SVENSKA HAVSFORSKNINGSFÖRENINGEN
THE SWEDISH SOCIETY FOR MARINE SCIENCES

ABSTRACT BOOK
THE MARINE RESEARCH DAYS 2025
GOTHENBURG, 18-20 NOVEMBER

KEYNOTE SPEAKERS

When the Ice Last Melted: Paleo Perspectives on Arctic Sea Ice in a Warmer World

Matt o' Regan[a]

[a]Department of Geological Studies, Stockholm University

The geologic history of Arctic sea ice is a critical, but missing piece in the narrative on global climate change. Arctic marine sediments preserve a long-term archive of sea ice variability offering a rare window into cryosphere dynamics well beyond the limits of the instrumental record. These paleo-records enable us to explore the complex links between Arctic and global climate systems and to test the models we use for future sea ice projections. However, the development of the Arctic's perennial sea-ice cover, and its persistence across Quaternary (last 2.6 million years) interglacial periods, remains a subject of active debate. Early paradigms that suggested a persistent perennial sea ice cover since the middle Miocene (12 -14 million years ago) appear incompatible with terrestrial paleoclimate data and marine proxy evidence suggesting profoundly different oceanographic and sea ice conditions in the recent past. Continued methodological advances in paleo-sea ice reconstructions, using microfossils, biogeochemical proxies, and ancient DNA, are revolutionizing our ability to track sea ice variability. Recent (GEOEO 2024, AO25) and planned expeditions (AO26, AO27) on Sweden's Icebreaker *Oden* are providing access to regions of the Arctic where the thickest multi-year sea ice exists today, and is projected to persist longest in the future. This talk will outline current ideas on sea ice variability during the early Holocene and previous Quaternary interglacials and discuss how multi-proxy approaches from these new expeditions are poised to resolve long-standing questions about the resilience and variability of Arctic sea ice in a warmer world.

Ocean Recovery Through Collaboration: Lessons from the Stickleback Wave

Johan Eklöf[a], invited by EcoChange

[a]Department of Ecology, Environment and Plant Sciences, Stockholm University

Reversing ecosystem degradation requires bridging scientific insight and societal action. In the Baltic Sea, the decline of large predatory fish such as pike and perch and the rapid rise of the three-spined stickleback illustrate how ecological feedbacks and governance challenges interact across scales. Through the interdisciplinary FORCE project (*Facilitating Ocean Recovery in a Changing climate*), we integrate ecology, law, and social science to identify social-ecological drivers of change and explore practical pathways for recovery. Our work emphasizes reconciling top-predator conservation with ecosystem-based management and making fuller use of legal and institutional frameworks to foster collaborative marine stewardship. I will also present preliminary results from a large-scale field study displaying how fishery closures influence the recovery of predatory fish and their cascading effects in coastal food webs. Together, these insights show how cross-disciplinary collaboration can transform understanding into effective action for ocean recovery.

From climate-scale to fine-scale: The Southern Ocean's role in heat and carbon uptake as revealed by marine robots

Sebastiaan Swart[a]

[a]Department of Marine Sciences, University of Gothenburg

The Southern Ocean plays a pivotal role in the global climate system, serving as a major conduit for the exchange of heat and carbon between the ocean and atmosphere. Its environment is among the most extreme on Earth, characterized by fierce winds, towering waves, and pervasive sea ice—making it both a formidable challenge and a unique privilege to study. In recent years, there have been significant advances in our ability to observe this remote region, particularly the upper ocean and the air-sea interface. These developments have been driven in large part by autonomous observing platforms like underwater gliders, which have opened unprecedented windows into the Southern Ocean's dynamic processes. This talk highlights how these observational advances are revealing a highly dynamic ocean shaped by fine-scale features such as eddies and fronts, which interact with vast storms to regulate the exchange of heat and carbon between the atmosphere, ocean surface, and its deep interior. Looking ahead, the talk will also introduce upcoming large-scale field campaigns, including the ERC Synergy "WHIRLS" cruises in 2026 and the *Pulse of the Weddell Sea* (POW) expedition, scheduled for 2027–2028. These initiatives promise to further enhance our understanding of the Southern Ocean and its role in the climate system.

PANEL DISCUSSION - How can we promote interactions between marine research and stakeholders?

PANEL MEMBERS:

Kaisa Tönnesson - Havsmiljöinstitutet
Mats Svensson - Havs- och Vattenmyndigheten
Louise Biddle - Voice of the Ocean Foundation
Ulrika Siira - Havs- och Vattenmyndigheten
Bengt Karlsson - SMHI
Mattias Obst - Institutionen för marina vetenskaper, Göteborgs Universitet, EMBRC

DYRSSEN AWARD CEREMONY

The Swedish Society for Marine Sciences annually presents *The Dyrssen Award* for Master's degree projects in marine sciences in Sweden. Monetary prizes are awarded to the two best nominations. The award is instituted by SHF in honour of David Dyrssen (1922 - 2011), emeritus professor of analytical chemistry at the University of Gothenburg. As one of the founding members of the Swedish Society for Marine Sciences, he spent his career being an active proponent for the promotion of inter-disciplinary research in marine sciences. The 2025 prizes will be awarded during the Swedish Society for Marine Sciences Marine Research Days meeting in Gothenburg.

1st prize is awarded to **Sarah Verhoeven** (University of Gothenburg) for their Masters thesis entitled "Exploring the effects of salinity and nutrient interactions on Ulva metabolism".

2nd prize is awarded to **Johannes Till** (Lund University) for their Masters thesis entitled "Harbour Porpoises (Phocoena phocoena) in Busy Waters: How Recreational Boats Affect Numbers, Swimming Speed, and Surfacing Interval".

ORAL PRESENTATIONS

Restoring *Zostera marina* meadows: National Progress, regional challenges, and new methods

Louise Eriander [a], *Beatrice Alenius, Eduardo Infantes, Anders Olsson, Per-Olav Moksnes*

[a] University of Gothenburg

Eelgrass (*Zostera marina*) meadows are foundational marine habitats that support high biodiversity, improve water clarity, stabilize sediments and contribute to carbon sequestration. In Sweden, extensive losses—particularly along the Skagerrak coast—have raised concerns about ecosystem degradation. In response, a national restoration guideline for eelgrass was published in 2016, outlining best practices for site selection, permitting, planting, and monitoring. Here we summarize development of eelgrass restoration in Sweden since 2016, compiling lessons learned from different projects, highlighting regional differences in outcomes and the development of methods.

Eelgrass restoration today has expanded into a nationwide effort involving universities, county administrative boards, municipalities, consultants, and NGOs. Between 2016 and 2024, 59 restoration efforts were identified at 37 sites across Sweden, resulting in the planting of over 500,000 shoots and the establishment of approximately 2.3 hectares of new eelgrass meadows. Several new restoration methods for eelgrass have been developed in response to new challenges. Innovations include checkerboard planting to reduce costs, sand capping to improve light conditions in turbid environments, and strategies to mitigate biological disturbances from shore crabs. New studies have also allowed information of genetic diversity and connectivity to be used when selecting donor meadows and restoration sites.

Findings demonstrate that while large-scale eelgrass restoration is feasible, it remains costly with risk for failure. Protection of existing meadows is essential, and restoration should be strategically targeted to support Sweden’s national and EU marine habitat recovery goals.

Social Dimensions in Ecosystem Based Marine Planning and Management - A Swedish Match?

Andrea Morf [a], *Madeleine Prutzer* [b], *Embla Ekström* [b]

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[b] Swedish Institute for the Marine Environment, Gothenburg

Sustainable development and the application of the ecosystem approach requires meeting and balancing both environmental, economic and social targets. However, especially the latter targets have been challenging to include, not the least for the sea. Currently, marine planning and management have to accommodate an increasing amount of old and new user demands in a marine environment already under pressure. Sweden has subscribed to the 30 by 30 targets and needs to step up nature protection. So, how is this monitored and evaluated and what about the inclusion of social aspects?

At present, various complementary integrative approaches are running in parallel, with ambitions to balance different views and needs. One is legally based marine and coastal spatial planning. Marine spatial planning (MSP) is an integrative, adaptive and forward-looking spatial approach to address spatial conflicts; it is stipulated to follow an ecosystem-based, adaptive approach and includes legally defined minimum requirements for public participation. The national MSP responsibilities overlap with those of over 80 municipalities and regions, which raises the issue of multi-level integration also of monitoring and evaluation. National MSP has tried to encompass all three pillars of sustainability at an overarching scale, while a coherent inclusion of social aspects across all governance levels and the related appraisals and evaluation are missing. Another is a test project on ecosystem-based marine management. The project, initiated and financed by national authorities, is driven at lower levels and aims to develop a regional management model and promote cross-level and cross sector integration. It uses a commitment-based, co-creative network approach involving a wide set of actors and stakeholders from marine users to managers. Continuous reflection to learn and adapt according to needs, not the least in terms of social sustainability related aspects, is a key characteristic. Comparing the rather different evaluation approaches of these two and two further ecosystem approach-based initiatives, and with focus on the inclusion of social-cultural aspects, we discuss important challenges and enablers to develop a more coherent ecosystem-based planning and management system for Sweden from a monitoring, evaluation and learning perspective.

Five Years of Glider Observations Enhance Understanding of Baltic Sea Extreme Events

Martin Mohrmann[a], *VoTo Team*

[a]Voice of the Ocean Foundation

The Baltic Sea is one of the fastest-warming coastal seas worldwide, with temperatures rising by approximately 0.05 °C per year and an increasing frequency of marine heatwaves. Despite ongoing nutrient reduction measures, intense cyanobacteria blooms persist, and anoxic bottom areas continue to expand, threatening ecosystem health, fisheries, and tourism. Long-term monitoring programs, conducted over the past four decades using ship-based CTD sampling, moorings, and more recently Argo floats, have documented major changes in water masses and ecosystems across the open Baltic Sea. However, these traditional methods provide either limited temporal (CTDs, Argo) or vertical (moorings) resolution.

To bridge this sampling gap, the Voice of the Ocean Foundation established five Baltic Observatories across different basins, continuously operated by autonomous underwater gliders over the past five years. These gliders collect persistent, high-resolution data that capture both spatial and temporal variability in key regions of water mass transformation. The observations provide valuable insight into extreme events such as heat waves and algal blooms and long-term changes in the water column. The continuous presence and high resolution of observation often allow for a direct interpretation of underlying preconditioning processes.

