Recommendation nº 74

Impact of Climate Change on the Fisheries and Aquaculture Sector in the Outermost Regions

The Outermost Regions (ORs) of the European Union (EU) - *Saint Martin, Guadeloupe, Martinique, French Guiana (Guyane française), Azores, Madeira, Canary Islands, Mayotte and La Réunion* - due to their unique geographical location and strong dependence on marine resources, are particularly vulnerable to the effects of climate change - namely, rising ocean temperatures and their consequences, such as coral bleaching, acidification, changes in species' migration patterns and extreme weather events - all of which have a direct impact on the sustainability of fisheries and the livelihoods of local communities.

Ocean warming

Ocean warming is one of the most widespread impacts, generating profound changes in the distribution of species, their behaviour and the productivity of ecosystems. Rising temperatures are associated with changes in the migration routes of large pelagic species - including different species of tuna - which tend to move to more northerly latitudes or to areas with more stable environmental conditions, reducing their seasonal availability in regions such as the Azores and the Canary Islands. This phenomenon jeopardises the predictability of fisheries and directly affects the economic stability of the artisanal fleets that depend on these resources.[1]

In the Indian Ocean, the increase in temperature and ocean dynamics off *La Réunion* is also altering the distribution and abundance of commercial species. Recent research on *yellowfin tuna* (*Thunnus albacares*) and *bigeye tuna* (*Thunnus obesus*) shows that catches are strongly associated with variability in temperature, salinity and currents in the first 400 metres of the water column, reinforcing the link between physical-oceanographic changes and fishing productivity[2]. At the same time, several small and medium-sized coastal and pelagic species have seen sharp declines associated with reduced primary productivity and warming waters.

In Madeira, the Regional Fisheries Directorate has identified significant changes in

[1] Triathlons (Horizon 2020, European Union). *Tuna migration in the Atlantic Ocean*

[2] *Interannual Variability of Yellowfin Tuna (Thunnus albacares) and Bigeye Tuna (Thunnus obesus) Catches in the Southwestern Tropical Indian Ocean and Its Relationship to Climate Variability.* Frontiers in Marine Science,2022.

the occurrence of species that are traditionally abundant and used as bait - namely horse mackerel (*Trachurus sp.*) and mackerel (*Scomber colias*), locally known as "ruama". Studies presented at the III National Congress of Biologists show that between 1997 and 2007, landings of mackerel fell by approximately 81 per cent, while those of blue jack mackerel (*Trachurus picturatus*) recorded significant fluctuations, suggesting an overall decline in the abundance of these species[3]. In the Canary Islands, small and medium-sized pelagic species have shown sharp declines due to the combination of rising sea surface temperatures and reduced primary productivity, and these species play an essential ecological role in marine ecosystems, acting as a link between lower and higher trophic levels and constituting fundamental prey for species of greater commercial value. [4]

The vulnerability of species to disease also increases under extreme temperatures, as demonstrated by the massive mortality of dusky grouper (*Epinephelus marginatus*) recorded in the Azores in 2024, associated with infections aggravated by anomalous thermal conditions.[5]

In French Guiana, shrimp fishing - a traditional pillar of the local economy - has been in sharp decline due to the warming of the water and the degradation of mangrove areas, which are essential for the reproductive cycles of this species[6]. In the region, there was an episode of exceptional rainfall in 2022, with values around four times higher than the maximum previously observed. Studies and sampling campaigns currently being carried out by IFREMER in the region point to a direct impact on the decline in the number of Acoupa weakfish (*Cynoscion acoupa*) fry observed in the samples taken, which suggests possible impacts of rising water temperatures on the reproductive cycles of this species.[7]

The above examples show that climate change not only affects the abundance of species, but also structurally alters the functioning of marine ecosystems, increasing the uncertainty of fisheries, weakening the resilience of species and jeopardising the economic sustainability of fishing communities in the ORs.

