# Fish play a critical role in seabed ecosystems and climate regulation



New research conducted by scientists from the Convex Seascape Survey has revealed the significant role many fish species play in maintaining the seabed ecosystem and, by extension, influencing the global climate. The study, focused on shallow seas around the UK, evaluated the contribution of fish to bioturbation—the process of churning and reworking seabed sediments—which affects how the ocean absorbs and stores organic carbon.

The research highlighted that fish such as the Atlantic cod, Atlantic hagfish, and European eel are among the leading “ecosystem engineers” for sediment bioturbation. This process is vital because ocean sediments represent the world’s largest reservoir of organic carbon, making seabed health crucial in mitigating climate change by regulating greenhouse gas absorption. University of Exeter PhD student Mara Fischer, who led the study, explained: “Bioturbation is very important for how the seabed takes up and stores organic carbon, so the process is vital to our understanding of how the ocean absorbs greenhouse gases to slow the rate of climate change.”

The study is the first to comprehensively quantify the impact fish have on bioturbation, complementing existing knowledge about invertebrates. The scientists analysed records of all fish species residing on the UK continental shelf, discovering that over half—amounting to 185 species—actively contribute to sediment reworking through behaviours like foraging, burrowing, and nest building. Notably, 120 of these species are commercially fished. The researchers developed a bioturbation impact score for each species based on factors including the mode of bioturbation, fish size, and frequency of sediment disturbance.

The assessment underscored the vulnerability of many key bioturbating species to threats such as commercial fishing. Professor Callum Roberts of the Centre for Ecology and Conservation at Exeter’s Penryn Campus noted: “Many of the largest and most powerful diggers and disturbers of seabed sediments, like giant skates, halibut and cod, have been so overfished they have all but vanished from our seas. These losses translate into big, but still uncertain, changes in the way seabed ecosystems work.”

Examples of prominent fish species with significant bioturbation scores and their conservation status include:

* The European eel, with a score of 100 (out of 125), is a burrower currently classified as critically endangered. It is caught primarily via traps and fyke nets and features in various European and Asian cuisines. Threats encompass climate change, habitat loss, diseases, pollutants, and fishing.
* Atlantic cod, also scoring 100, acts as a vertical excavator and is designated as vulnerable. It is commonly harvested by trawling and longlining, valued in culinary uses such as fish and chips, salted cod, and cod liver oil. Populations have notably declined in the North Sea and West Atlantic due to overfishing and habitat degradation.
* The common skate, with a bioturbation score of 50, is a lateral excavator now critically endangered. While protected in several areas, it is still frequently caught as bycatch. Its large size and slow reproductive rate exacerbate its vulnerability.
* Black seabream, a nest builder scoring 36, is currently of least concern but is subject to fishing methods like bottom trawling and gillnets that pose risks, particularly during spawning seasons.
* Red gurnard, a sediment sifter with a score of 16, also holds a status of least concern. However, recent increases in commercial targeting lack regulatory management in the EU, raising questions about sustainable practices.

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Julie Hawkins, co-author of the study, remarked: “Anyone who has spent time underwater, whether snorkelling or diving, knows that fish are constantly digging up the seabed. It’s hard to believe that such an obvious and important activity has been largely overlooked when it comes to understanding ocean carbon burial.”

The Convex Seascape Survey is a collaborative initiative involving the Blue Marine Foundation, University of Exeter, and Convex Group Limited. It represents a comprehensive five-year global research programme aimed at deepening the understanding of oceanic and continental shelf functions within the Earth’s carbon cycle, contributing critical insights into addressing climate change challenges.

The findings of this study are detailed in a paper titled “A functional assessment of fish as bioturbators and their vulnerability to local extinction,” published in the journal Marine Environmental Research.

Source: [Noah Wire Services](https://www.noahwire.com)

## References

* <https://phys.org/news/2025-04-popularly-eaten-fish-key-seabed.html> - This article corroborates the role of fish like Atlantic cod, Atlantic hagfish, and European eel as key bioturbators, highlighting their significance in seabed maintenance and climate regulation. It also mentions the study's findings on fish participation in bioturbation and their vulnerability due to commercial fishing.
* <https://convexseascapesurvey.com> - The Convex Seascape Survey homepage provides an overview of the project's aims, including understanding the ocean’s role in the Earth’s carbon cycle, which aligns with the study’s focus on bioturbation and climate balance.
* <https://news.exeter.ac.uk/faculty-of-environment-science-and-economy/chip-shop-fish-among-key-seabed-engineers/> - This news article supports the study by detailing the findings on fish like Atlantic cod as crucial ecosystem engineers and highlighting the importance of bioturbation in organic carbon storage and climate change mitigation.
* <https://convexseascapesurvey.com/the-science/marine-life/> - This webpage discusses the assessment of marine life and seabed ecosystems, supporting the broader goals of the Convex Seascape Survey, including studying the impacts of seabed disturbances on wildlife.
* <https://www.lifetechnology.com/blogs/life-technology-science-news/role-of-fish-in-seabed-maintenance-for-climate-balance> - This article emphasizes the role of fish in maintaining seabed health, which contributes to climate balance by regulating greenhouse gas absorption through bioturbation processes.
* <https://www.noahwire.com> - This is the source of the original article, providing context and summary of the research findings regarding fish species and their impact on seabed ecosystems and climate.
* <https://news.google.com/rss/articles/CBMiXEFVX3lxTE1sQkFIYV91cUFTUDlKR00tVUtnTG5ubFMtNFdRNGh2Zmh1WE81LS1qLWxuZjBheHZOOUktZndsS01aSkdIREhZWWJxMkU2VEFlZW5Qb2xGNlU4VkVQ?oc=5&hl=en-US&gl=US&ceid=US:en> - Please view link - unable to able to access data