



KAMARAJ IAS ACADEMY
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Marine heat waves

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Why in News

In April, the average daily global sea surface temperature reached 21.1 degrees Celsius, breaking the previous record of 21 degrees Celsius in 2016. And since then, ocean temperatures have remained at record-high levels, giving rise to marine heat waves (MHWs) around the globe.

What are marine heat waves?

A marine heat wave is an extreme weather event. It occurs when the surface temperature of a particular region of the sea rises to 3 or 4 degree Celsius above the average temperature for at least five days.

MHWs can last for weeks, months or even years, according to the US government's agency National Oceanic and Atmospheric Administration (NOAA).

At present, MHWs have gripped the north-east Pacific, the southern hemisphere in the southern Indian Ocean and the Pacific, the north-east Atlantic, tropical North Atlantic, and the Mediterranean, according to a recent forecast of the non-profit science organisation Mercator Ocean International.

Global warming affecting marine heat waves and oceans

Marine heatwaves under global warming', published in the journal Nature, showed that with the soaring global temperatures, MHWs have become longer-lasting, more frequent and intense in the past few decades.

Between 1982 and 2016, we detect a doubling in the number of MHW days, and this number is projected to further increase on average by a factor of 16 for global warming of 1.5 degrees Celsius relative to preindustrial levels and by a factor of 23 for global warming of 2.0 degrees Celsius

More significantly, it stated that 87 per cent of MHWs are attributable to human-induced warming.

Research suggests that the oceans have absorbed 90 per cent of the additional heat caused by the release of greenhouse gases into the atmosphere from burning fossil fuels and deforestation in recent decades.

This has increased the global mean sea surface temperature by close to 0.9 degree Celsius since 1850 and the increase over the last four decades is around 0.6 degree Celsius, according to Copernicus Climate Change Service.

Therefore, as global air temperatures increase, so will ocean temperatures, leading to more MHWs.

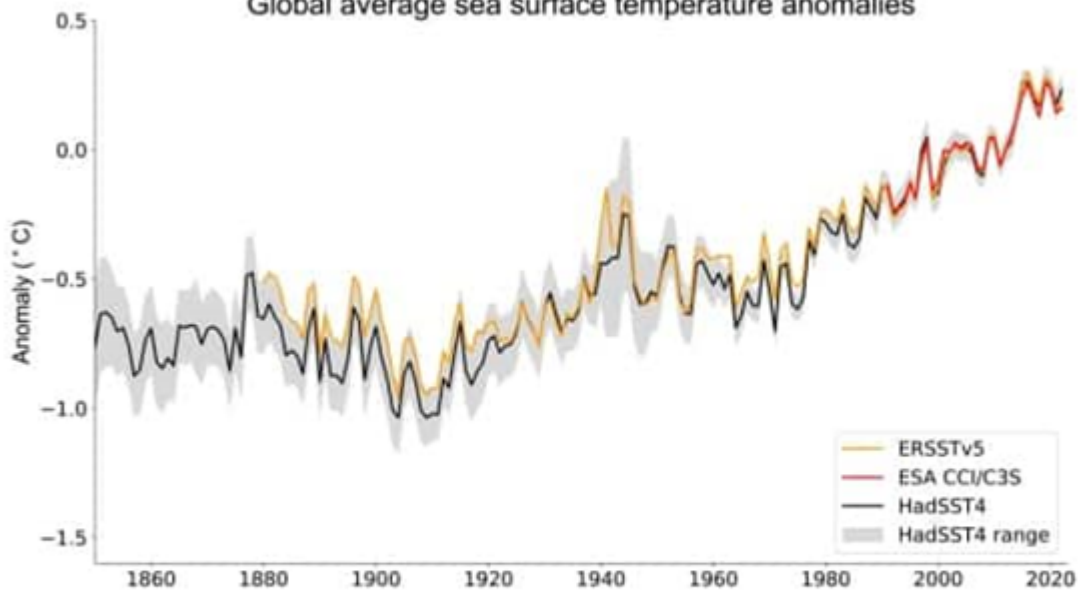
To make matters worse, El Nino — a weather pattern that refers to an abnormal warming of surface waters in the equatorial Pacific Ocean — conditions have set in for the first time in seven years.

Scientists and experts suggest that El Nino will trigger extreme heat and increase the likelihood of breaking more temperature records in different regions of the world.

The impact of marine heat waves on ocean life

Kamaraj IAS Academy

Plot A P.127, AF block, 6 th street, 11th Main Rd, Shanthy Colony, Anna Nagar, Chennai, Tamil Nadu 600040
Phone: 044 4353 9988 / 98403 94477 / Whatsapp : 09710729833



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MHWs can have debilitating effects on both marine ecosystems and humans. They may cause the deaths of several marine species, alter their migration patterns, lead to coral bleaching and even impact weather patterns.

MHWs can make storms stronger and severely affect coastal communities. What's more, these disastrous consequences are set to become even worse as the world continues to get warmer, making MHWs more intense and longer.

Although an increase of 3 or 4 degrees Celsius in average temperatures may not be much for humans, it can be catastrophic for marine life.

For instance, MHWs along the Western Australian coast during the summer of 2010 and 2011 caused some "devastating" fish kills — the sudden and unexpected death of many fish or other aquatic animals over a short period and mainly within a particular area — as per a 2013 study in the *Journal of Marine Systems*.

A different study revealed that the same MHWs destroyed kelp forests and fundamentally altered the ecosystem of the coast. Kelps usually grow in cooler waters, providing habitat and food for many marine animals.

Another example is when high ocean temperatures in the tropical Atlantic and Caribbean in 2005 led to a massive coral bleaching event.

A 2010 study showed that more than 80 per cent of surveyed corals had bleached and over 40 per cent of the total surveyed had died. Corals are very sensitive to the temperature of the water in which they live.

When water gets too warm, they expel the algae known as zooxanthellae, living in their tissues, causing them to turn entirely white. This is called coral bleaching.

When a coral bleaches, it is not dead. Corals can survive a bleaching event, but they are under more stress and are subject to mortality," another report by NOAA noted.

Coral bleaching has severe consequences as it reduces the reproductivity of corals and makes them more vulnerable to fatal diseases. Not only this, thousands of marine animals depend on coral reefs for survival and damage to corals

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could, in turn, threaten their existence.

MHWs also fuel the growth of invasive alien species, which can be destructive to marine food webs. Additionally, they force species to change their behaviour in a way that puts wildlife at increased risk of harm

MHWs have been linked to whale entanglements in fishing gear, according to a report by the International Union for Conservation of Nature (IUCN).

Marine heat waves impact on Humans

Higher ocean temperatures, which are associated with MHWs, can make storms like hurricanes and tropical cyclones stronger.

With warmer temperatures, the rate of evaporation escalates and so does the transfer of heat from the oceans to the air. When storms travel across hot oceans, they gather more water vapour and heat.

This results in more powerful winds, heavier rainfall and more flooding when storms reach the land — meaning heightened devastation for humans.

Moreover, only marine wildlife isn't dependent on coral reefs. According to NOAA, half a billion people depend on reefs for food, income, and protection. So when MHWs destroy these reefs, humans relying on them also bear the brunt.

The IUCN report pointed out that MHWs have “profound socio-economic impacts for coastal communities.” For example, in 2012, an MHW over the northwest Atlantic Ocean caused marine species that like warm water to move northwards and migrate earlier than they usually did, affecting fisheries targeting those species in the United States.

All of these disastrous consequences are set to become even worse as the world continues to get warmer, making MHWs more intense and longer.