

A Marine Heatwave Sweeps Across the North Sea

A widespread marine heatwave developed across the North Sea in June and July 2026, supported by unusually warm air, increased solar heating and weakened winds.

RESEARCH & ANALYSIS Manal Hamdeno and Aida Alvera-Azcárate • GHER, University of Liège, Belgium

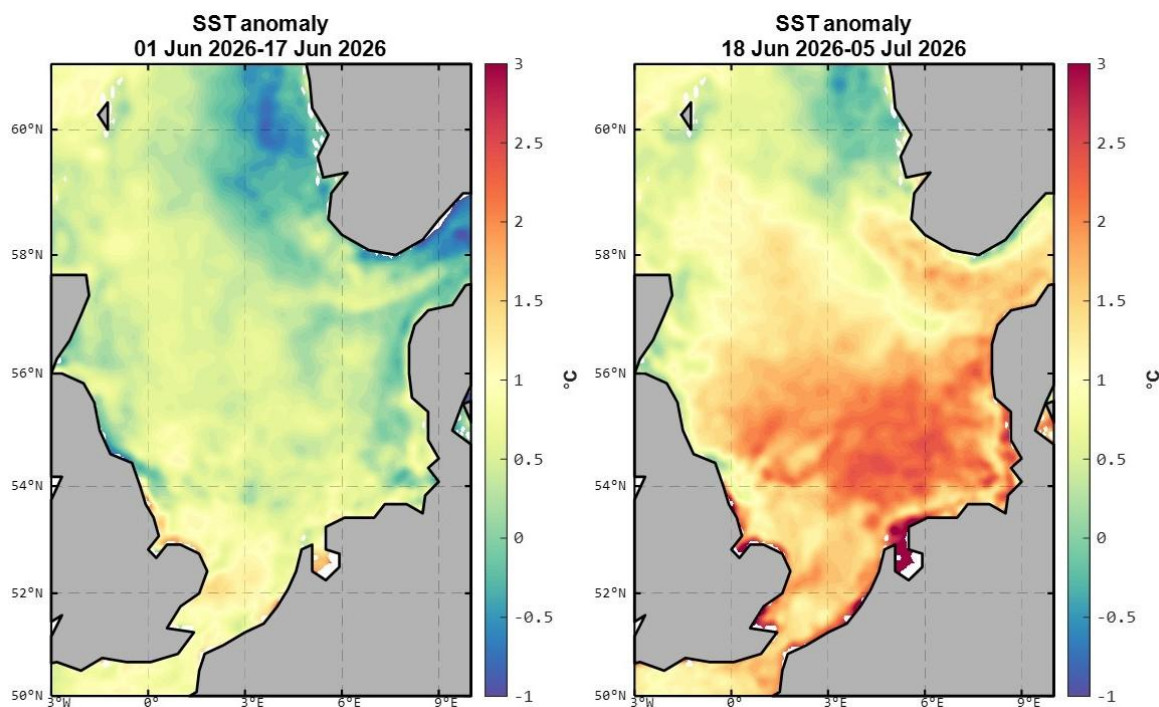


Figure 1. Rapid development of anomalous sea-surface warming across the North Sea. Mean SST anomalies relative to the 1998–2025 climatology are shown before the event (1–17 June; left) and during the broader marine-heatwave period (18 June–5 July; right). Warming intensified and expanded across the central and southern basin, locally exceeding 3°C.

By the end of June 2026, unusually warm water had spread across much of the North Sea. Sea surface temperatures were widely 1–2°C above the 1998–2025 average, with local anomalies approaching or exceeding 3°C in parts of the southern basin.

During the first half of June, anomalies were moderate and spatially uneven. From 18 June onward, the warming intensified and expanded. A marine heatwave was detected from 20 June to 5 July, and at its peak approximately 60–65% of the analysed area was affected.

THE EVENT

A moderate-to-strong marine heatwave

Marine heatwaves are periods when ocean temperatures remain unusually high relative to the conditions normally expected at a particular location and time of year. Their definition accounts for the local seasonal cycle and identifies temperatures above a seasonally varying extreme threshold.