Satellite-derived sea surface temperature (SST) and CTD-monitoring data (both 40+ years of data) near the glider sites show strong agreement, enabling the development of full-depth climatologies at the observatory sites. Using these, we identify subsurface heatwaves and associated anomalies in salinity and oxygen concentrations. During bloom events, maximum chlorophyll levels occur near the base of the mixed layer rather than at the surface, with both chlorophyll and thermal structure strongly controlled by mixed-layer depth. Beneath the mixed layer, cooler intermediate waters provide refuges during heatwaves, though these are increasingly constrained by a long term shoaling Baltic halocline and expanding anoxic deep waters. The deepest layers remain largely isolated from atmospheric forcing, responding mainly to horizontal advection. Repeated observations of warm, saline intrusions in late summer indicate small-scale inflows that contribute substantially to an observed warming below the halocline, especially strong for the Bornholm Basin. The sustained glider presence also enabled the capture of rare, high-resolution observations of transient halocline eddies, increased dissolved methane concentrations following the Nord Stream pipeline sabotage, and intense phytoplankton coagulation and sinking. These results demonstrate the essential role of continuous, high-resolution glider observations for resolving the full dynamics and long-term impacts of extreme events in the Baltic Sea.

Using advanced numerical methods to explain observations of microplastics accumulation patterns in complex marine environments

Thisal Mandula Sugathapala [a], *Martin Hassellöv [b], Karin Mattsson [b,e], Lars Arneborg [c], Bengt Liljebladh [d], Amanda T. Nylund [a,c], Ida-Maja Hassellöv [a], Rickard Bensow [a], Gaetano Sardina [a]*

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This research aims to develop and apply advanced numerical methods to study the physical and biological processes in marine environments that give rise to observed patterns of microplastic pollution. While numerous studies are emerging that document microplastic accumulations on beaches, in sediments, and throughout the water column, there is a limited understanding of how oceanic conditions and processes lead to these observations. Focusing on microplastic pollution in the Orust–Tjörn fjord system as a case study, this work develops MPDrift, a large-scale particle-tracking model. The model is designed to be used with velocity input from high-resolution oceanographic models and may then accurately capture the three-dimensional transport and fate of microplastics in complex marine environments. Initial simulations using a rough estimate of the fjord velocity fields suggest that biofouling is a dominant mechanism driving the sinking of buoyant microplastic types, such as polyethylene, ultimately leading to their accumulation in marine sediments. The model also includes the possibility for shear stresses acting on sedimented microplastics, causing them to resuspend and leading to sediment transport. Over time, these particles may then redistribute across the fjord sediments, which could then cause the observed spatial patterns of microplastic concentrations in the fjord's sediments documented by existing literature. The presently used velocity field, however, does not provide realistic shear stresses to support this explanation. These results highlight the importance of using detailed numerical models for understanding the transport of microplastics in marine environments. Consequently, MPDrift, used in combination with high-resolution coastal ocean models, is expected to serve as a valuable predictive tool in future environmental impact assessments of microplastic pollution and support the development of more informed policies and legislation strategies.

Sustainability ranking of antifouling coatings for leisure boats – balancing efficacy and environmental impact

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Antifouling coatings are essential for preventing biofouling on leisure boats, yet their environmental impact varies widely depending on biocidal content and release behavior. This study aimed to evaluate the sustainability of seven commercially available antifouling coatings—five copper-based, one tralopyril-based, and one biocide-free silicone coating—by comparing their efficacy and environmental impact. Field tests were conducted over six months at three European coastal sites (Sweden, Denmark, France), assessing biofouling resistance, biocide release rates and environmental risk assessment (ERA) using EU guidelines. Ecotoxicity was also evaluated via four bioassays on leachates from exposed panels. Results showed that while copper coatings generally performed well, efficacy did not consistently correlate with copper content. The tralopyril-based coating exhibited strong antifouling performance but posed the highest environmental risk and toxicity. The silicone coating demonstrated low toxicity and environmental risk, with comparable or superior efficacy to biocide-containing coatings. A sustainability ranking integrating efficacy, ERA modeling and ecotoxicity testing identified the silicone coating as the most sustainable option, while the tralopyril-based product ranked lowest. These findings highlight the need for holistic assessments to guide environmentally responsible antifouling choices and regulatory decisions.

Coastal chemical mixtures affect microzooplankton abundance and diversity, contrary to results from risk assessment

Ingela Dahllöf [a], *Christina Jönander, Jenny Egardt*

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Marine surface waters contain complex mixtures of chemicals that can adversely affect marine organisms such as zooplankton. The microzooplankton community consists of many protists, but there is limited data on the toxicities of single chemicals to species in this organism group, and even less on mixtures. A general limitation in chemical risk assessment is indeed the lack of ecotoxicity data for both individual chemicals and mixtures, and here we use two different methodologies to fill this gap. We tested the toxicity of three chemical mixtures of polar organic compounds from marine surface water to microzooplankton communities, using both a component-based approach and a whole-mixture approach. Using the component-based approach, we estimated cumulative toxic units for each mixture based on their single compound concentrations, together with observed hazard data for zooplankton. When data was missing, we supplemented with ECOSAR generated QSAR daphnid LC50s. This component-based approached suggested that none of the mixtures should be toxic to zooplankton at the respective measured environmental concentrations. The second methodology, whole-mixture approach, gave contrasting results. We found that mixture exposure reduced the number of ciliates and dinoflagellates, as well as the overall microzooplankton diversity at the respective measured environmental concentrations, and with indications of effects even below measured environmental concentrations. Our findings suggest that the contaminant mixtures present in Swedish marine surface water have the potential to adversely affect organisms with a central role in the marine pelagic food-web, which could have negative implications for water quality in the area.

Phytoplankton dynamics and nutrient limitation of a 30-year-old series in an anthropized system: the western Gulf of Bothnia

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[a] Umeå University

The Gulf of Bothnia, a near-Arctic brackish system characterized by low salinity and seasonal sea ice, is increasingly affected by anthropogenic pressures such as global warming, eutrophication, and brownification. In this unique system phytoplankton has great importance sustaining higher trophic levels and supporting numerous ecosystem services. However, enhanced stress due to the anthropogenic factors raises concerns on its productivity and ecological function. In this study, 30 years old times series on multiple stations including environmental parameter and phytoplankton counts along the Gulf were analysed through time modelling. The results display a pronounced North-South gradient of salinity and nutrient stoichiometry with higher N:P linked with lower biomass in the North. Phytoplankton composition shows co-dominance of diatoms and dinoflagellates and in lesser proportion cyanobacteria while in the North only diatoms predominate. Three dominant taxa are also reported as Harmful algal bloom (HAB) producers. Ecological succession patterns highlight the competitive advantage of diatoms and dinoflagellates during the spring bloom, followed by secondary groups that bloom later in summer. A temporal delay in bloom peaks between the northern and southern basins is also highlighted. Nutrient limitation appears as the main driver of ecological succession, with phosphate limitation prevailing in the south, whereas in the north, shifting stoichiometry indicates co-limitation by nitrogen and phosphorus. The use of organic matter may be an important factor for productivity as a major of nitrogen and phosphorus pool is organic. Future changes in nutrient dynamics and climate conditions are likely to further alter phytoplankton community structure and productivity in the Gulf of Bothnia, potentially increasing the frequency of HAB events and reducing overall ecosystem productivity, with cascading impacts throughout the food web.

Genetic observatories for early detection and prediction of marine non-indigenous species

Justine Pagnier[a], *Nauras Daraghmeh, Gunnar Andersson, Matthias Obst*

[a]University of Gothenburg

The increasing prevalence of non-indigenous species (NIS) in marine ecosystems presents critical challenges for biodiversity conservation and ecosystem management. Advances in molecular techniques, particularly DNA metabarcoding, offer unparalleled opportunities for early detection and long-term monitoring of these taxa. The European ARMS Marine Biodiversity Observation Network (ARMS-MBON) exemplifies this approach, conducting standardized genetic sampling campaigns across Europe. We evaluated the potential of genetic monitoring networks to monitor marine NIS by analyzing ARMS-MBON data for cytochrome c oxidase subunit I (COI) and 18S rRNA markers using a custom bioinformatics pipeline. Screening against reference databases and incorporating manual curation, we detected diverse NIS across multiple locations, including taxa indicative of potential new introductions. This dataset also provides a valuable foundation for modeling NIS distributions and applying machine learning techniques to enhance predictive capabilities. Our findings highlight the efficacy of genetic observatory networks in identifying NIS distributions, mapping range shifts, and functioning as early warning systems. This talk will discuss key insights and future directions for the integration of genetic tools into NIS monitoring frameworks, emphasizing their role in addressing the growing pressures on marine ecosystems.

Investigating local adaptation and environmental drivers of body size divergence in northern and southern eastern Baltic cod populations

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[a]Uppsala University

Eastern Baltic cod (EBC) has decreased in population size and the size at which adults attain sexual maturity due to overfishing, and it has lost two out of three spawning grounds due to increased hypoxia at the bottom of certain areas of the Baltic proper. Currently, only the Bornholm basin (SD25) offers suitable oxygen conditions for development and salinity for eggs to be buoyant. EBC is a phenotypically and genetically distinct population of Atlantic cod found in the Baltic Sea, and the only one able to successfully reproduce in this Sea. Interestingly, cod in the Åland Sea (SD29) is large and healthy compared to the cod found in the Bornholm basin. Our goal is to deepen our understanding of this enigmatic population and uncover the reasons why the northeastern Baltic cod (Åland cod) differs in size and overall health from the southeastern Baltic cod (Bornholm cod).

We investigated whether Åland cod exhibits local adaptation to low salinity, hypothesising that Åland cod eggs show higher survival than Bornholm cod at 9–7 psu and has evolved more buoyant eggs and larvae or demersal spawning as an adaptive strategy. Results show no difference in survival or buoyancy at early life stages between these two populations, and suggest Åland cod is not locally adapted to the low salinity found in the Åland Sea. However, our findings also indicate that EBC might be able to successfully reproduce outside the historical spawning rounds, potentially around Åland Sea. Further research is required to disentangle its population structure and accurately identify its spawning areas. We also characterised the 16S rRNA region from gill tissue to investigate differences in microbiome diversity between the two populations. We observed higher alpha diversity in the Åland population compared to Bornholm, along with a distinct bacterial community composition. These results suggest that the greater microbiome diversity in Åland cod may be associated with their better overall condition.

