Coast Clim Coastal Ecosystem and Climate Research

Newsletter 3/2026

Marine heatwaves – adding the missing perspective of four seasons

Marine heatwaves (MHWs) modify marine ecosystems and earlier studies show that high extreme summer temperatures exceed species' tolerances. Less is known about the effect of extreme temperatures in other seasons. Until now.

"In spring and autumn, strong heatwaves with temperatures of 8.5°C caused distinctly increased respiration rates compared to summer, where this temperature is normal"

says Norman Göbeler, lead author of the recently published paper on the study conducted at Tvärminne Zoological Station.



Four repetitive laboratory experiments, in winter, spring, summer and autumn, investigated the effects of seasonal MHWs on the processes and structure of natural benthic communities sampled at about 30-m depth. Surprisingly, community metabolism was constant year-round under climatologically normal temperatures despite a difference of 7.4°C between winter and summer, strongly suggesting seasonally adapted communities in the Baltic Sea.

Why does a community respond differently to a heatwave than a normal temperature rise?

Communities have adapted to gradual temperature shifts that come with the seasons, e.g. species reproduce in spring because the following conditions, like food, light and temperature, favor growth. When heat arrives at the wrong moment, communities are not prepared for it and it can cause stress and mismatches in the seasonal timing of ecosystems.

What does this mean in the Baltic Sea with strong seasonality?

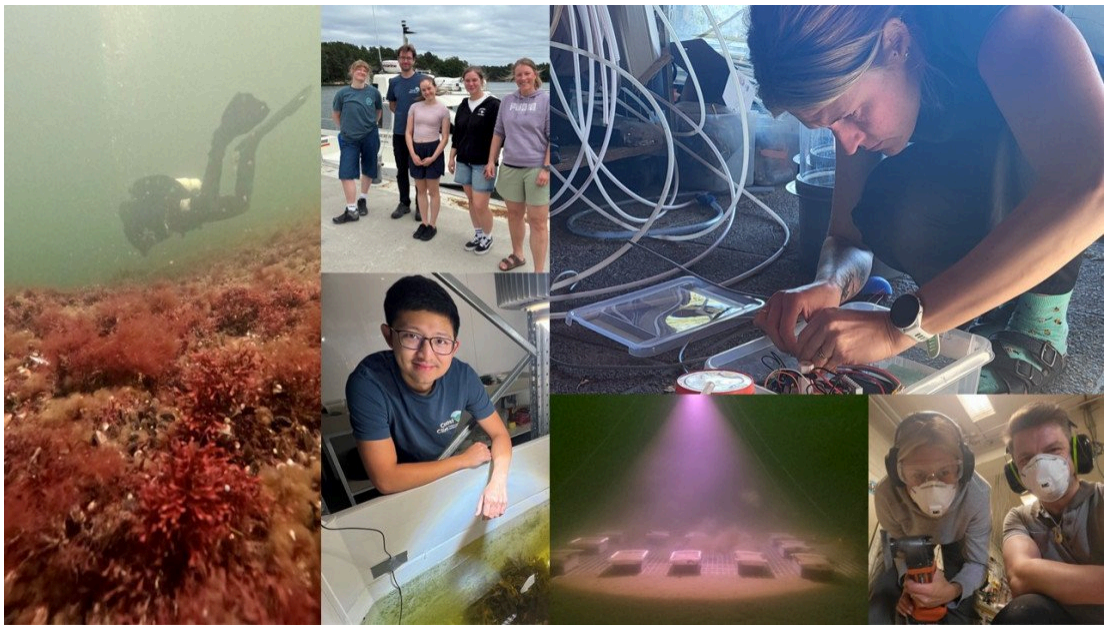
Beyond seasonality itself shifting, e.g. shorter winters and earlier spring, it will also require communities to adapt to these changing conditions. In our results we show varying stress responses (metabolic or behavioural) across seasons, but the consequences likely don't stay within a single season. Nutrient availability and energy flows through the ecosystem could shift as a result. The full cumulative picture across a year and into the next is still largely unknown.

Next points of interest?

Now that we have shown the variable, direct responses during the seasons, it would be interesting to follow up and ask “How does the heat stress in one season carry into the next?”. And if heatwaves cause metabolic stress across seasons – does it also translate to stronger carbon dioxide and methane releases?

