# Ocean darkening reduces light in over 20% of seas, threatening marine life and ecosystems



Recent findings reveal alarming changes in the world's oceans, indicating that vast areas have darkened significantly over the last two decades. Research conducted using satellite data indicates that more than 20% of the global ocean has experienced a reduction in light penetration from 2003 to 2022. This phenomenon, affecting around 75 million square kilometres—an area roughly equivalent to the combined landmass of Europe, Africa, China, and North America—poses profound risks to marine ecosystems, fisheries, and the natural processes that regulate carbon and nutrient cycles in the oceans.

Dr Thomas Davies, a marine conservationist at the University of Plymouth, has been at the forefront of this research, describing the trend as a "genuine cause for concern." His study, published in *Global Change Biology*, shows how darkening is predominantly affecting the photic zones where 90% of marine species thrive. These surface layers are essential for the survival of microscopic phytoplankton, which form the foundation of marine food webs and contribute to nearly half of the world's oxygen supply. The findings suggest that in 9% of the studied ocean, the photic zone has become 50 metres shallower, while in 2.6% of the ocean, it has dropped by 100 metres. Consequently, the implications for marine biodiversity and fishing industries could be severe, signalling urgent action is necessary.

The darkening effect is thought to be driven by various factors. Along coastlines, upwellings of cold, nutrient-rich water and sediment runoff can cause reduced light penetration. However, the causes of offshore darkening remain more elusive, with climate change and alterations in ocean currents being potential culprits. Dr Davies highlighted that regions experiencing significant changes in ocean circulation, such as the Southern Ocean and areas influenced by the Gulf Stream, are among those seeing pronounced darkening.

Interestingly, not all areas have succumbed to this trend; approximately 10% of the ocean, or 37 million square kilometres, has grown lighter over the same period. Regions such as the west coast of Ireland demonstrate this contradiction, with significant brightening observed. This duality in changes raises questions about the future distribution of marine species, with Dr Davies noting that as light retreats, organisms are forced to migrate upwards in the water column. Such shifts not only crowd these species into shallower waters but also jeopardise their hunting, mating, and reproductive activities, all of which heavily depend on light.

The consequences of darkening extend beyond just altered habitats. Coastal areas, already stressed by human activity, are especially vulnerable and may find their resilience further undermined. Professor Oliver Zielinski, director of the Leibniz Institute for Baltic Sea Research in Germany, expressed concern over the potential disruption of marine food webs and weakened biodiversity, stressing the importance of maintaining healthy coastal ecosystems for both ecological balance and human wellbeing.

Moreover, the darkening of coastal waters can heavily impact specific marine habitats, such as kelp forests. Studies have revealed that this phenomenon can reduce kelp productivity by a staggering 95%, thus compromising its ability to act as a carbon sink and exacerbating climate change. This decline has cascading effects on marine life, affecting not just the kelp itself but the multitude of organisms that depend on it for food and habitat.

As these environmental changes unfold, the need for stricter land-use regulations becomes paramount. Coastal darkening could lead to alterations in contaminant transport and availability, with potential repercussions for animals higher up the food chain. Creatures ill-adapted to darker environments, such as visually-hunting fish, risk being outcompeted by species like jellyfish that thrive in lower light conditions.

In summation, the trend of ocean darkening presents a multi-faceted challenge that requires immediate scientific inquiry and robust policy intervention. The ongoing degradation of marine environments underscores the urgency for global action to address not only the drivers of climate change but also the intricate linkages that define oceanic ecosystems and their vital role in global biodiversity and our planetary health.

