1), Notargiacomo Lorenza (1,2), Mattei Giorgia (1), Brancaleone Eleonora (1), Sette Clara (1), Mancini Pamela (1), Silvestri Serena (1,2), Pacchione Guglielmo (1,2), Vitanza Luca (1), Peluso Alessia (1,2), Brandtner David (1), Garbini Alice (1,2), Bollella Alessandro (1,3), Franco Agata (1,2), Papa Elena (2), Piccioli Andrea (4)

(1) National Centre for Water Safety, National Institute of Health (ISS), Rome, Italy
(2) Department of Chemistry, Sapienza University of Rome, Rome, Italy
(3) Department of Environmental Biology, Sapienza University of Rome, Rome, Italy
(4) Director General of National Institute of Health (ISS), Rome, Italy

The intricate nexus between ocean health and human well-being has emerged as a cornerstone of Planetary Health, amid the triple planetary crisis of climate change, pollution, and biodiversity loss. Oceans, covering over 70% of Earth's surface, regulate climate, provide essential protein for billions, and drive global biogeochemical cycles. Yet, anthropogenic pressures-warming waters, acidification, deoxygenation, and pervasive contamination—threaten these vital services, amplifying risks to human health through seafood-borne toxins, respiratory irritants from algal blooms, and antimicrobial resistance from polluted waters. Internationally, initiatives like the UN Decade of Ocean Science for Sustainable Development (2021-2030), the Global Ocean Observing System (GOOS), and forums such as the WHO's Ocean and Health dialogues underscore the urgency. Nationally in Italy, the ISS's leadership in Planetary Health aligns with EU Horizon programs and the National Recovery and Resilience Plan, emphasizing integrated ocean monitoring. Key projects include the EU's JPI Oceans initiatives, NOAA's Harmful Algal Bloom programs, and the Global Partnership on Marine Litter, which have advanced understanding of coastal threats but largely overlook high seas, regions beyond national jurisdictions comprising 64% of oceans. Critical knowledge gaps persist: sparse data from remote high seas due to logistical costs, sampling challenges, and limited transdisciplinary integration. Conventional methods falter in capturing synergies between chemical pollutants (e.g., PFAS, PAHs, heavy metals), microplastics, biological pathogens, viruses, and antibiotic resistance genes, whose long-range transport via currents poses understudied risks to global health. The Sea Care project led by ISS, exemplifies a sustainable, scalable solution. Born from ISS's Ocean & Human Health program, it leverages routine Italian Navy voyages, ships of opportunity navigating major ocean basins, eliminating dedicated expedition costs. Partners include ISS, the Italian Navy, ARPAE (Emilia-Romagna Environmental Protection Agency), and Chemistry Departments of Sapienza University of Rome and Padua. Operating on a "business-as-usual" model, no new funding was allocated, partners integrated sampling and analyses into daily operations, investing routine resources toward a shared higher goal of evidence-based policy. Methodologically robust, Sea Care standardizes protocols across vessels: seawater samples are collected via Niskin bottles or continuous pumps, preserved onsite, and analyzed in

partner labs for >50 contaminants using validated LC-MS/MS, ICP-MS, qPCR, and metagenomics. Pollution hotspots were pre-identified by overlaying Copernicus Sentinel satellite data (e.g., chlorophyll-a, sea surface temperature anomalies) with ocean current models (Copernicus Marine Service) and Navy routes, prioritizing high-risk corridors. In its first three years (2023–2025), Sea Care yielded unprecedented results: >4,000 samples from 140+ sites across the Atlantic, Pacific, Indian, Arctic Oceans, Mediterranean Sea, Red Sea, Persian Gulf, and Java Sea. Findings, published in high-impact journals reveal widespread PFAS (up to 50 ng/L in remote Pacific gyres), microplastics (avg. 1.2 particles/m^3), ARGs (e.g., *blaTEM* in 30% of Arctic samples), and viral pathogens linked to sewage plumes. Synergies emerged, such as metal-microplastic co-occurrences enhancing bioavailability. Sea Care bridges gaps by delivering baseline data for high seas, fostering reproducibility, and informing policies like the UN Plastic Treaty and EU Zero Pollution Action Plan. It advocates scaling via global navies and citizen science, urging integrated One Health frameworks. By embedding health in ocean governance, we can safeguard both for future generations.