ANALYSIS WINDOW	18 June–5 July 2026
DETECTED MHW	20 June–5 July 2026
REFERENCE	1998–2025
EVENT INTENSITY	2.5°C maximum; 35°C·days cumulative
DOMINANT CATEGORY	Moderate to strong

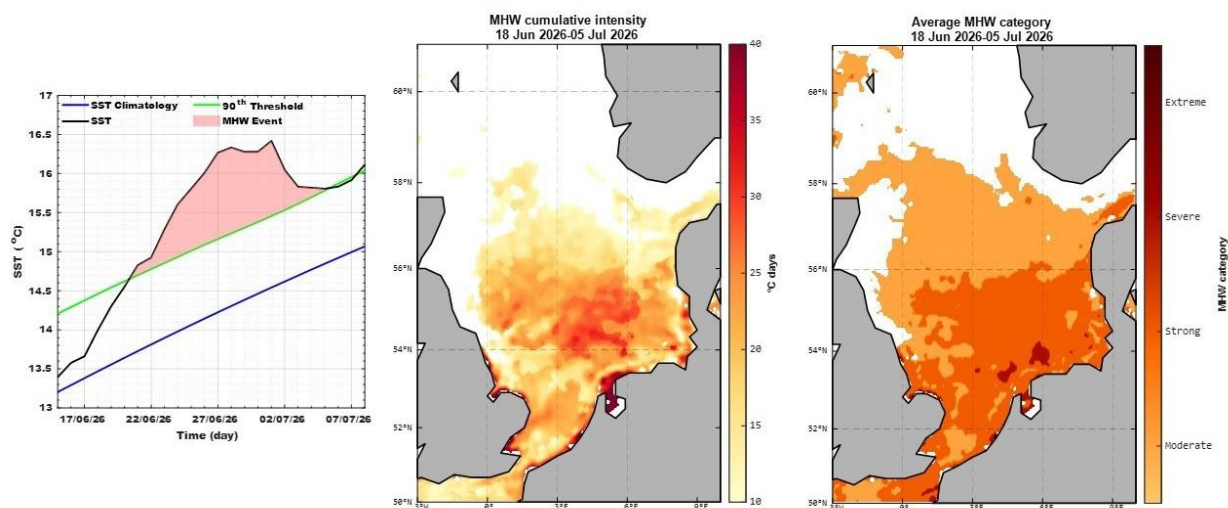


Figure 2. Development, intensity and spatial distribution of the June–July 2026 North Sea marine heatwave. The time series compares SST (black) with the seasonal climatology (blue) and 90th-percentile threshold (green); pink shading marks the detected event. Maps show cumulative intensity and average category during 18 June–5 July. The strongest and most persistent warming occurred across the central and southern North Sea.

Conditions varied considerably across the basin. Much of the North Sea experienced moderate conditions, while strong conditions covered extensive central and southern waters. Local cumulative intensities exceeded 30°C·days and approached 40°C·days in some southern and coastal areas.

“The most striking feature was not only the intensity of the warming, but how rapidly it expanded across the North Sea.”

WHAT DROVE THE WARMING?

Atmospheric conditions favoured ocean warming

The marine heatwave developed alongside an unusually warm and persistent atmospheric pattern over northwestern Europe and the North Sea. During 18 June–5 July, air temperatures over the southern basin were commonly 2–3°C above average, with locally stronger anomalies.