Genetic Monitoring of Eelgrass

Marlene Jahnke[a]

[a] University of Gothenburg

The seagrass *Zostera marina* (eelgrass) is a key foundation species in coastal ecosystems of the Northern Hemisphere, providing an important habitat and ecosystem services. Despite extensive management efforts, eelgrass meadows continue to decline in many regions, including Sweden. Given limited resources, genetic baselines can help identify meadows most vulnerable to local extinction as well as those most valuable for protection and restoration. This contribution presents an assessment of genetic diversity and differentiation of eelgrass along its entire Swedish distribution developed in collaboration with the Swedish Agency for Marine and Water Management and the county administrative board of Västra Götaland. The resulting national genetic baseline enables the evaluation of the effectiveness of conservation actions, identification of resilient and vulnerable populations, and can guide the choice of donor material for restoration. The establishment of a genetic baseline as a reference point for future assessments now allows continued spatiotemporal genetic monitoring to detect changes in genetic variation driven by climate change, restoration efforts, or anthropogenic pressures. It also provides a basis for exploring how genetic information can be used to source donor material with the highest likelihood for rapid establishment and long-term survival. This contribution summarizes recent research on genetic monitoring of eelgrass and illustrates how principles of restoration genomics can support eelgrass restoration—through close collaboration between researchers and local, regional and national agencies.

The Impact of Brownification on the Primary Production of Habitat-Forming Macrophytes in the Baltic Sea

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The transport of terrestrial dissolved organic carbon (DOC) into aquatic ecosystems is causing a global darkening of coastal seas – a process known as brownification. This phenomenon reduces water transparency and light availability, disrupts nutrient cycling, and alters primary productivity, with cascading effects on ecosystem functioning. Climate change is expected to intensify brownification by increasing precipitation and terrestrial run-off, raising DOC levels, and accelerating coastal darkening. While most research on brownification has focused on lakes and pelagic systems, where it is known to decrease phytoplankton production and modify food web dynamics, its effects on benthic primary producers in the marine environment remain largely unexplored. These habitat-forming macrophytes (e.g., seagrasses, macroalgae, aquatic plants) play a crucial role in sustaining biodiversity, nutrient cycling, blue carbon sequestration, and coastal protection. Using the Baltic Sea as a model system for future coastal brownification scenarios, here we investigated how light attenuation affects benthic macrophyte productivity and ecosystem functioning. Along the Baltic Sea's natural brownification gradient spanning 10° of latitude, we characterized underwater light fields and quantified the photophysiology and acclimation traits of dominant macrophyte species (*Potamogeton perfoliatus*, *Fucus vesiculosus* and *Zostera marina*) to model primary production under present and projected future conditions. By integrating physiological, ecological, and modeling approaches, this research provides key insights into how brownification may reshape coastal ecosystem structure and functioning, offering valuable guidance for conservation and management strategies under accelerating climate and land-use change.

Bottom trawl surveys show a sharp decline in European eel (*Anguilla anguilla*) abundance in northern European coastal waters

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Almost fifty years ago, the first signs of population decline in the European eel (*Anguilla anguilla*) were observed when upstream migration of yellow eel and catches of silver eel decreased in the Baltic Sea. Since then, the decline in recruitment has continued throughout the eel's range and many indices based on early life stages are now hovering at extremely low levels. Consequently, the European eel is considered as critically endangered, which has been linked to overfishing, habitat destruction including barriers, spread of parasites, contaminants, and climate change. Measurements of European eel escapement are considered as difficult to obtain because return sea migrations occur diffusely from all possible coasts, including marine habitats. Currently, the main source of data is the reported commercial landings data, which are subject to several uncertainties. Such uncertainties make it difficult to evaluate stock status and the efficiency of eel management plans (EMPs). In this study, data on eel catches are presented from fishery independent international trawl surveys, which often is a more consistent data source than fisheries-dependent data (i.e. tag returns and landing reports from commercial fisheries). The trawl survey data presented here show drastic declines in eel abundance over the last 30-35 years throughout the Baltic Sea, Kattegat, and southern North Sea both regardless of size, and in the group of larger eels (≥ 50 cm). This decline in abundance of larger eels calls into question the effectiveness of national EMPs and the future of the European eel.

Analysis and modeling of coastal hazards to the desalination plants on Gotland: The Hans Coastal Storm 2023 event

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[b] Swedish Meteorological and Hydrological Institute (SMHI), Norrköping, Sweden

Extreme sea weather events are predicted to intensify under climate change. Extreme winds can profoundly modify the coastal circulation by inducing strong currents, strong temperature variations due to coastal upwelling and strong vertical mixing. On the island of Gotland, located in the centre of the Baltic Sea, desalination of drinking water from the Baltic Sea complements the municipal water supply, especially during summer when water stress can occur due to the increased demand during the touristic season and the limited groundwater resources. Extreme wind associated with the passage of windstorms could pose multiple hazards for the two desalination plants which are sensitive to variations in temperature at the intake source and the presence of organic material clogging the filters. This study presents an analysis of the sea state conditions associated with the passage of storm Hans over Gotland in August 2023 which led to disturbances in the operation of the two desalination plants. We analyse the coastal ocean-dynamical drivers around Gotland associated with Hans storm which produced cold temperatures at the bottom and strong surface currents in the proximity of the desalination plants. We will present a pathway towards a forecast system for the coastal hazards associated with wind-driven coastal circulation to be implemented for the existing and operating desalination plants and to be considered for the future planning of new coastal infrastructure on Gotland.

Microbes as indicators of Hg contaminated sediments

Agneta Andersson[a]

[a] Umeå University

Paper industry has been very important for the buildup of Swedish economy during the past 100 years. The industrial activity has, however, caused environmental issues, such as deposition of Hg in coastal fiber rich sediments. Here, we studied if certain bacterial groups could be used as indicators of Hg contaminated sediments. Three gradient samplings were performed in the northern Baltic Sea, from close to industrial emission points to clean offshore locations. Physicochemical variables were measured along with 16S identification of bacterial taxa and sequencing of specific genes. The results show that certain bacterial groups were enriched in the Hg contaminated sediments, for example Campylobacterota and Desulfobacterota. Shot gun analysis of genes showed that the mercury resistant genes *merR* and the methylmercury genes *Hgcab* were enriched in the contaminated sediments. Together this suggests that these bacteria are enriched in contaminated regions because they are resistant to Hg poisoning and can uphold their ecosystem function as degraders sinking phytoplankton. Nevertheless, Hg contaminated sediment pose an environmental risk, since MeHg can spread and be accumulated in fish and other organisms.

Release of allelochemicals facilitates nutrient uptake from co-occurring phytoplankton in dinoflagellate *Alexandrium ostenfeldii*.

Elin Lindehoff [a], *E. Svahn* [a], *J. Jerney* [b], *C. Legrand* [a], *A. Kremp* [c]

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The toxic dinoflagellate *Alexandrium ostenfeldii* forms dense blooms in shallow waters of the coastal Baltic Sea proper during late summer, a period marked by low concentrations of inorganic nitrogen (DIN) and elevated levels of dissolved organic nitrogen (DON). Its potential mixotrophic behaviour, i.e the ability to utilize DON, may contribute to the development of these blooms. In this study, phytoplankton-derived DON was generated from co-occurring cryptophyte *Rhinomonas nottbecki*, which was pre-cultivated with $^{15}NO_3$ and subsequently lysed by allelochemicals released by *A. ostenfeldii*. Uptake of ^{15}N- labelled DON by *A. ostenfeldii* was visualized using second iron mass spectrometry (SIMS) and quantified in bulk using iron mass spectrometry (IRMS) across strain exhibiting varying allelopathic activity (EC_{50}). This approach enabled the investigation of a potential correlation between allelopathic activity, and the uptake of phytoplankton derived DON. Our findings support the concept that dense blooms of *A. ostenfeldii* utilize DON as N source and that its allelopathic activity facilitates N uptake.

Three decades of marine research at SKB

Ulrik Kautsky [a]

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SKB, responsible for Sweden's radioactive waste, has carried out more than three decades of intensive, multidisciplinary marine research to ensure the long-term safety of coastal geological repositories. Most work has focused on Forsmark (Northern Uppland) and Laxemar (north of Oskarshamn), involving site investigations, coastal and marine modelling, and ecosystem studies. Over this period, SKB has produced more than 120 reports and 80 scientific articles addressing current, historical, and projected future states of the coastal environment.
Key achievements include updated reconstructions of salinity throughout postglacial stages of the Baltic Sea coupled models to estimate future salinity. Hydrodynamics have been studied with everything from simplified box models to advanced 3D and Lagrangian models, linked to ecosystem models for radionuclide transport in pelagic and benthic food webs over a 10000 year period. A unique 10-year monitoring program has yielded invaluable water chemistry, biological, and physical data on nutrient turnover with monthly resolution. Multielement analyses (48 elements) track stoichiometric relationships and trophic flows in plankton, organic matter, and sediments, complemented by regular benthic sampling and SCUBA surveys tracking changes in the Öregrundsgrepen near Forsmark. Extensive mapping of seafloor geology informs models of sediment erosion, deposition that together with shoreline displacement project future Sea Basins and lakes. Studies of undersea hydrology have identified potential discharge points.

Current understanding indicates that potential radiological doses during the marine phase are orders of magnitude lower than those projected for future terrestrial phases, reinforcing the importance of studying radionuclide accumulation in sea sediments, which may eventually become agricultural land.

Exploring nutrient-driven microbial interactions through co-culture experiments

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Heterotrophic marine microorganisms play a significant role in the global carbon cycle by transforming organic carbon and consequently influencing long-term carbon storage in the ocean. It is predicted that nutrient stocks and stoichiometry will change with anthropogenic activities. However, the specific responses of marine heterotrophic microbial communities and their interactions to changing nutrient stoichiometry remain unclear, thereby limiting our understanding of their role in ocean carbon cycling under global change. With this study, we aim to demonstrate the influence of nutrient stoichiometry on microbial community composition and the transformation of dissolved organic matter. Using high-throughput laboratory techniques, we are looking at microbial monocultures as well as synthetic communities with the objective of elucidating microbial interactions, physiological responses and growth patterns under varying stoichiometric drivers. For that, we have isolated heterotrophic marine model microorganisms from the Swedish West Coast. We have scrutinized them for their interaction behavior towards each other as well as natural communities to understand metabolic exchange patterns within marine heterotrophic microbes. Our results highlight species-specific metabolic responses, demonstrating how community assembly patterns affect organic carbon processing.

Ambitious environmental monitoring is essential for successful management of natural resources

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Environmental monitoring is not only essential for ecosystem assessments but provides the foundation for mitigation measures, including the evaluation of their effectiveness and guidance regarding improvement of existing measures. We provide a Pan-Baltic ecologists' perspective on the importance of ambitious - here defined as well-funded - marine environmental monitoring as the foundation for successful resource management. We contrast this with the trends in monetary investments in marine monitoring for the Baltic Sea EU member states. We also discuss the relationship between mandate-driven monitoring and question-driven research and the potential for synergies among the two domains, as well as funding opportunities. With tight public budgets in many countries, funding for monitoring programs is increasingly threatened, and policymakers need to be better informed about the critical importance of sustaining and expanding monitoring programs to understand and manage the inevitable ecosystem changes that will develop as human pressures continue to grow.

