Global ocean report shows unprecedented climate change impact, as Arctic registers record low ice levels

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Arctic ice levels logged in the last two years have reached record lows, whilst per decade have—on average since 1979 to 2020—dropped by nearly 13%, a new vast report on the ocean worldwide shows.

Published in the peer-reviewed *Journal of Operational Oceanography*, the annual 'Copernicus Ocean State Report', draws upon expert analyses by more than 120 scientific experts from more than 30 European

institutions.

Recognized as the reference point for the scientific community; national and international bodies; decisionmakers; blue economy actors; and the general public, this year's crucial review (focused on results from 2019) shows unprecedented levels of impact of climate change.

The report, chaired by Mercator Ocean international (MOi), shows across the world issues are arising.

The warming of the Arctic Ocean is contributing to an estimated near 4% of the entire global ocean warming. A near 90% reduction of average sea ice thickness has been witnessed in the Barents Sea (a small part of the Arctic), which has led to a decrease in sea ice import from the polar basin.

In the North Sea, extreme variability from cold-spells and marine heatwaves has been linked to reported changes in catches of sole, European lobster, sea bass, red mullet, and edible crabs.

Whilst in the Mediterranean Sea, there were four consecutive record flooding events in Venice (November 2019), and higher-than-average wave heights in the southern Mediterranean (in 2019).

Globally, average sea temperatures went up at a rate of 0.015 celsius per year from 1993-2019, and oxygen levels (oxygen inventory) in the Black Sea dropped at a rate of -0.16 mol/m^2/year from 1955-2019. Summarizing the international situation of the ocean, report chair Dr. Karina von Schuckmann, of MOi, states a need for ongoing improved development and provision of state-of-the art ocean knowledge and products, in addition to regular monitoring through the EU-funded Copernicus.

"Climate change, pollution, and overexploitation have placed unprecedented pressures on the ocean requiring the urgent need for sustainable measures for governance, adaptation, and management in order to secure the various life support roles the ocean offers for human well-being," she says.

"Scientifically-sound knowledge derived from high-quality ocean products and delivered by ocean services is critical to stimulate transformative change. Considering the ocean as a fundamental factor in the Earth system and embracing the multidimensional and interconnected nature of the ocean is the bedrock for a sustainable future."

Overall, the 185-page testimony provides a comprehensive, state-of-the-art, scientific report on the current conditions, natural variations, and ongoing changes in the global ocean and European regional seas.

Among other key findings made this year include:

- A new satellite-derived plankton-to-fish index in support of ocean management and fisheries is presented
- A new indicator method in support of eutrophication monitoring has been introduced, which is used by EuroStat (SDG 14.1)
- Development of additional attributes for Indian Ocean Dipole monitoring, which reported strong events in 1997 and 2019 linked to droughts and extreme precipitation
- An Invasive lionfish migration into the Ionian Sea in 2019
- In the Baltic Sea, there were unusual 2019 sea level and extreme wave conditions in the Gulf of Bothnia.

Dr. von Schuckmann adds: "The ocean products and services that the Copernicus Marine Service provides are used by other systems to develop state-of-the-art tools for tracking and forecasting key ocean

changes. These tools and technologies, including alert systems, forecasting technologies, and real-time monitoring programs, help to protect marine environments and human communities, to provide early warning systems, to safeguard economic infrastructure, to develop adaptation measures, and to plan for and manage extreme ocean events.

"This issue of the Copernicus Ocean State Report provides insight into the design and functioning of downstream tools and is approached from several angles, presenting the state of the changing ocean, examining evolving impacts of the changing ocean in line with climate change on environmental, human, social, and economic systems, and discussing the importance of science, data and services for society and policy in adapting to these impacts."

Further details can be found in a summary, written specifically for policy makers.

More information: Karina von Schuckmann et al, Copernicus Marine Service Ocean State Report, Issue 5, *Journal of Operational Oceanography* (2021). DOI: 10.1080/1755876X.2021.1946240

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