Setting the Scene

OCEAN HEALTH AND PUBLIC HEALTH PREVENTION: INTEGRATED STRATEGIES FOR SUSTAINABLE AND RESILIENT SYSTEM

Campitiello Maria Rosaria
Department Prevention, Research and Health Emergencies, Ministry of Health, Rome, Italy

The relationship between oceans, the environment, and health represents one of the major global challenges for prevention policies and sustainable development. Marine ecosystems perform essential functions for maintaining planetary balance: they regulate the climate, sustain biogeochemical cycles, preserve biodiversity, support food security, and safeguard the quality of water resources. Ocean health is therefore closely linked to human health and requires an integrated approach capable of addressing the profound interdependencies between the environment, animals, and people. In this context, water prevention plays a strategic role as a key element in protecting public health and strengthening the resilience of health systems. Indeed, the quality of marine and freshwater resources influences multiple health determinants, ranging from food safety and the prevention of infectious diseases to the effects of environmental pollution and the consequences of climate change. For this reason, environmental prevention and water safety must be addressed through a One Health perspective, recognizing the inseparable connection between human, animal, and ecosystem health, as well as social contexts. This vision is fully consistent with the objectives of the National Prevention Plan, which promotes public health models based on interdisciplinary integration, preventive surveillance, and community-level health promotion. In this direction, international strategies for the protection of marine ecosystems are being strengthened, as reflected in the United Nations 2030 Agenda and the recent BBNJ Agreement (High Seas Treaty), which promote scientific cooperation and shared governance for the conservation of marine biodiversity. Within this innovative framework, the National Prevention Hub has become fully operational within the Department of Prevention, Research and Health Emergencies of the Ministry of Health. This large-scale One Health digital ecosystem represents one of the most advanced strategic infrastructures for prevention in Italy. For the first time, data on human, animal, environmental, and social health will be integrated into a single interoperable platform aimed at enabling early risk detection, supporting predictive analytics, and disseminating evidence-based best practices to healthcare professionals and citizens alike. The protection of oceans and water resources therefore represents not only an environmental priority, but also a strategic global prevention choice capable of combining innovation, scientific cooperation, and the One Health approach to build more resilient and sustainable health systems that are better aligned with the needs of future generations.

Session II

Ocean and Human Health: Challenges and Innovations for Resilient Future

Moderators:

Giuseppe Bortone and Flavia Riccardo

OCEAN AND HUMAN HEALTH: CHALLENGES AND INNOVATIONS FOR A RESILIENT FUTURE

Bortone Giuseppe (1), Riccardo Flavia (2)
(1) Environment and Health Department, National Institute of Health (ISS), Rome, Italy
(2) External Relations Office and Centre for International Affairs, National Institute of Health (ISS), Rome, Italy

By regulating climate, sustaining food systems, supporting livelihoods, and shaping exposure to environmental hazards, oceans directly influence human health and well-being. Consequently, ocean degradation is posing difficult, and unfortunately numerous, health challenges. Ocean and health are undoubtedly impacted by the triple crisis which encompasses the interrelate challenges of climate change, increasing pollution and loss of biodiversity in the marine ecosystems. Changes in global ocean temperature are irreversible on centennial to millennial timescales. Climate projections show that ocean warming will continue over the twenty-first century and beyond as a result of the existing energy imbalance in the Earth system, even if future emissions are significantly reduced (WMO, 2025). Ocean warming and sea level rise are impacting water security and exacerbating coastal hazards, while lower coastal salinity alters the risk of exposure to pathogens and toxins. These changes can directly and indirectly impact physical and mental health by driving, among others, environmental disruption, displacement, interruption of health services, food safety concerns, and disease transmission. While still not fully understood, evidence on the health impact of chronic exposure to pollution is also increasing. Plastic pollution has been identified as a human health crisis, and oceans may play a greater role than previously assumed. Innovations to enhance prevention, preparedness, and health system resilience to ocean-driven health impacts include integrating ocean observations into systematic processes that directly inform early warning and surveillance systems. Through these proof-of-concept innovations, ocean observations are being translated into actionable public health intelligence. Work has also been done in enhancing strategic frameworks and regional institutional capacity linking strategies to mitigate drivers of climate change to health, including reducing the environmental impact of health care facilities. Innovation is pointing to a shift from reacting to ocean-driven health impacts to anticipating them, while acting upstream on climate and pollution. Streamlining this shift will need institutional awareness, research, and multidisciplinary investment at a global level.