Read our new Policy Brief about marine heatwaves.
Watch the Baltic Breakfast seminar on Wednesday 21 Oct at 8.30 (CEST) about ocean warming.

RESEARCH NEWS



Curious about our field work and current science?

Scientific fieldwork and experiments are an integral part of research. During the field season of 2026, CoastClim scientists both at University of Helsinki and Stockholm University have been busy getting their hands dirty while gathering samples and data!

At Tvärminne Zoological Station researchers went from shallow seashores to 30 metres depth in the Baltic Sea and experiments were running in all indoor tanks and aquariums at the station. In total, 10 different research projects were carried out in Finland, read more about these projects on the Tvärminne webpage.

When a meteorite crater turns into a living lab

A fluorescent dye released into the water is helping scientists unravel how greenhouse gases move through coastal seas.



Photo: C. Humborg

During a major international research campaign this autumn, experts from Sweden, Germany and France used the meteorite-created basin Tvären, south of Stockholm as a natural laboratory to investigate the processes controlling methane transport. By tracking how the dye spread through the water column, researchers were able to measure vertical mixing, a key mechanism that determines whether methane remains trapped at depth or reaches the atmosphere.



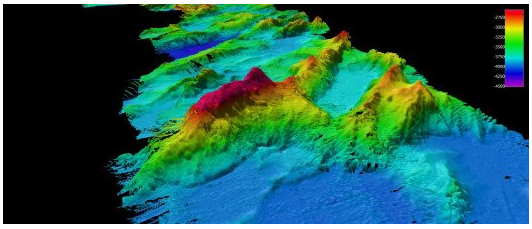
Photo: I. Stenson

How are seafloor animals affecting greenhouse gas emissions?

The coastal greenhouse gas dynamics are currently under investigation in a large experiment with over 20 mesocosms at the Askö laboratory, Stockholm University. The PhD students Sara Westerström and Moritz Nusser investigate how sediment-living animals influence the release and uptake of the greenhouse gas nitrous oxide. Watch a TV interview with the researchers.

COASTCLIM ON POLAR EXPEDITIONS

Mapping the seafloor for European-Asian high-transmitting cables



In September, PhD student Vicent Doñate Felip joined the expert team from Stockholm University in the extensive work of mapping the seabed over parts of the planned cable route. The Polar Connect project is an initiative for a fibre connection with ultra-high transmission capacity between Europe and Asia via the Arctic Ocean – the shortest route between the two continents.

How do you observe an ocean hidden beneath the Arctic sea ice?



Hanna Winge, a PhD student in physical oceanography from Stockholm University has

been onboard the icebreaker Oden to investigate how currents and different water masses move through the Arctic Ocean. Read more about the team's research and adventures.

POLICY UPDATE FROM BALTIC SEA CENTRE

Current marine and climate policy processes

This summer's heatwaves and wildfires in Europe have pushed the climate issue higher up on the agenda again. In the **EU State of the union speech**, president Ursula von der Leyen clearly stated that Europe needs to stay on existing climate targets. She also promised a European Heatwave Plan, a European Water Initiative, a Climate Insurance Alliance and a New framework for Climate Resilience.

However, at the same time we are seeing a continued weakening of existing climate regulations, for instance the review of the EU's flagship climate policy tool, the **Emissions Trading System (ETS)**. A recent Member State compromise has proposed a pause to the cancellation of surplus carbon permits until 2031, when a new cap of 800 million allowances (increase from 400 million) would take effect. An overall agreement with the European Parliament on this and the wider ETS review, may come in the first half of 2027.

In the fall the **Marine Strategy Framework Directive** is up for scrutiny as part of the EU Commission so-called 'omnibus' processes. These are reviews and revisions of existing legislation to simplify matters for both companies and regulators. In practice however, this has often meant weakening or removing environmental protection. We hope this will not be the fate for the MSFD.

26-27 of October the **Total Allowable Catch for Baltic fisheries** will be decided by the EU Council. Experts at Baltic Sea Centre have done a thorough analysis of the EU Commission proposal. Watch the experts present their analysis of the of Baltic fisheries management during the latest Baltic Breakfast.