[3] Alves, A., Faria, G. & Vasconcelos, J. (2008). *Brief description of the small pelagic and demersal fisheries in the Madeira Archipelago* [Technical report]. Regional Directorate of Fisheries, Madeira.
[4] *Deepening our perspective about the small and medium pelagic fish: case study in the Canary Islands (NW Africa, Spain).* Journal of the Marine Biological Association of the United Kingdom, Cambridge University. 2024.
[5] Sea warming causing the stranding and death of groupers in the Azores. Okeanos Institute of the University of the Azores, 2024.
[6] Diop, B., Blanchard, F., & Sanz, N. (2018). *Mangrove increases resiliency of the French Guiana shrimp fishery facing global warming.*
[7] *Trans Océans Tortues Marines (TOTM)*

Coral Reef Bleaching and Mortality

Rising ocean temperatures are also causing the bleaching and mortality of coral reefs, which are essential for marine biodiversity and are fundamental habitats for many species that depend on these ecosystems.

A clear example of this phenomenon occurred in *Saint-Martin*, where in 2018 the *Fondation pour la Nature de Sint Maarten* recorded episodes of significant bleaching during its annual monitoring campaigns.[8]

This trend has worsened in recent years. In 2023, in Martinique, 95% of the corals monitored showed signs of bleaching and 34% recorded mortality, constituting one of the most severe events ever documented in the territory. In the same year, Guadeloupe also faced a bleaching episode of unprecedented magnitude since 2005. This degradation of the reefs directly jeopardises local marine biodiversity - including emblematic species such as manta rays (*Mobula alfredi*) observed in Mayotte - and threatens the socioeconomic sustainability of coastal fisheries that depend on these habitats.[9]

In *La Réunion*, coral reefs are also facing increasing pressure due to rising water temperatures and ocean acidification. In response to this phenomenon, Projet CORAIL Réunion (*Colonisation de Récifs Artificiels à l'ÎLe de La Réunion*) was launched, led by the *Comité Régional des Pêches Maritimes et des Élevages Marins de La Reunion* (CRPMEM La Ré*union*). The project develops artificial reefs that provide new habitats for fish stocks, support local artisanal fishing and reduce pressure on natural reefs, thus contributing to the preservation of coastal biodiversity and the ecological resilience of the region.

The restoration of sensitive habitats - in particular coral reefs - has become a central element of global climate adaptation strategies[10]. In the French European ORs, the French Initiative for Coral Reefs (IFRECOR) plays a central role in the implementation of these strategies, supporting monitoring actions, coral transplantation, the creation of artificial reefs and conservation-oriented educational programmes, with a view to strengthening coastal resilience, protecting fishing communities and preserving biodiversity. Experiences developed in other exposed island regions, such as Fiji, show that hybrid artificial reef structures and coral regeneration techniques can enhance these results, offering useful

[8] Sint Maarten Nature Foundation (2018). *Sint Maarten Nature Foundation records coral bleaching during annual coral reef surveys.*

[9] *Parc Naturel Marin de Mayotte (n.d.). The coral reef under pressure. French Biodiversity Office.*

[10] Hein, M. Y. et al. (2020). *Coral reef restoration as a strategy to improve ecosystem services: A guide to coral restoration methods.* United Nations Environment Programme (UNEP) & International Coral Reef Initiative.

references.[11]

Proliferation of Invasive Algae

Changing ocean conditions have also favoured the proliferation of macroalgae, notably sargassum (Sargassum *natans* and *Sargassum fluitans*) in the Western Atlantic Outermost Regions (ORs) (Caribbean Sea) and the alga *Rugulopteryx okamurae* in the Eastern Atlantic ORs (mainly the Azores and Canary Islands). Rising water temperatures accelerate the growth of macroalgae; changes in ocean currents transport these algal masses from the tropical Atlantic to the coasts of the Caribbean and South America; and the intensification of nutrient runoff - resulting from extreme rainfall and changes in land use - further fuels the phenomenon. The massive and recurrent arrival of macroalgae in coastal areas significantly disrupts fishing activities, hindering access to catching areas, altering the distribution of coastal and pelagic species, damaging fishing gear and boat engines, and deteriorating sensitive coastal ecosystems.

In Martinique, these phenomena have even led to total losses of reared biomass, following the massive accumulation of sargassum and episodes of anoxia around marine fish farms.

Extreme meteorological phenomena

At the atmospheric level, there has also been an increase in the frequency and intensity of extreme meteorological phenomena in the Outermost Regions, with direct impacts on both the safety of coastal communities and the operation of fishing fleets, due to:

- Destruction or severe damage to harbours, access ramps and shelter infrastructure;
- Loss of vessels, fishing gear and essential equipment;
- Significant damage to marine fish farming infrastructure and losses of reared biomass, resulting in operating losses for companies;
- Long periods of fishing inactivity and increased risk for crews when they are out fishing;
- Degradation of coastal marine habitats, with indirect effects on fish stocks.