PROTECTION OF MARINE ENVIRONMENTS AND THE NEW CHALLENGES AND INNOVATIONS FOR A RESILIENT FUTURE

Kim Riyong
European Environment Agency, Copenhagen, Denmark

Europe's seas cover more than 11 million km^2, and range from shallow, semi-enclosed seas to vast expanses of the deep ocean. They host a wide, highly diverse range of coastal and marine ecosystems and have a large variation in their habitats and species. The European Union has a comprehensive policy framework in place for the protection and restoration of the marine environment. A key policy is the Marine strategy framework directive, aiming for good environmental status in the marine environment. While the latest round of reporting under the Directive is currently being completed - feeding into the European Environment Agency's flagship report 'State of Europe's seas' foreseen to be published at the end of 2026 - existing EEA data shows that Europe's seas are facing significant challenges impacting their resilience. A high proportion of marine mammals, fish, birds and habitats are not in a good state, and marine ecosystems continue to deteriorate. Progress has been made towards the 2030 Biodiversity strategy objective of protecting a minimum of 30% of the EU's sea area by 2030, with marine protected area coverage having now reached 13.7% in 2023. However, further significant efforts are required to achieve the target, while also ensuring that all protected areas are effectively managed. The Nature restoration regulation adopted in 2024 and currently in its early implementation phase, aims also to restore sea areas. The condition of the marine environment directly affects human health and resilience. The ocean is a key pillar of food security, providing seafood and other nutritional resources derived from marine plants and algae. However, overfishing, habitat degradation and bycatch are coupled with the effects of other pressures from human activities, such as eutrophication, pollution and climate change. The combined effects of these pressures may reduce the resilience of fish populations to adapt to environmental changes, potentially leading to stock depletion and even fisheries collapse. Pollution of European seas can also pose risks to human health. For example, European seas are contaminated by both legacy and currently used per- and polyfluorinated substances (PFAS). More than 70% of assessed coastal water exceed the relevant Environmental Quality Standard for perfluorooctane sulfonate (PFOS), which is set based on the protection of human health and the environment. Bacterial pollution in bathing waters can also present a significant risk to health, however in Europe at present the majority of bathing waters comply with regulatory requirements. Mercury, a persistent pollutant present in marine life, leads to human exposure through consuming seafood, the primary means of exposure for people in Europe. Protecting and restoring biodiversity, reducing pollution, and addressing climate change can enhance human health and wellbeing while strengthening societal resilience.

THE OCEANIC SEASCAPE AND ITS MICROBIOME: A ONE HEALTH PERSPECTIVE

Iudicone Daniele
Stazione Zoologica Anton Dohrn, Naples, Italy

The One Health framework, as defined by the WHO, recognizes that the health of humans, animals, and ecosystems are deeply interconnected and mutually dependent. Nowhere is this interdependence more apparent than in the oceanic seascape, where planktonic microbiomes regulate processes fundamental to planetary and human health—including climate stabilization, oxygen production, and food security through the marine carbon cycle. Critically, marine unicellular organisms are not merely passive regulators of ecosystem services: they include pathogens, toxin-producing harmful algae, and reservoirs of antimicrobial resistance genes that pose direct threats to human and animal health through contaminated seafood, coastal waters, and atmospheric aerosols. This dual role—as both ecosystem engineers and health hazards—places the ocean microbiome at the heart of any meaningful One Health agenda. Yet significant knowledge gaps about the biology and ecology of oceanic plankton hinder our ability to assess its status and resilience in the face of accelerating human-induced stressors. Metagenomic and meta-omics approaches have emerged as transformative tools for bridging these gaps, enabling the simultaneous characterization of taxonomic diversity, functional potential, and the distribution of virulence and antimicrobial resistance genes across the seascape at unprecedented resolution. These tools reveal the oceanic microbiome not only as an ecological entity, but as a dynamic interface between environmental and human health, capable of tracking the propagation of health-relevant signals across ocean basins. The dynamics of pelagic communities represent a major source of uncertainty in predictive models, with direct consequences for our capacity to anticipate changes in ecosystem services upon which human well-being depends. These communities exist in a constantly shifting balance, shaped by three interconnected complex systems: the turbulent dynamics of the atmosphere and oceans, the internal biology of individual organisms, and the intricate network of interactions among them. Understanding their structure and function requires a multidisciplinary approach that integrates all three simultaneously. Adopting a One Health perspective demands precisely this kind of integration. We therefore combined remote sensing with extensive in situ observations, state-of-the-art meta-omics with systems biology, and theoretical ecology to advance ecological theories, models, and frameworks that promote the seascape as a new conceptual lens for understanding ocean health in its full planetary and public health context. In particular, metagenomic approaches allowed us to move beyond descriptive inventories of microbial diversity towards a mechanistic understanding of how environmental change reshapes microbiome function, community stability, and the prevalence of organisms and genes of direct relevance to human health.