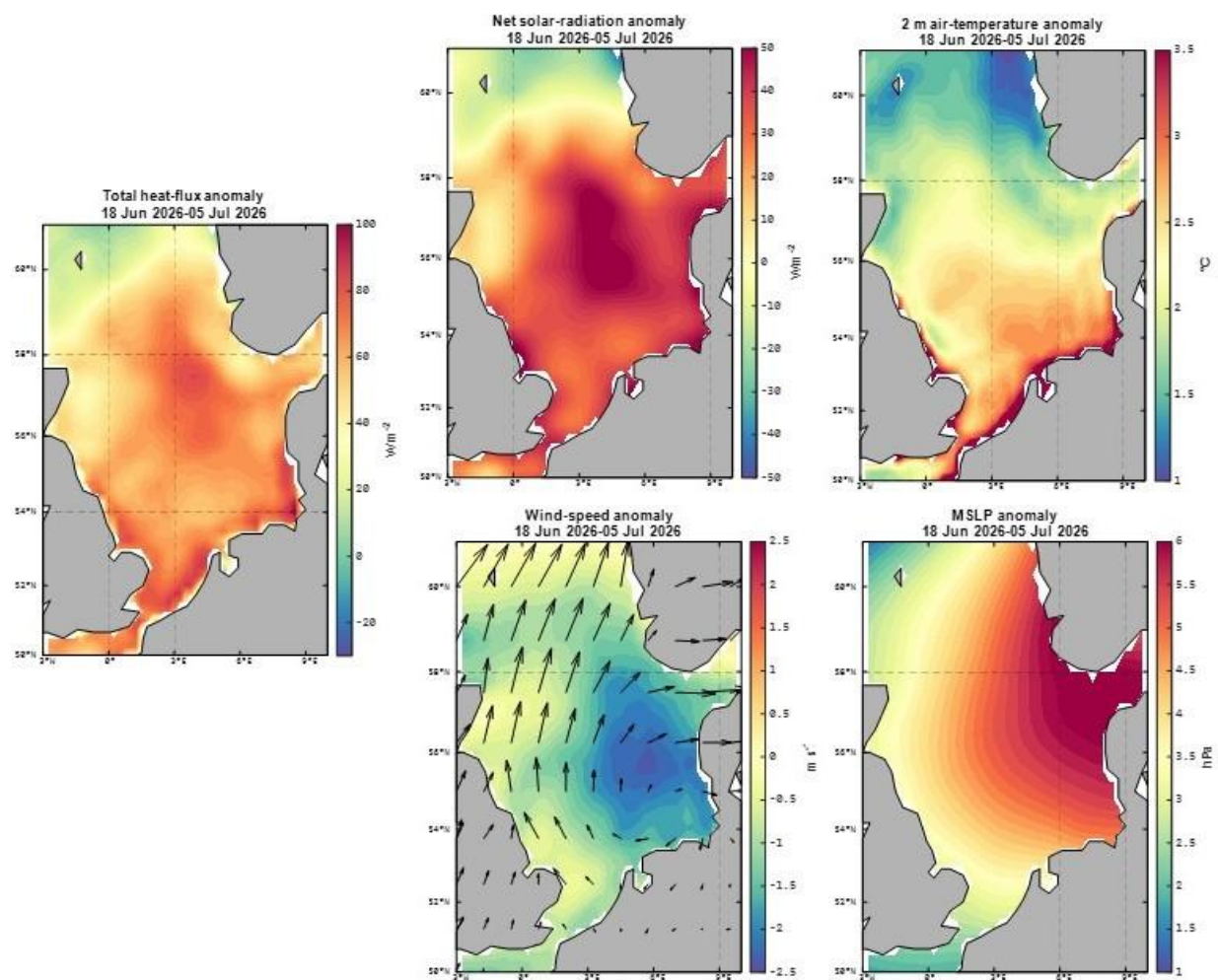


Figure 3. Atmospheric conditions accompanying the June–July 2026 marine heatwave. Mean anomalies in total air–sea heat flux, net solar radiation, 2-m air temperature, wind speed and direction, and mean sea-level pressure are shown for 18 June–5 July relative to the 1998–2025 climatology.

Incoming solar energy increased substantially, and total air-sea heat flux was anomalously positive over much of the region. Winds were weaker than normal across the central North Sea. Reduced winds can limit vertical mixing, allowing solar energy to remain concentrated near the surface instead of being redistributed into deeper water.

“Warm air, extra sunlight, positive ocean heat uptake and weaker winds created favourable conditions for rapid surface warming.”

These patterns identify atmospheric conditions that likely supported the event. Establishing the precise contribution of each driver would require a dedicated attribution analysis.