In *Saint-Martin*, extreme phenomena such as Hurricane Irma (2017) have revealed

[11] *Bowden-Kerby, A. et al. (2025). Creating a National Coral-Focused Climate Change Adaptation Plan: The Case of Fiji.*

the island's profound vulnerability, which remains exposed to adverse meteorological events of great magnitude. More recently, episodes of intense rainfall have caused significant flooding. Climate projections also indicate that the average air temperature could rise by between 2.5°C and 3.5°C by 2080, with direct implications for the safety and productivity of fishing activities.[12]

In *Guadeloupe*, the passage of Cyclone Maria in 2017 caused severe destruction, especially in coastal areas, harbour infrastructure and marine fish farming businesses.

In Martinique there have been extreme rainfall events during the rainy season, with reference to Hurricane Dean in 2007, which caused large-scale flooding.

In *French Guiana*, between 1970 and 2004, there was a 0.65°C increase in the average water surface temperature, affecting habitats and the structure of fish populations[13]. The Guyaclimat project, presented in 2024, predicts that warming will continue until 2100, influencing the regional climate and aquatic ecosystems.[14]

In the Indian Ocean, extreme phenomena such as Cyclone Fakir (2018) and Cyclone Garance (2025) have caused significant damage in *La Réunion*. In *Mayotte*, Cyclone Chido (2024) was also a destructive event of great magnitude. [15]

As for the Azores and Madeira, they are facing an intensification of storms, strong winds, torrential rain and prolonged periods of bad weather.[16]

The worsening of these meteorological phenomena therefore represents a critical challenge that requires reinforced prevention, adaptation and socio-economic support measures for fishing communities and aquaculture producers in the Outermost Regions.

Regional Fisheries Management Organisations

Recent developments within regional fisheries management organisations (RFMOs) for highly migratory pelagic species show a clear trend towards integrating climate change into their scientific assessment and management plans. In the case of the International Commission for the Conservation of Atlantic Tunas (ICCAT), a specific resolution on climate change was adopted in 2022, in which it was agreed to consider the potential impacts of climate on target and non-target species, as well as actions to reduce or mitigate

[12] *Les effets du changement climatique déjà visibles à Saint-Martin.*
[13] Thiéblemont, R., Le Cozannet, G., D'Anna, M., Idier, D., Longueville, F. et al. (2023). "Chronic flooding events due to sea-level rise in French Guiana".
[14] Bureau de Recherches Géologiques et Minières (BRGM) (2024). *GuyaClimat: the impact of climate change on a range of physical parameters in French Guiana.*
[15] *Le Monde (2024), "Mayotte : les dégâts causés par le cyclone Chido vus du ciel.*
[16] Government of the Azores (22 January 2025). *FUNDOPESCA activated in the Region for around 700 professionals in the sector.*

these impacts, and to create a Joint Expert Group on Climate Change. This process led, in 2024, to the adoption of a Climate Change Action Plan and the creation of a permanent working group to facilitate dialogue between scientists and managers, with climate issues now featuring regularly on the organisation's scientific and decision-making agendas. [17]

Aquaculture

The increase in average temperatures intensifies the evaporation of fresh water in reservoirs, rivers and aquifers, aggravating situations of water scarcity - as occurred in *Mayotte*, which faced an unprecedented crisis in 2023, with water rationing for up to four days a week, causing direct repercussions in sectors such as aquaculture, which depends on a regular supply to control salinity and operate ponds.[18]

There has also been an increase in the intensity of hurricanes. Category 5 hurricanes have become much more frequent and marine fish farming structures are rarely spared. When Hurricane Maria hit Guadeloupe in 2017, despite the prevention efforts implemented (immersion of cages), the island's main aquaculture farm lost half of its biomass. In addition to the direct loss, the drop-in activity in the following months almost led to the company's collapse.

The above example shows how aquaculture is particularly vulnerable to climate change. Lack of water and sudden variations in temperature and salinity affect the growth, survival and health of farmed organisms, and can increase mortality and the risk of disease. [19]At the same time, they require greater management effort and investment in infrastructure and adaptation measures, especially on smaller farms, which have fewer resources to respond to these challenges.

