# Ocean acidification breaches planetary boundary with 60% of waters affected



The state of the world’s oceans is more precarious than previously acknowledged, with scientists sounding alarms over the alarming degree of ocean acidification. This critical phenomenon has now been reported to have breached a vital planetary boundary, underscoring the urgent need for action to preserve marine ecosystems. This warning originates from a collaborative study involving the UK’s Plymouth Marine Laboratory, the National Oceanic and Atmospheric Administration, and Oregon State University, revealing that ocean acidification crossed this boundary approximately five years ago.

Ocean acidification, often described as the “evil twin” of climate change, results from the rapid absorption of atmospheric carbon dioxide by the oceans. This absorption leads to a significant decrease in seawater pH, thereby threatening coral reefs and other vital marine habitats. In extreme cases, acidification can dissolve the calcium carbonate structures of various marine organisms, posing grave risks to biodiversity and ecological balance. According to the study, the average condition of the oceans worldwide was perilously close to, if not exceeding, the threshold for sustainable acidity levels by 2020. Specifically, at depths of 200 metres, a staggering 60% of global ocean waters had breached what is considered the safe limit for acidification.

The implications of these findings extend beyond mere numbers. As Professor Helen Findlay of Plymouth Marine Laboratory pointed out, most marine life thrives not just at the surface but also in deeper waters. These depths are home to an incredible diversity of species that are now facing significant threats due to the changing conditions. Coral reefs, including both tropical and deep-sea varieties, are especially vital as they serve as crucial nurseries for many juvenile marine species. Yet, as the acidity increases, calcifying species like corals and shellfish struggle to maintain their shells, leading to weaker structures and decreased reproductive success.

The authors of the study stress that reducing carbon dioxide emissions is the only comprehensive solution to combat global acidification. However, they also advocate for targeted conservation strategies to protect the most vulnerable regions and species. Jessie Turner, the director of the International Alliance to Combat Ocean Acidification, echoed this sentiment, saying, “We are running out of time and what we do – or fail to do – now is already determining our future.” She underscored the urgent need for governments to prioritise ocean acidification in their policy agendas, given the existential threats posed to marine ecosystems.

Further compounding the issue, additional reports highlight that the global aragonite saturation state, a critical measure of ocean health, is perilously close to its critical threshold. Current assessments place this metric at 2.80, marginally above the crucial limit of 2.75. If trends continue unchecked, experts warn that ocean acidification could lead to dire ecological consequences within just a few years, jeopardising not only marine life but also global fisheries and economies dependent on them.

While discussions regarding planetary boundaries have largely revolved around climate change, the rapidly advancing state of ocean acidification presents a stark reminder that human activities are pushing multiple environmental systems to their limits. With six of the nine planetary boundaries already exceeded due to anthropogenic influences, ocean acidification stands poised to become the seventh. The urgency for substantial policy interventions has never been clearer, as scientists and environmentalists alike implore decision-makers worldwide to act decisively before it’s too late.

### 📌 Reference Map:

* Paragraph 1 – [[1]](https://www.theguardian.com/environment/2025/jun/09/sea-acidity-ecosystems-ocean-acidification-planetary-health-scientists), [[2]](https://www.theguardian.com/environment/2025/jun/09/sea-acidity-ecosystems-ocean-acidification-planetary-health-scientists)
* Paragraph 2 – [[1]](https://www.theguardian.com/environment/2025/jun/09/sea-acidity-ecosystems-ocean-acidification-planetary-health-scientists), [[5]](https://www.science.org/doi/full/10.1126/science.1259855), [[6]](https://www.planetaryhealthcheck.org/boundary-pages/ocean-acidification)
* Paragraph 3 – [[3]](https://news.mongabay.com/2024/09/inaugural-planetary-health-check-finds-ocean-acidification-on-the-brink/), [[2]](https://www.theguardian.com/environment/2025/jun/09/sea-acidity-ecosystems-ocean-acidification-planetary-health-scientists)
* Paragraph 4 – [[4]](https://phys.org/news/2024-09-world-oceans-critical-acidification.html), [[7]](https://www.indiatoday.in/environment/story/oceans-are-getting-acidic-marine-life-faces-existential-crisis-2605495-2024-09-24)