THE ITALIAN NAVY'S STRATEGY FOR SAFEGUARDING THE SEAS: CHALLENGES IN THE OCEAN-HUMAN HEALTH NEXUS

La Rosa Filippo
Italian Navy Inspectorate of Health, Rome, Italy

National interests on the sea and oceans have a global projection as they represent the reflection of the depth and pervasiveness of the cultural, scientific, economic, and entrepreneurial inclination of the country, which pervades every aspect of our social life. The Navy has long been at the forefront of the joint action in promoting sustainable development and protecting the marine environment. The sea is a precious resource that provides energy, food, economic sustenance, and represents the historic "bridge" of connection between peoples that has ensured prosperity by reducing distances, encouraging exchanges, stimulating international cooperation, and scientific development. The oceans, moreover, constitute the main climate regulators. The human civilization that has been able to develop also thanks to the oceans is the same that has long subjected the marine environment to serious threats. The threat to marine biodiversity is due to various factors including exceptional fishing and the increasing pollution from microplastics sees the Italian Navy engaged in monitoring marine environmental parameters useful for assessing the health status of the seas and safeguarding their protection. Furthermore, the Navy has activated the “Green Fleet” program, a concrete initiative aimed at reducing emissions from military ships and promoting the use of innovative technologies in order to make the sea increasingly clean and sustainable. The Navy was the first Armed Force in Europe to have experimented with, validated, and qualified, during the period 2014-2016, Green Diesel, a fuel composed of up to 50% synthetic renewable component. The Navy does not sail alone! It is indeed through institutional synergies, sharing of strategies, and the search for a shared and inclusive approach, in close cooperation with other Navies, institutional and civilian partners, that the Italian Navy proceed daily in facing environmental and security challenges - also in cultural terms - to generate a renewed awareness capable of guiding the actions of the entire maritime cluster and our communities. The collaboration with the ISS goes in this direction and constitutes an important additional means to define the role of the Navy in service to the country in safeguarding human health, through the study and care of the marine ecosystem. Recently, the agreements regarding the study of the well-being of the sea and oceans, called "Sea Care," have been renewed, within the framework of the ambitious Planetary Health project, which saw ISS researchers engaged in collecting marine water samples on board Navy units. Many ships have taken part in the project, but among all, the ship Vespucci played a key role in the context of the formidable world tour campaign. Another important project, in synergy with the ISS, it is aimed at strengthening the security of the Navy's drinking water supply chains.

ADVANCING THE OCEAN-HUMAN HEALTH NEXUS: CHALLENGES AND INNOVATIONS AT THE SEA STUDY CENTRE OF THE UNIVERSITY OF GENOA

Giovine Marco, Ferrari Claudio, Vezzulli Luigi
Sea Study Centre, University of Genoa, Genoa, Italy

The growing recognition of the interdependence between ocean systems and human health calls for integrated, interdisciplinary approaches capable of addressing complex and evolving global challenges. Within this framework, the Sea Study Centre of the University of Genoa represents a strategic and innovative model for advancing the ocean–human health nexus. Established in 2019, the Centre operates as a cross-cutting hub that brings together a wide spectrum of scientific disciplines, ranging from marine biology and environmental sciences to engineering, medicine, economics, and social sciences. This strong interdisciplinary foundation enables the Centre to address key challenges at the interface between ocean and human health, including ecosystem degradation, climate change impacts, sustainable resource management, and the development of marine-based solutions for human well-being. The core strength of the Centre lies in its ability to foster synergies between academia, public institutions, and industry, promoting collaborative research, innovation, and knowledge transfer. Through integrated research networks and international cooperation projects—particularly within the Western Mediterranean but extending globally—the Centre contributes to the generation of actionable knowledge supporting both environmental sustainability and public health. In alignment with the objectives of the UN Decade of Ocean Science for Sustainable Development, the Sea Study Centre actively promotes a vision of a cleaner, healthier, and more resilient ocean. This includes advancing research on marine ecosystems as determinants of human health, supporting the development of innovative technologies for monitoring and protection, and contributing to science diplomacy initiatives, such as collaborative projects conducted during international maritime expeditions. Furthermore, the Centre plays a pivotal role in education and capacity building through the PhD program in Marine Sciences and Technologies, currently the largest doctoral program in Italy focused on marine and sea-related research, fostering a new generation of researchers equipped to operate across disciplinary boundaries. This contribution highlights how the Sea Study Centre of the University of Genoa addresses current challenges and promotes innovation in the ocean–human health nexus, offering a replicable model for interdisciplinary collaboration aimed at achieving a resilient and sustainable future.