FROM ATMOSPHERE TO OCEAN

The warming signal strengthened after 18 June

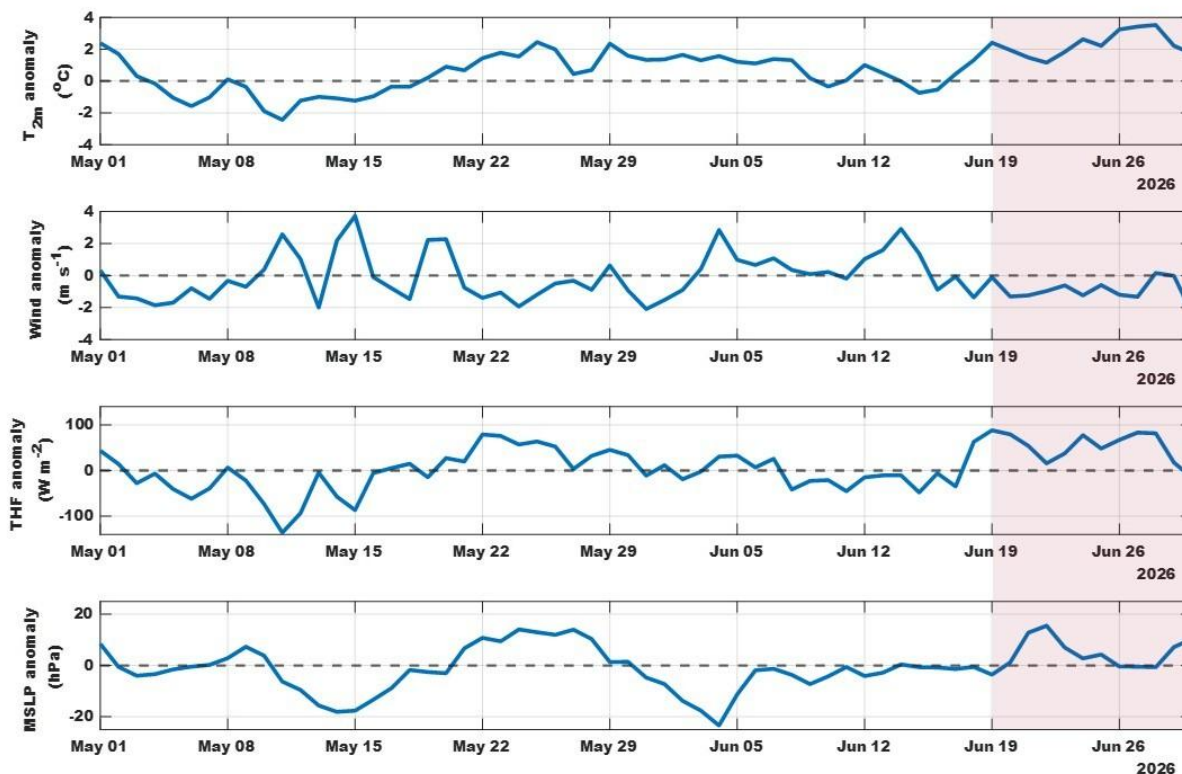


Figure 4. Evolution of atmospheric conditions preceding and during the June 2026 marine heatwave. Daily regional anomalies in 2-m air temperature, wind speed, total air–sea heat flux (THF) and mean sea-level pressure (MSLP) are shown from 1 May to 30 June. The shaded period marks the development of the event from 18 June onward.

The daily evolution clarifies how the atmospheric variables aligned. Air temperature remained positive, wind speed was predominantly below normal, and heat input into the ocean was strongly positive through much of the highlighted period. Atmospheric pressure also rose during the event’s onset.

This combination favoured sustained surface heating while limiting the wind-driven mixing that can otherwise disperse heat through the upper water column. The temporal agreement strengthens the interpretation that the atmospheric pattern supported the marine heatwave, while stopping short of formal causal attribution.

“A shallow regional sea can respond quickly when persistent atmospheric heating and weak mixing occur together.”

ECOLOGICAL SIGNAL

What happened to marine productivity?

Marine heatwaves can strengthen upper-ocean stratification (the separation between warm surface water and cooler water below). Stronger stratification may restrict the upward transport of nutrients required by phytoplankton, the microscopic organisms at the base of the marine food web.