Sand capping to break feedback mechanisms and promote the return of seagrass

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In NW Sweden, eelgrass recovery and restoration face challenges due to local regime shifts triggered by eelgrass loss, leading to increased sediment resuspension that prevents growth. Here we assessed if sand capping could improve conditions necessary for eelgrass restoration at historic sites.

We used pilot studies to identify a suitable area for sand capping, and high-resolution hydrodynamic models to determine the optimal location within the bay. In 2021, 1800 tons of sand were placed in a 10 cm thick layer over a one-hectare, followed by the planting of 80,000 eelgrass shoots on top of the sand. The sand capping activity showed no long-term negative effects on water quality or infauna.

The restoration resulted in a dramatic improvement of growth conditions in the bay. Light penetration within the sand capped area increased by up to one meter, resulting in a rapid growth of planted eelgrass in the second year. By 2023, over 1.5 million shoots were found in the sand capped area, harboring a diverse community of invertebrates and fish. In 2025, also natural eelgrass had expanded into the bay. The results suggest that sand capping can break feedback mechanism on a local scale and promote the return of a seagrass dominated state with clear water and high biodiversity.

Impact of mussel farming on greenhouse gas emissions in a Swedish fjord and in the Baltic Sea

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Swedish coastal waters are highly affected by eutrophication. Filter-feeding bivalves can remove nutrients and farming mussels has been proposed as eutrophication mitigation measure in the Baltic Sea and on the Swedish West Coast. However, mussel farming enhances organic matter loading and may increase greenhouse gas fluxes from the sediments. The magnitude of the sediment fluxes to reach the atmosphere and how the suspended mussels impact the water column dynamics remains unclear. We investigated the distribution of the three greenhouse gases carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) from the sediment-water fluxes through the water column to the emissions across the sea-air interface at four Swedish mussel farms.

In two farms on the Swedish west coast we compare three seasons, including pre- and post-harvest conditions. By comparing farm sites to nearby control sites, we found that CO_2 emissions were 15 % lower and 11 % greater in farms (small farm and large farm respectively), CH_4 emissions were similar in farms and controls, while N_2O emissions were 46 % lower in the farms. Our seasonal assessment on the west coast showed that summer was a high impact season. Therefore, in the Baltic Sea we studied impacts during summer, examining one farm at the harvest and another farm midway through its two-year growth cycle. Due to the lower salinity in the Baltic Sea compared to the Swedish west coast, we expected a higher impact on CH_4 emissions, but our results indicate that similarly to the west coast, there are small impacts of mussel farming on GHG emissions.

Chemical mapping and hazard assessment of antifouling coating systems on the EU market

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When ships and yachts are immersed in water, the attachment of fouling organisms on vessel hulls will start and consequently increasing the frictional drag of vessels and fuel consumption. The most common way to prevent fouling on vessel hulls is the application of antifouling coatings, in which copper-based biocidal coatings account for the majority of the market share. However, the usage and release of copper to the marine environment have shown to be substantial, particularly in semi-enclosed environments. Several alternative systems to copper coatings are currently available on the market, for example non-copper (or alternative) biocide coatings, foul-release coatings, biocidal foul-releasing coatings. Despite their lack of copper, these alternative coating systems may result in other kinds of emissions into the marine environment, e.g. biocides, persistent/toxic substances and microplastics (MPs). Notably, the current reporting and evaluation processes only focus on the emission of biocides and zinc when considering the introduction of a product to the European market. However, little or no information exists regarding emissions of substances such as MPs or persistent/toxic compounds, which do not fall under the legal classification of biocides. Without this knowledge, it is difficult to decide whether the alternative coating systems have a lower environmental impact. While leachate studies can demonstrate the hazards of coatings, they are product specific and required intensive resources and lab expertise. Both the current authorization process and leachate-based toxicity tests require specialized knowledge, laboratory facilities, and significant time investment, making them impractical for end users such as vessel owners who need quick and clear guidance. This complexity creates a gap between regulatory compliance and practical decision-making for sustainable choices.

To address this challenge, this study proposes a simplified, user-friendly method for estimating the potential hazard of a coating product based on information already provided in the Safety Data Sheet (SDS). By using existing SDS data, a screening tool and calculation method are developed that provides an indicative hazard score. This score would help guide end users in comparing products and making informed, environmentally responsible decisions without requiring advanced technical expertise or costly laboratory tests. Finally, this approach aims to complement existing regulations by broadening the scope of hazard consideration beyond biocides, ensuring that both biocidal and biocide-free coatings are evaluated for their full environmental impact.

When Fronts Leak: Statistical Distributions of Eddy-Driven Coastal-Open Ocean Exchange

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Topographically trapped shelfbreak fronts separate coastal from open ocean waters, shield coastal ecosystems from offshore forcing, and inhibit the advective transport of heat, salt, carbon, and nutrients between the biologically productive coastal and oligotrophic open ocean. These frontal systems occur at shelf edges worldwide, including along the Norwegian shelf, East Greenland, the Arctic Ocean, Patagonia, and Japan. While ocean fronts inhibit transport by mean advection, eddy-driven transport can cause significant cross-frontal exchange with impacts on coastal water mass budgets, nutrient supply, and larvae/plankton dispersal. However, comparing eddy-flux estimates across different frontal sites and experiments has been difficult due to differences in methodology and unconstrained uncertainty arising from the non-linear and intermittent nature of eddy-driven exchange. Here, we present a generalizable methodology showing that simple time series data from moorings, already available at many coastal frontal sites, can capture the statistical distribution of eddy-driven exchange across topographically trapped frontal systems without need for additional instrumentation or resolving spatial gradients. We present full distributions of eddy-covariance fluxes of salt <v'S'> and heat <v'T'> and separate significant exchange events from underlying noise. This approach was validated using comprehensive observations from the US East Coast shelfbreak front and can be applied to other regions. The mooring-assessed eddy-covariance fluxes close coastal water mass budgets and flux distributions are positively skewed with long tails irrespective of location across the frontal zone. Statistically anomalous shelfbreak exchange events contribute about half the total flux despite only being present 10-20% of the time. We discuss how the presented methodology simplifies long-term monitoring of intermittent non-linear exchange across stationary frontal systems.

Role of Baltic Sea sediments in the cycling of carbon and nutrients: what have we learned from 25 years of in-situ measurements

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Biological, chemical and physical processes at the seafloor plays an important role for coastal ecosystem. We plan to present and talk about results from more than 300 in-situ sediment-water incubations using autonomous bottom landers. Fluxes of Nutrients, Carbon and Oxygen were measured during more than 25 years from different Baltic Sea basins. The role of hypoxia and sediment re-suspension will also be discussed.

Remedial measures to aid the recovery of declined fish stocks – a review of spawning closures for pelagic fish in the Baltic Sea fisheries management

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The commercial fish stocks in the Baltic Sea show persistently negative trends, with few exceptions. Over the past decade, both cod stocks and the western spring-spawning herring have collapsed, while herring in the central Baltic and Bothnian Seas remain below levels capable of producing Maximum Sustainable Yield (MSY) — the production target of the EU Common Fisheries Policy.

This study examines the safeguards within Baltic Sea fisheries management intended to restore declining stocks to productive levels. Fishing opportunities are decided annually by the Council of Ministers, which sets Total Allowable Catches and determines remedial measures to support recovery. The aim of this study is to assess the effectiveness of these remedial measures, focusing on forage fish. Specifically, we (i) identify measures implemented to improve forage fish stocks, and (ii) evaluate whether these measures are appropriate for achieving a rapid return to MSY levels.

We conducted a systematic, deductive review of Council decisions on fishing opportunities and related policy documents, focusing on remedial measures. For forage fish, these primarily consist of seasonal spawning closures across different areas and times. To evaluate their effectiveness, we obtained spatial and temporal fishing data from all member states, detailing when and where fishing occurs.

Our results show that the closures do not coincide with actual fishing activity and are therefore poorly designed to promote stock recovery. We conclude that, although remedial measures formally are in place, they are not effectively structured to support recovery.

Mind the gap: identifying weak links in the marine data processing chain and the supporting role of non-academic actors

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Ocean observations are critical for growing scientific knowledge, contributing to policy decisions and understanding out changing ocean. With the introduction of new observing platforms and methods, such as gliders, low-cost sensors and citizen science, data collection has grown substantially over the last decade. Regulatory mandates to increase monitoring around new offshore installations have also increased data collection. However, not all these data are open, accessible or usable by the ocean community. A key step in achieving these goals is processing datasets into a standardised and quality-controlled format. This requires international frameworks and relies upon community involvement and resources. The Global Ocean Observing System (GOOS) and EMODNet have contributed significantly to this work, but many core contributions towards this work voluntary or lacking specific funding streams.

Here, we present efforts to improve ocean data processing tools that the Voice of the Ocean Foundation supports as a core activity. We highlight two external projects that are supported through our Ocean Support process, focusing on developing community toolboxes to process echosounder data and standardisation and quality control of glider data. Additionally, we demonstrate our Glider Dashboard tool, an interactive platform to explore and visualise ocean data, as well as describe our contributions to open source tools and the development of our libraries that are created to support the ocean community. The Glider Dashboard is used to visualize the full time-series of our VOTO Observatory data, capably loading over 200,000 profiles, stitching together individual glider missions. This tool has increased the usability of glider data and allowed events of interest to be identified with ease. We present the role that non-academic parties, such as philanthropic foundations and industry, can play in improving ocean data processing and distribution.

POSTER PRESENTATIONS

Harmonised ocean data sets for blue sustainable eutrophication management of the North-East Atlantic Ocean and Baltic Sea (CodeBlue)

Elin Almroth-Rosell[a], *Itzel Ruvalcaba Baroni, Emilie Brévière et al.*

[a] SMHI

CodeBlue is a European Digital Twin of the Ocean project aiming to fill in knowledge gaps to contribute to an efficient and long-lasting eutrophication policy in a changing climate based on conventions recommended nutrient input levels. The project will work with methods to harmonise model results from 9 ocean models together covering the Baltic Sea, the North Sea and the North-East Atlantic Ocean.