NEW PUBLICATIONS

- Göbeler et al. Season-specific effects of marine heatwaves on macrofaunal community composition and ecosystem processes
- Gräfnings et al. Temperate marine macrophytes are highly variable sources of Biogenic Volatile Organic Compounds – a comparative study from the Baltic Sea and NE Atlantic

MEET OUR MEMBERS

Roseline Thakur

Researcher
Aerosol-Climate Feedbacks



Who are you?

I am an atmospheric scientist at the Institute for Atmospheric and Earth System Research, University of Helsinki. My research has taken me from the Southern Ocean to Antarctica, from the Arctic to the Gulf of Finland, studying the chemistry of air-snow interface to air-sea interface. As a Coastclim researcher I am responsible for the infrastructure and measurements of precursor gases and aerosols at the coastal atmospheric observatory in Tvärminne-Coastal SMEAR.

What are you doing in CoastClim and why?

In CoastClim I study the aerosol-climate feedbacks. I have developed measurement techniques to study the volatile organic compounds (VOCs) at the air-sea interface in the field. These measurements enable quantification and identification of VOCs that are emitted from coastal surface waters. My research is currently focussing on how these VOCs form oxidized compounds which may influence aerosol formation processes at the coast. The Baltic Sea is a fragile ecosystem impacted by eutrophication and increasing temperature which causes many hot spots and hot moments in this coastal region which can increase the outgassing of many VOCs, which in turn can change the chemistry of the overlying atmosphere. This is an important lacuna which deserves more research.

Your recommendation to others...

Be curious, keep exploring, the field of research has space for everyone to be passionate about that “one” thing you care about!
And my forever favourite lines are also my recommendation - Somewhere, something incredible is waiting to be known (Carl Sagan)

The CoastClim team

SHORT NEWS AT A GLANCE

Watch real-time images of a plankton community

Starting off in the protected Askö bay, the air-sea platform has now been further equipped

and moved to a more exposed site to perform continuous measurements of the sea-air-exchange of climate-relevant compounds. Following this move, the Imaging FlowCytobot was deployed at the new site and is now capturing real-time images of the archipelago's phytoplankton community around the clock. Watch the plankton community live (only available in Sweden).



Photo: I. Stenson



DNA from marine microbes can predict the status of the sea

The microorganisms found in one litre of sea water can reveal a lot about their environment. In a new methodological study, Emma Bell and the team demonstrate how DNA sequencing and AI can be used to predict the biological and chemical properties of the sea. Read a news item about the study.

CoastClim represented around the world



7th ICOS Science Conference



12th International Aerosol Conference

Four CoastClim researchers presented their work on coastal greenhouse gas dynamics and how it links to biodiversity at the ICOS conference in Lund, Sweden in September.

At the Aerosol Conference in Xi'an, China in September, three CoastClim researchers presented their work on emissions of volatile organic compounds from coastal ecosystems.

Upcoming events

21 OCT Baltic Breakfast: Ocean warming - from global change to Baltic Sea impacts
11 NOV Baltic Breakfast: Klimateffekter av odling av musslor och alger
23 NOV Aquatic Microbiome Research Initiative meeting in Stockholm
24-26 NOV Nordic Marine Science meeting in Stockholm

CoastClim in media

- Opinion: Vi får inte glömma havet i klimatpolitiken (HBL)
- Opinion: Utan havsforskning förlorar vi kampen mot klimatkrisen (HBL)
- TV interview: Forskare vill förstå metangaserna i Östersjön: Vi kan förvalta Östersjön bättre (TV4)
- Radio interview: Havsforskare: Miljöfrågorna börjar bli en existentiell fråga (YLE Vega)
- Podcast: Hopp i klimatkrisens tid - Alf Norkko: Vi måste se det fina i naturen (YLE)
- News article: Östersjön blir mörkare och havsnivån i Finska viken höjs trots landhöjningen (YLE)
- News article: Dykare kartlägger livet under ytan vid Söderlångvik gård (YLE)
- News article: Ny forskning: Östersjön värms upp dubbelt så snabbt som världshaven (DagensPS)
- News article: Ålandskungen: Lyssna mer på Greta Thunberg (Svenska Dagbladet)
- Article: Kronprinsessan Victoria firade Östersjöpriset (Svensk Damtidning)

CoastClim

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