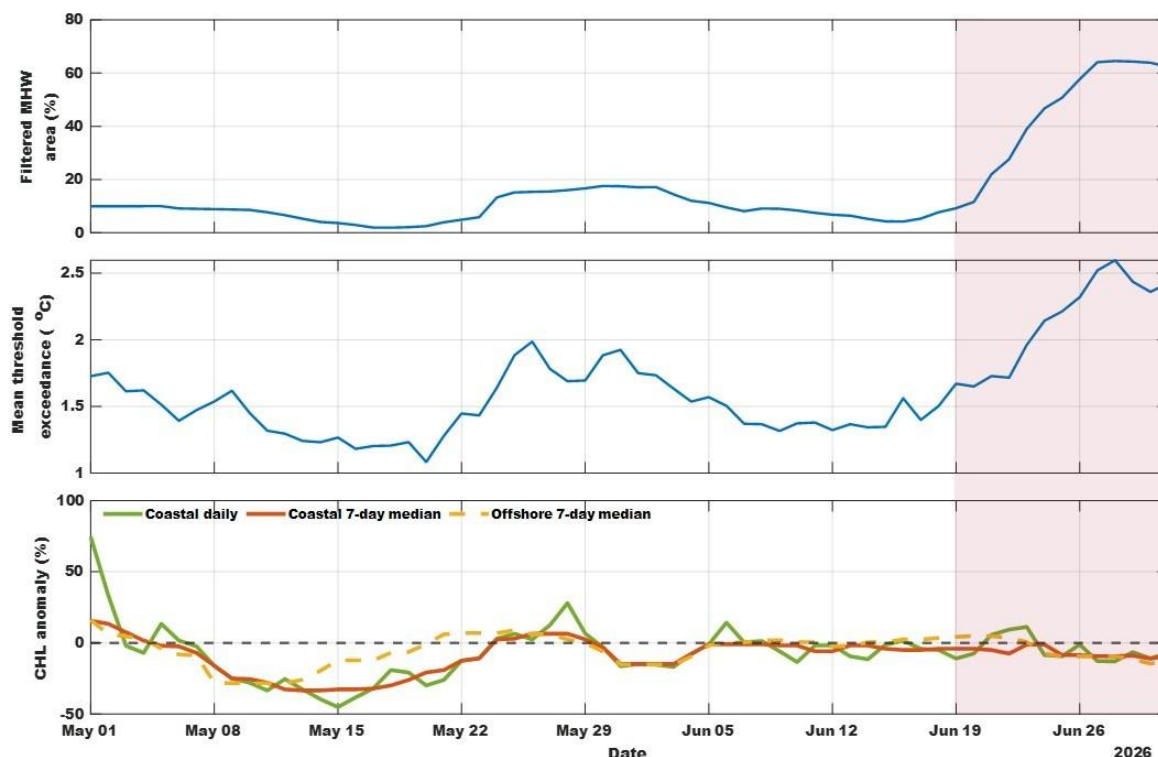


Figure 5. Spatial expansion and potential biological response of the June 2026 marine heatwave. The upper panels show the affected area and mean threshold exceedance. The lower panel shows coastal and offshore chlorophyll-a anomalies. From 18 June, the affected area expanded rapidly to approximately 60-65%, while mean exceedance peaked near 2.5°C.

Satellite-derived chlorophyll-a was used as an indicator of surface phytoplankton biomass. Its response was less pronounced than the physical warming: coastal and offshore values fluctuated through May and early June, then coastal chlorophyll-a became approximately 10-15% lower than the climatological expectation during the later stages of the event.

The decline coincided with the marine heatwave, but it cannot be attributed to temperature alone. Chlorophyll also responds to nutrient availability, currents, light, vertical mixing and grazing.

“The biological signal is more complex than the temperature response. We observed a moderate decline in coastal chlorophyll-a, but more information is needed to determine how much was caused by the marine heatwave.”

THE WIDER CONTEXT

A region already experiencing long-term warming

The 2026 event did not occur in isolation. Sea surface temperatures increased across almost the entire study region between 1998 and 2025. Trends generally ranged from approximately 0.1 to 0.3°C per decade, with some southern and coastal areas approaching 0.4°C per decade.