A set of long-term model simulations, including “what if scenarios” of low riverine nutrient load and no climate change scenarios as well as climate projections will be generated. A weighted ensemble model approach will be used to combine the model results and estimate uncertainties at regional scales, and aims to quantify the relative role of enhanced nutrient loads versus climate change in establishing present-day eutrophication as well as evaluate if suggested maximum input levels of nutrients will be effective in a changing climate. The regional scenario results will be used by local models at 5 sites in the Baltic Sea, the North Sea and at the Western Iberia (Galicia and Sado estuary) to establish how the implemented measures will affect blue economy activities (e.g. aquaculture) and local marine management. The work will be performed in close collaboration with a co-design board consisting of active members in working groups of HELCOM, OSPAR. CodeBlue is a three-year project. It consists of 15 European partners, and is funded by national funders (in Sweden: FORMAS) within the Sustainable Blue Economic Partnership.

Blue Carbon Potential of Marine Sediments in the German Baltic Sea

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Marine sediments worldwide are some of the largest sites for carbon burial, and play a pivotal role as natural climate protection. Nonetheless, the storage of organic carbon within these sediments also bears the potential to foster production and release of greenhouse gases, in particular methane. In order to accurately quantify the overall balance between carbon storage and release, a comprehensive approach using standardized methods is needed, as it would facilitate global assessments composed of comparable observations and models across various marine ecosystems. Within the research consortium KomSO (“Study of the carbon storage capacity of marine sediments in the German Baltic Sea”), we address this gap by developing standardized methods, evaluating the carbon storage capacity of marine sediments of the German Baltic, and assessing the extent at which sedimentary methane release might offset carbon storage.

Genetic differentiation of European lobster (Homarus gammarus) in Swedish waters
Shedding light on population structure, genetic monitoring of restocking efforts, and potential hybridisation with alien H. americanus.

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The European lobster, Homarus gammarus, is an iconic crustacean species in coastal European seas, with high cultural and economic importance. While a genetic gradient has been observed on a pan-European scale, genetic differentiation on a smaller geographical scale in the Skagerrak–Kattegatt sea has thus far been unknown. Due to high fishing pressures, populations have dwindled across the distribution area, prompting restocking projects to replenish stocks by releasing hatchery-reared larva or juvenile lobsters. However, the efficacy of restocking projects remains to be resolved. A third unknown has been if the introduction of American lobster (Homarus americanus) in the early 21st resulted in hybrids occurring in the environment. Hybrid eggs have been recorded on American lobsters caught in Skagerrak, but no wild hybrids have previously been identified. Using a 96-SNP panel, three aspects of population genetics are examined in this study: genetic differentiation within the lobster population in Skagerrak–Kattegatt; genetic monitoring of lobster restocking success in the Sotenäs archipelago; and monitoring potential hybridisation between European and American lobsters. Little genetic variation was found, meaning that the current management regime of treating the European lobster along the Swedish coast as one panmictic population cannot be rejected. No hybridisation of alien American lobsters could be detected. No restocked individuals could be discovered from captures in 2024, but monitoring will continue over coming years. Still, SNP:s can be confirmed as suitable for monitoring lobster restocking efforts and to assign kinship in both hatchery and ecosystem settings, as well as to monitor hybridisation with alien species. However, the power to detect small-scale genetic structure using the currently available 96-SNP assay is limited.

Groundwater versus riverine export of methane and nitrous oxide in the Baltic Sea

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Coastal zones are hotspots for aquatic greenhouse gas emissions due to strong terrestrial influences. While riverine greenhouse gas emissions have been widely quantified, the role of submarine groundwater discharge (SGD) remains understudied. This study contrasts methane (CH_4) and nitrous oxide (N_2O) transport via rivers and fresh SGD across 17 coastal transects in six Baltic Sea countries and examines local-scale biogeochemical and catchment-scale hydrological drivers. On average, CH_4 and N_2O concentrations in subterranean estuaries were 72 and 4 times greater than in rivers, respectively. Total riverine fluxes of CH_4 and N_2O were 99.3-102.1 and 6.9-7.0 mol yr^{-1}, respectively. Fresh SGD contributed 1.2-1.9 and 0.04-0.06 mol yr^{-1}, equivalent to only 1.2-1.9 and 0.5-0.9 % of riverine inputs. Microbial processes such as organic matter degradation led to CH_4 production within subterranean estuaries. Effective CH_4 oxidation at the groundwater-surface water interface minimizes SGD fluxes. A strong ^{13}C-CH_4 fractionation indicated 5–82% removal of CH_4 from subterranean estuaries. Surface waters of beach transects showed evidence of water mixing and further CH_4 oxidation. In rivers, N_2O production was dominated by nitrification. Greenhouse gas dynamics were further linked to catchment soil properties, higher silt content favored CH_4 production, while sandy catchments had elevated N_2O concentrations. Despite modest fluxes of fresh SGD, unquantified total SGD (fresh + saline) may exert a disproportionately strong influence on local greenhouse gas dynamics, underscoring its relevance in coastal budgets.

Toxicity profiling of sediments from the Baltic Sea with the *Aliivibrio fischeri* assay

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Sediments are a sink for a myriad of organic chemicals, and they can represent a significant risk for benthic organisms and coastal ecosystems. Therefore, the toxicological characterisation of sediments is a crucial step in assessing and maintaining the health of aquatic environments. This study integrates the *Aliivibrio fischeri* assay to assess the toxicity of different sediments and machine learning(ML)- based toxicity prediction for prioritisation of chemicals' identification.
In total, 62 samples were collected along the Swedish shore, including sites near industrial activities, and open sea. They were freeze-dried, sieved, extracted, cleaned up and fractionated on a florisil® column. The chemical analyses were performed by LC-HRMS/MS, focusing on the most polar fraction. A ML approach was developed to prioritise the chemical identification, as it is impossible to identify all components of a complex mixture. The output of the model yielded inhibition concentration (IC50*) for the Aliivibrio fischeri* with lower values indicating higher toxicity. k-means clustering was applied to group sites according to the presence of chemicals. *Aliivibrio fischeri* was exposed to the sediments resulting in concentrations to inhibit 20% of the light from 2.81 to 144.3 mg of sediment/mL in the assay, with 9 samples considered non-toxic. Some shore and open sea sites showed high contamination despite no industrial activity. Overall, 5 compounds were identified with high confidence (level 1), 15 at level 2b (unconfirmed due to the lack of standards), and another 128 plausible chemicals at level 3. The k-means clustering revealed three clusters: non-industrial, paper/sawmills, and other industries.
This study showed the suitability of *Aliivibrio fischeri* for fast detection of toxicity and that the industrial influence is evident but not exclusive, suggesting diffuse pollution sources. Finally, ML helped prioritise chemical identification, linking specific compounds to biological effects

Chlorinated Fungal Metabolites and Bromoanisoles: Tracers of Land-Sea-Air Exchange in the Baltic Quark

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Many chlorinated fungal metabolites (CFMs) are produced during decomposition of forest litter, e.g. Drosophilin A (DA) and its methyl ether, DAME.[1,2] Related compounds include brominated anisoles (BAs) from marine and anthropogenic sources.[3] We are using CFMs and BAs as model terrestrial- and marine-derived compounds to follow land-sea-air transfer processes in the Quark zone of the northern Baltic Sea.[3,4] Here we report CFMs in forest soil/litter (S/L) and river water, and air-surface exchange of DAME and BAs.

Soil/litter (S/L) was collected in Västerbotten County (VC) forests, water samples from VC rivers and Baltic Quark estuaries, and air samples from southern and northern Sweden and Arctic Finland. Sampling and analytical methods are reported.[2-5] Air-surface exchange potential was assessed from water/air and soil/air fugacity ratios (FR_{WA}, FR_{SA}), derived from compound concentrations and physicochemical properties.[4] Equilibrium is indicated by FR=1, net deposition FR <1, net volatilization FR >1.

DAME concentrations in S/L ranged over three orders of magnitude, with higher concentrations in forests dominated by spruce than pine (p = 0.013). Most spruce S/L samples were populated by *Micromphale perforans*, a fungus with high DAME content.[2] DAME and DA were correlated by log DA = 0.422*log DAME – 1.326, r^2 = 0.54. BAs were highest in estuaries from *in situ* production and DAME was highest in rivers from terrestrial runoff. DA is a phenol and partly dissociated at environmental pH (pKa ~ 6.7). The fraction of DA/(DA+DAME) was higher in VC rivers than in S/L due to greater mobility of ionic DA . Net volatilization of BAs and DAME from water and DAME from S/L was predicted at most sites (FR_{WA} and FR_{SA} >1), concurring with similar findings in Canada.[6]

CFMs contribute to the land-sea transfer of total organically bound chlorine. DAME is predicted to have toxic properties[6]. BAs,[7] DAME[8] and DA[9] bioaccumulate.

Spatial variability and potential drivers of nitrous oxide oversaturation in the Baltic Sea

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Ocean deoxygenation and eutrophication drive high emissions of the potent greenhouse gas nitrous oxide (N_2O) to the atmosphere. However, control mechanisms for N_2O transformations and emission magnitude in eutrophic and hypoxic marginal seas remain largely unknown. Here, we quantified spatial patterns of air-water and sediment-water N_2O fluxes across the whole Baltic Sea. Dissolved N_2O concentrations were determined at 80 stations and sediment N_2O fluxes were quantified at 7 stations along a 5,000 km cruise track covering a full oxygen gradient (0.7–100% sat.). Oversaturation of N_2O (110.0±0.9%) was observed in surface waters from all major sub-basins (e.g., Gulf of Finland, Gulf of Riga). Hypoxic deep waters (<63 μM O_2) were hotspots of N_2O oversaturation, whereas no N_2O was detected in fully anoxic waters. Similarly, sediment N_2O fluxes of 69.0±9.3 μmol m^{-2} d^{-1} peaked at oxygen concentrations ~40 μM, representing a key source of N_2O in the Baltic Sea. In addition, N_2O oversaturation and sediment N_2O effluxes were primarily linked to increasing nitrate concentrations. Overall, we estimated that the Baltic Sea waters emit 0.11 – 0.19 mg N_2O m^{-2} d^{-1} to the atmosphere, which is equivalent to 31 – 52 mg CO_2 m^{-2} day^{-1} and is relatively higher than methane emissions (7.2 mg CO_2- equivalent m^{-2} day^{-1}). Our results indicate that eutrophic and hypoxic marginal seas are strong sources of N_2O to the atmosphere and that N_2O emissions act as the main offset to carbon uptake in the Baltic Sea.