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## Bibliography

1. <https://www.theguardian.com/environment/2025/jun/09/sea-acidity-ecosystems-ocean-acidification-planetary-health-scientists> - Please view link - unable to able to access data
2. <https://www.theguardian.com/environment/2025/jun/09/sea-acidity-ecosystems-ocean-acidification-planetary-health-scientists> - Scientists have reported that the world's oceans are in worse health than previously realised, with ocean acidification having crossed a crucial planetary boundary. This phenomenon, caused by rapid absorption of carbon dioxide by the ocean, leads to a decrease in seawater pH, damaging coral reefs and other marine habitats, and in extreme cases, dissolving the shells of marine creatures. The study, conducted by the UK's Plymouth Marine Laboratory, the National Oceanic and Atmospheric Administration, and Oregon State University's Co-operative Institute for Marine Resources Studies, found that by 2020, the average ocean condition worldwide was already very close to, and in some regions beyond, the planetary boundary for ocean acidification. The study also highlighted that at 200 metres below the surface, 60% of global waters had breached the 'safe' limit for acidification. The authors emphasised that decreasing CO₂ emissions is the only way to address acidification globally, but conservation measures should focus on the regions and species most vulnerable.
3. <https://news.mongabay.com/2024/09/inaugural-planetary-health-check-finds-ocean-acidification-on-the-brink/> - A recent report indicates that ocean acidification is nearing a critical threshold, with the global aragonite saturation state standing at 2.80, just above the critical limit of 2.75. This acidification, driven by rising atmospheric CO₂ levels due to fossil fuel emissions, poses a significant threat to marine life, including coral reefs and phytoplankton populations. If current trends continue, ocean acidification could exceed safe limits within the next few years, leading to severe ecological consequences and impacting global fisheries and economies.
4. <https://phys.org/news/2024-09-world-oceans-critical-acidification.html> - A new report from the Potsdam Institute for Climate Impact Research reveals that the world's oceans are close to becoming too acidic to sustain marine life or help stabilise the climate. The report highlights that six of the nine planetary boundaries have already been exceeded due to human activity, with ocean acidification potentially becoming the seventh. The increasing CO₂ emissions from burning fossil fuels are making oceans more acidic, which damages corals, shellfish, and phytoplankton, disrupting food supplies for billions and limiting the oceans' capacity to absorb more CO₂, thus exacerbating global warming.
5. <https://www.science.org/doi/full/10.1126/science.1259855> - The article discusses the concept of planetary boundaries, which are critical thresholds in Earth's systems that, if crossed, could lead to significant environmental changes. It highlights that three of these boundaries—climate change, stratospheric ozone depletion, and ocean acidification—remain essentially unchanged from earlier analyses. The paper underscores the importance of understanding and respecting these boundaries to maintain a stable environment conducive to human development.
6. <https://www.planetaryhealthcheck.org/boundary-pages/ocean-acidification> - The Planetary Health Check 2024 report examines ocean acidification, noting that while the current aragonite saturation state is within the safe operating space, it is close to crossing the boundary. Ocean acidification, caused by increased atmospheric CO₂, harms calcifying organisms and reduces the ocean's efficiency as a carbon sink. The report emphasizes the need for re-evaluating the safe boundary due to the potential impacts on marine ecosystems and biodiversity.
7. <https://www.indiatoday.in/environment/story/oceans-are-getting-acidic-marine-life-faces-existential-crisis-2605495-2024-09-24> - A report led by Earth System scientist Johan Rockström and the Potsdam Institute for Climate Impact Research highlights that ocean acidification is nearing a critical threshold, with the global aragonite saturation state at 2.80, just above the critical limit of 2.75. This acidification, driven by rising atmospheric CO₂ levels due to fossil fuel emissions, poses a significant threat to marine life, including coral reefs and phytoplankton populations. If current trends continue, ocean acidification could exceed safe limits within the next few years, leading to severe ecological consequences and impacting global fisheries and economies.