## Reference Map:

* Paragraph 1 – [[1]](https://www.theguardian.com/environment/2025/may/27/planets-darkening-oceans-pose-threat-marine-life-scientists-say), [[2]](https://www.theguardian.com/environment/2025/may/27/planets-darkening-oceans-pose-threat-marine-life-scientists-say)
* Paragraph 2 – [[1]](https://www.theguardian.com/environment/2025/may/27/planets-darkening-oceans-pose-threat-marine-life-scientists-say), [[2]](https://www.theguardian.com/environment/2025/may/27/planets-darkening-oceans-pose-threat-marine-life-scientists-say), [[3]](https://www.scientificamerican.com/article/coastal-darkening-could-block-kelps-carbon-sink-potential/)
* Paragraph 3 – [[1]](https://www.theguardian.com/environment/2025/may/27/planets-darkening-oceans-pose-threat-marine-life-scientists-say), [[7]](https://www.un.org/en/climatechange/science/climate-issues/ocean-impacts/)
* Paragraph 4 – [[1]](https://www.theguardian.com/environment/2025/may/27/planets-darkening-oceans-pose-threat-marine-life-scientists-say), [[4]](https://www.smithsonianmag.com/science-nature/how-coastal-darkening-is-harming-kelp-forests-180978994/), [[6]](https://www.ecowatch.com/coastal-darkening-ocean-pollution-2650785212.html)
* Paragraph 5 – [[4]](https://www.smithsonianmag.com/science-nature/how-coastal-darkening-is-harming-kelp-forests-180978994/), [[5]](https://pubs.acs.org/doi/10.1021/acs.est.9b03093)
* Paragraph 6 – [[3]](https://www.scientificamerican.com/article/coastal-darkening-could-block-kelps-carbon-sink-potential/), [[4]](https://www.smithsonianmag.com/science-nature/how-coastal-darkening-is-harming-kelp-forests-180978994/), [[6]](https://www.ecowatch.com/coastal-darkening-ocean-pollution-2650785212.html)
* Paragraph 7 – [[1]](https://www.theguardian.com/environment/2025/may/27/planets-darkening-oceans-pose-threat-marine-life-scientists-say), [[2]](https://www.theguardian.com/environment/2025/may/27/planets-darkening-oceans-pose-threat-marine-life-scientists-say)

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## Bibliography

1. <https://www.theguardian.com/environment/2025/may/27/planets-darkening-oceans-pose-threat-marine-life-scientists-say> - Please view link - unable to able to access data
2. <https://www.theguardian.com/environment/2025/may/27/planets-darkening-oceans-pose-threat-marine-life-scientists-say> - A recent study reveals that over 20% of the world's oceans have darkened between 2003 and 2022, reducing the photic zone where most marine life thrives. This phenomenon, covering 75 million square kilometres, poses significant threats to marine ecosystems, fisheries, and the ocean's role in carbon and nutrient cycling. Dr Thomas Davies from the University of Plymouth highlights the potential severe implications of this trend. The study, published in Global Change Biology, underscores the urgent need to understand and address the causes of ocean darkening.
3. <https://www.scientificamerican.com/article/coastal-darkening-could-block-kelps-carbon-sink-potential/> - Coastal darkening, caused by sediment and algal blooms, is significantly reducing kelp productivity by up to 95%. This decline hampers kelp's ability to sequester carbon, potentially exacerbating climate change. The study highlights the need for further research to understand the broader implications of coastal darkening on marine ecosystems and global carbon cycles. ([scientificamerican.com](https://www.scientificamerican.com/article/coastal-darkening-could-block-kelps-carbon-sink-potential/?utm_source=openai))
4. <https://www.smithsonianmag.com/science-nature/how-coastal-darkening-is-harming-kelp-forests-180978994/> - Coastal darkening, resulting from increased sediment and nutrient runoff, is severely impacting kelp forests by reducing their primary productivity by up to 95%. This decline affects the entire marine food web, as kelp serves as a crucial habitat and food source for various marine species. The study emphasizes the need to address the causes of coastal darkening to preserve these vital ecosystems. ([smithsonianmag.com](https://www.smithsonianmag.com/science-nature/how-coastal-darkening-is-harming-kelp-forests-180978994/?utm_source=openai))
5. <https://pubs.acs.org/doi/10.1021/acs.est.9b03093> - The study examines how coastal darkening affects contaminant transport and bioavailability in northern coastal waters. It suggests that increased darkening could lead to a microbial-based food web, potentially increasing the concentration of contaminants in higher trophic levels. The research highlights the need to understand these dynamics to anticipate ecosystem responses and inform management strategies. ([pubs.acs.org](https://pubs.acs.org/doi/10.1021/acs.est.9b03093?utm_source=openai))
6. <https://www.ecowatch.com/coastal-darkening-ocean-pollution-2650785212.html> - Coastal darkening, caused by increased runoff and pollution, is leading to significant changes in marine ecosystems. The study found that this phenomenon benefits creatures like jellyfish, which do not rely on sight to hunt, while hindering visual predators such as fish. The research underscores the need for stricter land-use regulations to mitigate the impacts of coastal darkening. ([ecowatch.com](https://www.ecowatch.com/coastal-darkening-ocean-pollution-2650785212.html?utm_source=openai))
7. <https://www.un.org/en/climatechange/science/climate-issues/ocean-impacts/> - Climate change is causing significant impacts on the world's oceans, including rising temperatures, ocean acidification, and deoxygenation. These changes threaten marine biodiversity, with estimates suggesting that more than half of the world's marine species may face extinction by 2100. The report emphasizes the need for global action to address these challenges and protect ocean ecosystems. ([un.org](https://www.un.org/en/climatechange/science/climate-issues/ocean-impacts/?utm_source=openai))