Programmed Unmanned Aerial Vehicles show great potential for monitoring of marine megafauna in specific areas of interest

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Targeted conservation measures are contingent on robust knowledge of spatiotemporal animal distribution in areas of interest. We explore unmanned aerial vehicle (UAV) transect monitoring as a novel method for standardised digital aerial surveys of marine megafauna by investigating the fine-resolution spatiotemporal distribution of harbour porpoises (Phocoena phocoena) in a Swedish nature reserve, along with drivers of this distribution and potential biases. Biweekly UAV video data was collected along pre-programmed strip transects over 17 weeks from June – September 2023, totalling a survey area of 3.37 km2, thereby providing porpoise monitoring data covering 89 % of a special area of conservation for the species. All UAV video data was manually reviewed by a primary observer and 25 % of the UAV footage was also reviewed by a second, unexperienced observer to identify observer bias and learning effects. No significant observer bias or learning effect was found, but increased sea state affected porpoise density negatively. From the monitoring data we were able to calculate relative density estimates, identify small-scale spatiotemporal differences, and detect negative effects of recreational boat activity on porpoise presence. We further demonstrate that within this restricted area porpoises are found in higher relative densities outside a designated conservation area, compared to within the conservation area, providing important knowledge to guide fine-scale local conservation actions. We highlight advantages and areas of improvement of UAV transect monitoring as an accessible, versatile and adaptable method to survey marine megafauna in spatially restricted specific areas of interest. We conclude that this method constitutes a promising and valuable tool for wildlife monitoring of marine megafauna, especially as it can be easily adapted and modified for other contexts and species.

Independence Fjord system (N Greenland): first environmental insights from foraminiferal assemblages

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Northern Greenland, and especially its fjords, are understudied because of remoteness and harsh climate, posing difficulties for sediment sampling. The aim of this study is to describe the modern environment in the Independence Fjord system, based on six surface sediment samples and a sediment core KH24-289-08 collected in September 2024, when less sea ice allowed sampling. To study spatial and temporal environmental changes in the fjord system and to possibly identify effects of sea ice and marine terminating glaciers on the foraminiferal fauna, we analysed the foraminiferal assemblages and bulk sediment geochemistry (TOC, C/N, $\delta^{13}C$ and $\delta^{15}N$).

Dead and living benthic foraminiferal assemblages were identified in the surface sediment samples, along with the dead assemblage of planktonic foraminifera. In the surface samples closest to the glacier, benthic agglutinated species were more abundant than calcareous, indicating a stressful environment and brine rejection. Planktonic foraminifera were found at all stations, suggesting that the currents along the shelf enter the fjord.

The downcore analyses from the KH24-289-08 core show higher foraminiferal diversity at the core top and a lower diversity towards the core base. The benthic foraminifera assemblages in the core are dominated by glaciomarine species *(*e.g. *Stetsonia horvathi* and *Nonionella iridea)*, but also species indicating phytoplankton blooms (e.g. *Epistominella arctica* and *Cassidulina neoteretis*). The C/N ratio in the core is between 20 and 75, which indicates a terrestrial input from the glacier, with the highest values observed within the core interval 15-30 cm. This core interval has also a higher presence of sea ice indicative species (e.g. *Stetsonia horvathi* and *Triloculina trihedra*), whilst the base and top of the core show their lower presence instead. In conclusion, the Independence Fjord system is dominated by glaciomarine species, with a big influence from the glacier at the head of the fjord.

Voice of the Ocean Foundation; providing ocean infrastructure and data processing support to the research community

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Voice of the Ocean Foundation (VOTO) works to make the ocean accessible to all sectors of society, focusing on the thematic areas of research, archiving and ocean literacy. The Ocean Knowledge division of VOTO conducts ocean data collection, processing and distribution, from the sea surface to the seabed, from physical oceanography to marine archaeology and method development for novel ocean instrumentation. We are committed to open science, making our data open access and contributing to community developed tools. Here we present our ongoing Ocean Support function, describing the marine infrastructure provided and showcasing recent projects supported through this process. Through 2024, seven projects were funded for researchers from around the Baltic, ranging from habitat mapping to complex glider deployments and averaging in-kind contributions of €100,000. Featured projects include seabed sediment sampling for methylmercury processes,developing methodology to use phycocyanin sensors on underwater gliders to detect algal blooms, utilizing aerial drones to sample the air-sea interface and deploying the first microstructure glider in the Baltic Sea. We also showcase a recent marine archaeology project using multibeam, side scan sonar and sub-bottom profiling to discover stone age human-built structures in the Bay of Laholm. The Ocean Support programme lowers barriers, enabling access to marine infrastructure and autonomous platforms. In this poster, we introduce the foundation’s work and provide advice for how to apply for Ocean Support.

Sustainability assessment of commercial antifouling coatings: Balancing efficiency and toxicity

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Conventional antifouling paints, primarily based on copper and zinc, remain the dominant strategy to prevent marine fouling but release toxic biocides that accumulate in sediments and affect non-target organisms. Silicone-based fouling-release coatings (FRCs) have emerged as promising non-biocidal alternatives; however, their effectiveness and environmental safety under varying conditions remain poorly characterized. In this study, we evaluated the balance between efficacy and toxicity of five commercial antifouling coatings, including biocidal and silicone-based formulations. Panels were statically deployed at five European sites, that differed in salinity and temperature, and antifouling performance was monitored over time. Ecotoxicological assessments combined several biological models and endpoints: (i) algal growth and viability assays using *Ceramium tenuicorne*, (ii) biosensor biosensors assays targeting stress and metabolic responses, and (iii) analyses of microbial biofilm formation and quorum sensing activity. We demonstrate that FRC coatings are significantly more effective in preventing biofouling, even under static conditions. Although silicone-based coatings are not entirely free of environmental impact, their toxicity is markedly lower than that of biocidal paints. These results indicate that FRCs, while not completely environmentally neutral, represent a much safer and more sustainable alternative to conventional antifouling coatings.

Looking back in time to explore the future potential of genetic observatory network data

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In an age where marine biodiversity is on the decline and efforts to protect marine areas are on the rise, gathering information about the organisms we strive to protect becomes increasingly important. Data on who inhabits our oceans and where they live may be derived from many different sources, one being genetic observatory networks.

Since 2018, genetic data from marine hard-bottom communities have been collected using Autonomous Reef Monitoring Structures (ARMS) through the genetic observatory network ARMS-MBON. Over the years, the data set has provided valuable information on taxonomic and spatial scales and has been used to monitor the spread of invasive species, investigate genetic diversity within cryptic taxa and provide insights into the structure of hard substrate communities. This project aims to use the accumulated data set and examine how biodiversity has changed since the very first sampling campaign within the ARMS-MBON network. The site of interest is located in Kosterhavet National Park, but the implications will apply to the observatory network as a whole.

By introducing a temporal scale to ARMS-MBON data, the data set can be integrated into the concept of Essential Biodiversity Variables (EBVs). The concept of EBVs aims to harmonize biodiversity data through the three dimensions taxonomy, space and time. With the introduction of the third dimension of time, the potential of genetic observatory networks to deliver EBVs will be further expanded. This project will therefore be a stepping stone for ARMS-MBON as a new EBV data product for the assessment of biodiversity status and trends.

Optimizing DIC sample preservation: Effects of filtration and mercury chloride fixation in groundwater, freshwater, and marine waters.

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The aim of this thesis is to provide a guideline of how to store water samples, and test whether mercury chloride (HgCl2) fixation is really necessary or could be avoided. The samples were collected from four different sites: Marstrand, Delsjön, Baltic Sea, and Blå Lagunen. For each site, the samples were divided into two major groups – filtrated and not filtrated – that were subdivided into other two groups – fixated and not Fixated. Measurements were conducted at different time steps, considering the time of collection: day zero (control); day two; day four; day seven; a week; two weeks, a month. The study will continue to evaluate three months, and six months. The evaluated parameters for each investigation were: DIC, salinity, temperature, dissolved oxygen (DO) and pH. For DIC investigation an Apollo SciTech's AS-C5 DIC Analyzer was used, being its precision for seawater better than ± 3 µmol/L and analytical range: 0.2 – 20 mM, calibrated with a certified reference material (CRM). Salinity, pH, temperature and DO readings were conducted with a YSI ProDSS (Digital Sampling System) Multiparameter Handheld Meter, with accuracy of ± 1% for salinity and DO, ±0.2 units for pH, and ±0.2°C for temperature. The preliminary results show higher variation between the treatment groups after one week. Current data might indicate that the use of mercury for fixate samples is not necessary for the ones that will be processed in lower times than a week. However, more accurate data analysis will be conducted once all data is available.

Blue culture landscapes – grazing impacts on coastal near-shore biodiversity

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Grazing cattle are appreciated for their ability to influence grassland habitats and for mediating biological diversity in a multitude of culture landscapes. Most studies on cattle and other large herbivores have focussed on terrestrial plants and vegetation and associated fauna. In contrast, less attention has been given to potential effects of such grazers on aquatic, littoral, environments. We hypothesise that grazing cattle may provide a cost-efficient tool to maintain and restore biodiversity in association to Baltic Sea shallow near-shore habitats. Thus, providing an opportunity to integrate nature conservation, fisheries and landscape management. We present a study that aimed to investigate the impacts of grazing on aquatic near-shore habitats and to develop recommendations on best practice in and adjacent to such areas in the Baltic Sea. Community responses to grazing were studied in the archipelago of Stockholm using vegetation surveys and sampling of young fishes combined with eDNA meta-barcoding to capture community responses of several organism groups. The grazing pressure of cattle and natural herbivores were quantified using time-lapse cameras. Our results have implications for the remediation of aquatic culture landscapes and stresses the importance of taking herbivore management into consideration also when managing aquatic ecosystems.

Depth and size distributions of marine snow and plankton under post-bloom conditions in some Northeast Greenland fjords.

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During the TUNU-VIII expedition to Northeast Greenland in August-September 2022, we investigated plankton and particles using a Video Plankton Recorder in several fjords and coastal locations. This data was used in addition to WP-2 net samples and Niskin samples and provided supplementary information on size and depth distributions as well as hydrological properties associated with sinking particles and non-copepod mesozooplankton and Rhizaria. Here we present data from Besselfjord and Dove Bugt, which are dominated by Polar water masses, as well as locations with a larger influence of Atlantic water (Breddefjord, Ardencaple). Ongoing climate changes affect both the Greenland ice sheet and circulation patterns in the North Atlantic, with a potential to cause major changes in the coastal ecosystems. We expect an Atlantification of the food webs, with a change towards smaller plankton sizes, a stronger microbial loop component and less transfer of energy to higher trophic levels.
Can we see a difference in the plankton and particle composition between locations with different water mass types, indicating future changes in the high-arctic locations in Northeast Greenland?