MARINE STRATEGY FOR OCEAN AND HUMAN HEALTH: ISPRA'S PIVOTAL ROLE

Silvestri Cecilia
ISPRA, Italian Institute for Environmental Protection and Research, Rome, Italy

The Marine Strategy Framework Directive (MSFD, 2008/56/EC) can be seen as a concrete expression of the One Health approach applied to the marine environment: protecting ocean health means protecting human health, food security, climate regulation, biodiversity and the ecosystem services on which societies depend. As the main European policy instrument for achieving Good Environmental Status (GES), the MSFD recognizes that human activities are part of marine ecosystems, but must remain within sustainable limits to avoid compromising ecological integrity and ecosystem functions. Assessing sea health and achieving Good Environmental Status requires large-scale, long-term and integrated monitoring capable of capturing the complexity of marine ecosystems and the multiple pressures acting on them. This is the role ISPRA performs within the Italian MSFD implementation. Since 2015, Italy has carried out an unprecedented national monitoring effort, coordinated by MASE with the technical and scientific support of ISPRA, regional environmental agencies (ARPAs), and research institutes. ISPRA plays a pivotal role by coordinating monitoring activities, data validation, reporting and methodological harmonization across the 11 MSFD descriptors, from biodiversity, food webs and seafloor integrity to eutrophication, contaminants, marine litter and underwater noise. Current monitoring results highlight both improvements and critical challenges for Italian seas. Marine biodiversity assessments show encouraging signs of recovery alongside persistent ecological pressures: several protected species and habitats display stable or increasing populations, yet many indicators related to reproductive success, habitat quality, and anthropogenic impacts remain below GES targets. Non-indigenous species continue to increase across all Italian marine subregions, preventing the achievement of GES for Descriptor 2. In recent years, 34 new introductions were recorded in the Adriatic-Ionian region, 29 in the Western Mediterranean, and 20 in the Central Mediterranean, confirming growing pressures linked to shipping and aquaculture. Commercial fish stocks remain under pressure, with around 75% of assessed stocks still exploited above sustainable levels, although fishing pressure has generally declined since 2010. Positive signals emerge from eutrophication assessments. Nutrient loads from riverine sources have decreased compared with the previous assessment cycle, and Italy has achieved the environmental target related to nutrient reduction. Monitoring data also indicate an overall improvement in coastal water quality, despite persistent hypoxia events in some Adriatic areas. As a result, GES for eutrophication has generally been achieved. Marine litter monitoring provides encouraging evidence that mitigation measures are producing positive effects: litter density on Italian beaches decreased from over 500 items per 100 m in 2015 to 252 in 2024. However, Italian seas remain far from the European GES threshold of 20 items per 100 m. Microplastics still reach about 40,000 particles/km² — nearly 50 times higher than the Mediterranean reference value — and more than 63% of monitored sea turtles had ingested plastic. For contaminants, results indicate partial improvements, including fewer exceedances for several chemical

substances in sediments and biota. However, some contaminants, such as mercury, still exceed environmental thresholds in certain areas. Overall, Italy's implementation of the MSFD demonstrates the importance of long-term monitoring, scientific cooperation, and integrated governance. Through its scientific expertise and coordination role, ISPRA contributes to advancing marine conservation policies and promoting a One Health approach in which healthy oceans are fundamental to the future health and sustainability of human societies.

INDEX OF AUTHORS

Serie ISTISAN Congressi
aprile-giugno 2026 (n. 2) 1° Suppl.

Stampato in proprio
Servizio Comunicazione Scientifica - Istituto Superiore di Sanità

Roma, maggio 2026