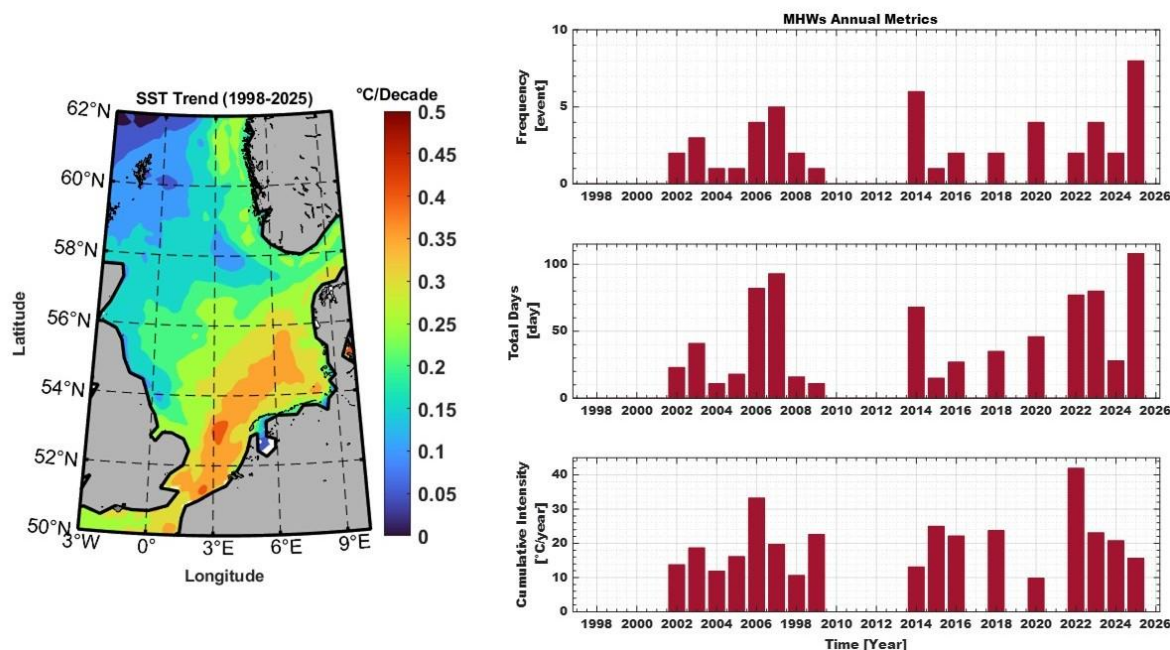


Figure 6. Long-term sea surface warming and annual marine-heatwave activity in the North Sea from 1998 to 2025. The map shows SST trends in °C per decade; the bar charts show annual frequency, total marine heatwave days and cumulative intensity. Several recent years, including 2022 and 2025, experienced particularly high activity.

Why the event matters

The North Sea supports highly productive ecosystems, important fisheries, coastal communities and offshore industries. Prolonged exceptional warmth can affect phytoplankton dynamics, species distributions, oxygen demand, nutrient cycling and the timing of ecological events.

Not every marine heatwave produces the same effects. Consequences depend on intensity, duration, spatial extent, season and interaction with other pressures. This event shows how atmospheric conditions can rapidly generate widespread warming across a shallow, economically important regional sea—and why physical and ecological monitoring must continue together.

ABOUT THE ANALYSIS

Daily satellite SST (DOI: 10.48670/moi-00165) was compared with the 1998-2025 climatology. Marine heatwaves were identified using a seasonally varying 90th-percentile threshold and a minimum duration of five days (Hobday et al.; DOI: 10.1016/j.pocean.2015.12.014). Atmospheric conditions (DOI: 10.24381/cds.adbb2d47) were assessed using air temperature, sea-level pressure, wind and surface heat-flux anomalies. Satellite chlorophyll-a (DOI: 10.48670/moi-00279) was examined as an indicator of the accompanying surface biological response.