Cognitive and behavioural effects of enrichment on fish used in experimental studies: A systematic review

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Enrichment alters the way in which fish perceive stimuli, their locomotion, anxiety- and stress levels, aggressiveness, social preference and learning ability. This is particularly relevant to species used for pharmaceutical drug testing or neurological behaviour studies, as captive environment affects behavioural and cognitive responses. This may damage the robustness of data between studies using fish as experimental species, particularly as no standardised conditions exist. This systematic review assesses the extent to which social and environmental enrichment affect behaviour and cognition in fish used in experimental settings. It demonstrates that aggression was affected across studies and species, whereas the data for locomotion, stress, anxiety, social preference and learning ability was highly inconsistent.

Estimation of microbial biodiversity in nordic marine environments

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Understanding microbial diversity across marine environments is essential to assess their importance for ecosystem functioning, particularly within the varied environments found across Nordic regions. This study compares microbial communities in Nordic marine environments using 16S rRNA gene sequencing data from both natural (Norwegian fjords and Tjärnö) and controlled systems (aquarium tanks and mesocosm experiments). Bacterial alpha diversity was investigated using Shannon and Inversed Simpson indices, while bacterial community composition was analysed based on the relative abundance of dominant classes. The relationship between Shannon diversity and temperature were also investigated. The findings indicated moderate to high microbial biodiversity across all environments, with Simpson indices repeatedly showing even community structures. Furthermore, statistically significant differences in microbial diversity were observed among the aquarium tanks. Shannon diversity correlated negatively with temperature for the mesocosms, while there was a weak positive correlation for the Norwegian fjords. This highlights how environmental conditions affect microbial richness, although with varying results. Overall, *Alphaproteobacteria* and *Bacteroidia* were more abundant in the controlled systems, while Gammaproteobacteria were higher in the natural systems (Norwegian fjords). In contrast, *Cyanobacteriia* could only be detected in Tjärnö. This study shows that microbial biodiversity across Nordic marine environments is generally moderate to high, with variation in diversity and community composition, which may be shaped by environmental factors such as temperature. These findings give us a greater understanding of microbial biodiversity in Nordic marine environments and can support future research aimed at complementing biodiversity measures of macroorganisms.

Diversity in coastal areas of the northern Baltic Sea – epiphytic and seawater bacteria

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Coastal macrophytes function as a filter in aquatic ecosystems by removing excess nutrients and degrading organic matter entering the coastal system via land runoff and wastewater emissions. These aquatic plants act as biodiversity hotspots by providing food and shelter for a variety of micro- and macroorganisms. Studying the biodiversity of macrophytes and associated bacteria provides important benefits to understand and preserve the Baltic Sea ecosystem health and resilience. In this study, we collected seawater and macrophyte samples, from *Najas* and *Potamogeton* meadows, from three different bays in the Bothnian Sea: Skeppsviken, Kronoren, and Otronsviken in summer 2023. We measured physicochemical parameters such as temperature, salinity, and dissolved organic carbon concentration in seawater of the three different bays. The DNA from filtered seawater and macrophyte samples was sequenced using 16S rRNA long-read sequencing. The sequencing reads were processed using the NGSpeciesID pipeline (v0.1.2.2) to determine the bacterial community composition. Our study provides valuable insight on how bacterial community composition varies on different macrophytes as well as in seawater. The findings will contribute to a better understanding of macrophyte-bacteria interactions and their role in ecosystem functioning in subarctic coastal areas.

POPs in brown waters – Revealing spatial patterns of PCDD/Fs, PCBs, and PBDEs in fish along gradients in the Northern Baltic Sea

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High concentrations of persistent organic pollutants (POPs) such as polychlorinated biphenyls (PCBs), polychlorinated dibenzodioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and polybrominated diphenyl ethers (PBDEs) have been found in the Baltic Sea for decades.[1] Their lipophilic properties have resulted in elevated concentrations in fatty fish such as herring and salmon. Bioavailability of pollutants are affected by the quality of dissolved organic matter (DOM) and organic carbon is an important parameter in the cycling and accumulation of POPs.[2] The hypothesis is that differences in bioaccumulation patterns in fish can be observed and follow the carbon-quality gradient in the Baltic Sea. The model fish used is the three-spined stickleback (*Gasterosteus aculeatus*) having high fat content as well as a migrations pattern moving from coast to offshore and back during their lifecycle.[3]

Sticklebacks were collected in defined bays along the Swedish and Finnish coasts as well as Offshore in the Bothnian Sea and Bothnian Bay (n=23). The fish samples were extracted, purified and target analytes were determined by HRGC-HRMS. Concentrations and congener composition of PCDDs, PCDFs, non-ortho-PCBs, indicator-PCB (I-PCB), mono-ortho PCB, and PBDE were compared and assessed by principal component analysis (PCA), across three station categories: Sweden, Finland and Offshore, for a spatial overview of concentrations. Concentrations for PCDDs differ significantly between all three station categories ($p \leq 0.01$); PCDF differ significantly between Finland- Offshore stations ($p \leq 0.01$); PBDE differ significantly between Sweden-Finland ($p \leq 0.001$), and Finland- Offshore ($p \leq 0.001$). Though no significant differences could be seen for I-PCBs, mono-ortho PCBs or non-ortho PCBs on a larger scale, there are differences between specific stations which are more impacted by anthropogenic sources. This study suggests that the inflow of DOM from allochthonous sources via river inputs in the different coastal areas is an important regulator of the levels and composition of POPs in northern brown waters.

Marine Research and Innovation in Hanö Bay

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Marint centrum, hosts a research and innovation environment in collaboration with Lund University and Region Skåne, focusing on the marine ecosystem and coastal development of Hanö Bay and southern Baltic Sea. Hanö Bay is a vital habitat in the Baltic Sea, featuring unique geological and marine archaeological sites. Through interdisciplinary collaboration between academia and society, we address pressing environmental challenges to develop practical solutions that promote sustainable development in the region. Current research and innovation projects at Marint centrum include the development of the fishing harbour of the future, the creation of artificial cod reefs in Hanö Bay, and the establishment of a sustainable fishery for the invasive round goby. We also advancing algae farming in the Baltic Sea through research and innovation on cultivation methods, as well as product and market development. Further areas of work include fisheries policy and the study of marine contamination e.g. ghost nets, microplastics, PFAS, and oil spills. Marint centrum provides researchers with office and meeting spaces, as well as access to a well-equipped field laboratory for sampling, initial laboratory- and small-scale experimental studies. We offer exciting thesis projects and internships for students passionate about marine science and sustainability. Through active collaboration with universities, research institutions, and industry partners, we advance research and innovation and welcome new partnerships.

Metabolic disruptions in marine environments: synthetic eternal chemical PFBS impacts widespread microbial eukaryotes

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Pollution caused by per- and polyfluoroalkyl substances (PFAS) is an urgent environmental concern, due to PFAS ubiquity, persistence, and toxicity to many organisms. However, the effects of PFAS on microbial eukaryotes remain poorly understood, leaving substantial knowledge gaps. In this study, we investigated the impact of perfluorobutane sulfonic acid (PFBS), a shorter-chain and supposedly less harmful PFAS compound. We tested how different PFBS concentrations (0, 0.1, 1, 10, and 100 µg/L) impact metabolic activity of five benthic foraminifera taxa: native *Bulimina marginata*, *Cassidulina laevigata*, *Eubuliminella* sp., *Globobulimina turgida,* and the putatively invasive *Nonionella* sp. T1. In laboratory experiments, foraminifera were incubated with PFBS-spiked seawater for three days while maintaining natural salinity and temperature conditions corresponding to the species natural habitat in the Gullmar Fjord, Sweden. Metabolic activity was assessed by uptake of isotopically (^{13}C and ^{15}N) labelled algal food. Our results show that even the lowest concentration of PFBS (0.1 µg/L) significantly impaired the foraminiferal metabolism. Most of the studied species demonstrated marked decreases in algal food uptake in response to PFBS. Only *Cassidulina laevigata* exhibited consistently low metabolic activity across treatments, likely reflecting poor performance even in short-term laboratory experiments. Overall, the decline in metabolic activity in four out of five studied taxa indicates that PFBS is toxic to microbial eukaryotes such as benthic foraminifera.

Mixotrophic Strategies and Habitat Influences on Dinoflagellate Blooms in the Coastal Baltic Sea

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Harmful Algal Blooms (HAB) are a threat to the coastal waters of the Baltic Sea, harming ecosystems and human health. They often occur in late summer in areas overgrown with vegetation, where dissolved inorganic nitrogen (DIN) is low and dissolved organic nitrogen (DON) is high. Mixotrophic phytoplankton play a key role in these blooms, combining autotrophic and heterotrophic metabolism to utilize both inorganic and organic carbon sources. Climate change is expected to prolong the growth season, increase freshwater input and raising dissolved organic matter (DOM) concentrations which could influence bloom dynamics and mixotrophic activity. This study investigates how DOM from freshwater inflow and aquatic vegetation affects the mixotrophic activity in the coastal Baltic Sea. A field campaign was conducted in late summer 2024 (June -September) in the Mönsterås archipelago, a shallow area with high vegetation cover and diversity. Two bays were sampled, one influenced by freshwater input from the Alsterån River. Nitrogen specific uptake and carbon fixation was measured using *in-situ* incubations with ^{15}N and ^{13}C tracers (ammonium, nitrate, urea, amino acids, bicarbonate). Preliminary results show that during a red tide event (chlorophyll *a*: 89.3 µg L^{-1}), dinoflagellate *Prorocentrum micans* dominated in macrophyte-rich zones. Growth conditions in both bays were slightly N limited to balanced, suggesting that phytoplankton can compensate for low DIN. Nitrogen specific uptake rates indicate ammonium as the main N source, with amino acid uptake observed in July, highlighting mixotrophic activity. This study contributes to our understanding of dinoflagellate bloom dynamics in coastal ecosystems with diverse aquatic vegetation by showing habitat characteristics and DOM fluxes shape bloom development.

Tracking spatio-temporal invasion of alien benthic foraminifera (Protista) on the Swedish West Coast

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Non-Indigenous Species (NIS) of benthic foraminifera (unicellular eukaryotes) have been increasingly reported in coastal and transitional waters over recent decades. As benthic foraminifera are key organisms in benthic food webs, oxygen and nutrient cycling, NIS may disrupt ecosystem functioning when outcompeting native species. Benthic foraminifera are also emerging bioindicators in environmental monitoring surveys. However, foraminiferal NIS may introduce bias as they are often excluded due to the lack of knowledge on their ecology. Hence, early detection, distribution monitoring and improved ecological understanding of NIS are crucial. On the Swedish west coast, two foraminiferal invasive NIS, *Ammonia confertitesta* and *Trochammina hadai*, have recently been reported. This study investigates their distribution in harbors, from sediment samples collected during Summer 2024. We aim to (i) investigate the spatial distribution of foraminiferal NIS and define their ecological drivers by analyzing trace elements, organic carbon, total nitrogen and chlorophyll a in sediments, (ii) estimate the date of their introduction through the analysis of palaeoecological records of coastal sediment archives and, (iii) develop specific assays for an emerging quantitative molecular method using eDNA, digital PCR (dPCR), for early detection. Preliminary results show that foraminiferal NIS are widespread along the west coast, comprising up to 75% of harbors communities. Morphological analysis of fossil foraminifera in a sediment core collected in the marina of Fiskebäckskil (Gullmar Fjord) suggests that *T. hadai* was likely introduced there around 2002. However, its consistently low abundance since then suggests that it has not yet become invasive at this site. Finally, this study provides initial insights into the developed dPCR assays by comparing molecular abundances with abundances of *A. confertitesta* and *T. hadai* obtained through traditional morphological taxonomy via microscopy.