Illegal, Unreported and Unregulated Fishing

Regarding illegal, unreported and unregulated (IUU) fishing, climate change is redefining the context in which it operates. Ocean warming and changes in current systems are likely to cause a significant redistribution of fish stocks, including the opening of new fishing zones at high latitudes and changes in regions of great productive importance. These dynamics could intensify competition for access to resources, increase pressure on marine protected areas and aggravate conflicts in areas with ambiguous or contested maritime borders, including regions already marked by geopolitical tensions.

[17] Kelly A. Kryc, Ph.D. Chair, ICCAT Climate Change Experts Meeting (2023 and 2024). Working Group on Pelagic Fisheries, 17 September 2025.
[18] Le Monde (2023). Fears of mass pollution as water crisis forces French Indian Ocean Island to pivot to bottles.
[19] FAO. (2019). *FAO's work on climate change: Fisheries & aquaculture*

On a socio-economic level, the worsening climate pressure on vulnerable coastal communities, coupled with the reduced productivity of certain fisheries, could drive some operators towards IUU practices and strengthen the weight of organised criminal networks in the sector. The trends identified point to increased risks associated with exploitative labour conditions on board, convergence between IUU fishing and other illicit markets, and more asymmetrical interactions between large industrial fleets and small-scale fisheries. At the same time, the change in the fleets' activity patterns and the greater frequency of extreme weather events pose increased challenges for monitoring, control and surveillance systems, making it necessary to adapt enforcement models, strengthen coordination between international organisations and increase transparency in value chains - including vessel ownership and access agreements - in order to prevent the climate crisis from being used to expand IUU fishing.[20]

The CCRUP therefore recommends that the **Member States concerned** (France, Spain and Portugal):

1. Developing and implementing **regional climate adaptation plans that consider the evolution of the ORs' marine ecosystems** and ensure the resilience of fisheries, aquaculture and coastal communities**;**
2. **Strengthening the protection and recovery of essential coastal habitats,** such as corals and mangroves, which are fundamental for the reproduction and stability of fish stocks;
3. **Establishing specific protocols for managing and mitigating macroalgae proliferations in the ORs**, guaranteeing the continuity of fishing operations and the protection of infrastructure;
4. **Finding lasting solutions to safeguard companies in the event of losses due to the effects of global warming**: increasing the *de minimis* aid limits for fishing and aquaculture (currently much lower than for other sectors of activity); intervening with insurance companies so that they can offer affordable contracts that are adjusted to the reality of companies in the ORs; and reviewing taxation, allowing companies to provision for potential losses related to natural disasters, as is already the case in agriculture.

[20] Haenlein, C. (2025). *IUU Fishing Trends in a Warming World - A Global Horizon Scan. Royal United Services Institute (RUSI*). Working Group on Illegal, Unreported and Unregulated Fishing, 17 September 2025.

Considering the cross-cutting nature of climate impacts in the ORs - covering biodiversity, fisheries, coastal planning, infrastructure and climate adaptation - the necessary measures involve several Directorates-General of the European Commission, which is why **we recommend that the European Commission - namely DG MARE, DG REGIO, DG ENV and DG CLIMA**:

1. The creation of **specific lines for the ORs in the European marine climate observation and modelling programmes**, ensuring the continuous collection of oceanographic and biological data relevant to the management of fisheries, aquaculture and marine affairs;
2. Promote **specific financial mechanisms to support the resilient modernisation of OR infrastructure and vessels**, including technologies adapted to emerging environmental conditions;
3. The promotion of **scientific cooperation with Member States and third countries**, ensuring the harmonisation of data and the sharing of information on changes in the distribution of species and marine ecosystems;
4. **The integration of the ORs as priority areas in climate adaptation and coastal resilience programmes,** ensuring structured funding for port works and coastal protection;
5. **The creation of a European programme for the restoration of reefs and coastal habitats in the ORs**, inspired by international best practices, with dedicated funding in the FEAMPA, LIFE and Horizon Europe programmes, in collaboration with regional scientific institutions;
6. **Creation of a European programme for climate-resilient coastal infrastructure** - including pontoons, harbours and shelters adapted to cyclones and extreme storms - **aimed specifically at the ORs**:
7. **Creating an inter-DG mechanism for coordinating climate adaptation policies in the ORs**, ensuring coherence between fisheries, biodiversity, climate and territorial cohesion.

The President of the Executive Committee of the CCRUP,

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