Will climate change lead to enhanced MeHg formation in contaminated sediments?

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In northern Sweden, the plentiful river water and rich forest resources provided favorable conditions for the establishment of pulp and paper industries. Before the Swedish environmental protection act was adopted in 1969, waste from production was directly discharged into the coastal marine environment. These discharges accumulated in aquatic environment, forming extensive fiber deposits called fiber banks, which contain various contaminants, including Mercury (Hg). Bacterial degradation of the fibers consumes substantial amounts of oxygen, leading to hypoxic or anoxic conditions that facilitate the formation of methylmercury (MeHg). MeHg is a highly toxic form of Hg, it is neurotoxic and biomagnifies in aquatic food webs. The methylation process occurs under anoxic and hypoxic conditions and is primarily driven by microbes carrying the gene pair *HgcAB*.

Climate change is expected to intensify several environmental drivers affecting MeHg formation, including elevated temperatures, enhanced eutrophication and increased inputs of terrestrial dissolved organic matter. However, limited knowledge exists about how such changes will influence biogeochemical processes and microbial communities in contaminated fiber banks. The aim of this study is to assess how the formation of MeHg and the composition of bacterial communities in contaminated fiber banks are influenced by projected climate change scenarios. To address this, a three month laboratory experiment will simulate climate change conditions exposing sediment samples to elevated temperature, increased terrestrial dissolved organic matter, and enhanced eutrophication.

The findings will contribute to an improved understanding of how future climate conditions will affect the formation of the neurotoxic MeHg and provide valuable insights for environmental management in the Baltic Sea region.

Regulation of Marine Plankton Respiration: A test of models

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Plankton respiration is a major process removing oxygen from pelagic environments and constitutes one of the largest oxygen transformations in the sea. Where the O_2 supplies due to dissolution, advection and oxygenic photosynthesis are not sufficient, hypoxic, or anoxic waters may result. Coastal waters with limited water exchange are especially prone to have low oxygen levels due to eutrophication and climate change. To support marine environmental management in a period of rapid climate change, we investigated the current knowledge of regulating plankton respiration based on field and experimental studies. Temperature is the most reported predictor positively influencing oxygen consumption (mean r^2=0.50, n=15). The organic carbon supply driven by primary production has a similar coefficient of determination but fewer reported relationships (mean r^2=0.52, n=6). The median predictions of respiration regulation produced by current models vary by a factor of 2 from the median of observed values and extreme values varied even more. Predictions by models are therefore still too uncertain for application at regional and local scales. Models with temperature as predictor showed best performance but deviated from measured values in some seasons. The combined dependence of plankton respiration on temperature, phytoplankton production and discharge of riverine organic carbon will probably lead to increased oxygen consumption and reduced oxygen levels with projected climate change. This will be especially pronounced where increased precipitation is expected to enhance riverine discharges of carbon compounds. The biologically mediated transfer of carbon for long-term storage in deeper layers will slow down. Implementation of oxygen consumption measurements in long-term ecological monitoring programs at water body and basin scales is advocated, which would enable future multivariate analyses and improvements in model precision across aquatic environments.

Phytoplankton biodiversity in the Skagerrak: patterns, trends and connectivity between fjords

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Understanding the diversity and community structure of phytoplankton is crucial for elucidating their ecological role in marine ecosystems and biogeochemical cycles. As part of a comprehensive investigation into pelagic microbial communities, we have conducted an extensive field sampling campaign along the Swedish West coast (Skagerrak) aboard R/V Svea in July 2025. A total of 20 stations, encompassing both fjord and offshore basins, have been sampled for a battery of biotic and abiotic parameters, including phytoplankton with the help of plankton nets and CTD rosette casts. Phytoplankton communities have subsequently been characterized using a combination of advanced imaging (PlanktoScope), traditional microscopy counts, pigments, and 18S rRNA gene amplicons and metagenomics. With our multi-method approach we aim at detailed assessments of spatial diversity patterns and variability across environmental gradients. Here, we present the preliminary results on phytoplankton assemblages and connectivity features between fjords and offshore sites in the context of local environmental gradients and hydrography patterns. This study, thus, aims to contribute to a broader understanding of phytoplankton dynamics and ecological patterns in temperate coastal and open marine systems.

Persistence of extreme low pH conditions in coralline algae habitats

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The severity of ocean acidification in 2100 is partly dependent on local natural variability. Coastal systems are known for high environmental variability, but the rate, magnitude and drivers of coastal environmental variability remains poorly quantified. This prevents accurate assessments for how species and their associated communities may respond to projected climate change. Here, we quantified the annual variability of pH, temperature and dissolved oxygen in a coralline algae reef – globally distributed, biodiverse habitats that may be one of the most sensitive to projected climate change. We found that coralline algae (and their associated communities) already spend 63% of the year, including most of autumn and all of winter, at pH conditions at or below 2100 projections. Annual fluctuations in pH ranged by 0.46 units, with identifiable patterns at diel to seasonal timescales, with varied biogeochemical drivers. Biologically-driven patterns in dissolved oxygen and pH change were coupled at multiple periodicities, and temperature was coupled to pH during the winter. Monthly tidal cycling also modulated the biological forcing of pH, increasing the complexity of intra-seasonal pH variability. Projecting this environmental variability to the future leads to the prediction of new extremes in low pH exposure, well beyond all current IPCC emission scenarios. However, the persistent long-term low pH exposure already experienced by organisms living in this habitat supports a level of optimism for their capacity to acclimate and / or adapt to projected climate change, for continued survival over the coming century.

Seasonality of cyanobacterial toxins in and associated with farmed mussels from the Baltic Sea

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Cyanobacterial blooms occur recurrently in the Baltic Sea, particularly during summer, often resulting in the production of cyanotoxins—bioactive metabolites with negative ecological and health impacts. While the toxicological effects of compounds such as nodularin, microcystin, and cylindrospermopsin are well studied, their bioaccumulation in farmed marine organisms remains poorly understood. This study investigated the seasonal presence and accumulation of cyanotoxins in the blue mussel Mytilus edulis at mussel farms in the Baltic Sea. Samples were collected over an entire year to encompass both peak bloom periods and off-season conditions. By combining liquid chromatography–mass spectrometry (LC-MS) and immunoassays (ELISA), we quantified cyanotoxins in water, phytoplankton biomass, and mussels. Cyanobacterial community composition and abundance were analyzed through microscopy and metagenomic sequencing, while genomic and transcriptomic tools were used to identify toxin-related genes and their expression patterns. Environmental parameters, including temperature, salinity, and nutrient levels, were concurrently monitored and correlated with toxin concentrations and cyanobacterial community data. Initial results showed that toxin types and concentrations varied throughout the year in water, phytoplankton, and mussels, with peaks of microcystin and nodularin during the warmer months. These patterns largely coincided with increased cyanobacterial abundance and environmental conditions conducive to bloom formation. In contrast, cylindrospermopsin appeared more frequently in the cooler early spring, although its producer in the Baltic Sea remains unidentified. Overall, this research provides new insights into cyanotoxin dynamics and bioaccumulation in aquaculture environments, contributing to the development of effective monitoring strategies to ensure safe and sustainable mussel farming in the Baltic Sea.

Biodiversity on the unknown planet

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Less than one in ten of the species are known. Only zero point zero zero one percent has been visualy mapped. The number of expeditions are less than to any other area. Sediment covered abyssal plains of the deep sea are dominating part of the planet and after years of total negligance only now starting to gain some interest. I will talk about why this is happening, why Swedish scientists are involved and show some examples of the discoveries we have made during the last 30 years. This include the amazing symbiontic life forms at bones of dead whales only discovered recently but also the work to map the less charismatic fauna lurking in the mud.

Marine microbial interactions are reflected in molecular composition of dissolved organic matter

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Heterotrophic bacteria contribute greatly to the turnover of marine organic matter via the microbial loop. Specifically in surface waters, a large quantity of labile dissolved organic matter is rapidly consumed by bacteria. Yet, it is still largely unknown how microbial interactions between heterotrophic bacteria impact the dissolved organic matter pool. To investigate this, we used a reductionist, full-factory co-culture experiment with four marine Roseobacter isolates. Genomic markup of the bacteria affected substrate diversification and growth in monocultures. Dissolved organic matter in co-cultures was specific to the respective consortium and produced many novel molecular formulas. In contrast, consumed molecules were utilized by a majority of consortia and low abundant bacteria contributed disproportionally to dissolved organic matter processing. Hence, in our setup, organic matter recalcitrance emerged as a property of community metabolism. Our findings highlight the importance of microbial interactions for the molecular diversity, composition and persistence of dissolved organic matter in the ocean.

The European Marine Biological Resource Centres - EMBRC

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Research infrastructure is critical to knowledge creation. Through a network of research organisations and marine stations across Europe, EMBRC provide access to ecosystems, organisms, resources, services, and facilities to help researchers from academia and industry study the ocean and develop innovative solutions to local and global issues. Importantly, EMBRC is also an infrastructure of interest to the EU, and features heavily in 24 EU-funded projects within Horizon and Interreg to bring marine services and knowledge, which address challenges in fields from health, climate, food, bioeconomy, natural resources, to aquaculture and environment. Sweden joined EMBRC in 2022 but, prior to officially joining the network, many of its institutions had been actively working with EMBRC partners for more than 20 years. Today, EMBRC Sweden is comprised of University of Gothenburg (GU), Linnaeus University (LnU), Swedish University of Agricultural Sciences (SLU), Swedish Meteorological and Hydrological Institute (SMHI), Stockholm University, Umeå University (UmU) and Uppsala University (UU). Through these partners, EMBRC Sweden can offer researchers access to 7 marine research sites along the Swedish coastline.

Here, we present these EMBRC resources available in Sweden (and the rest of Europe), how you can access them and how they can be utilized in your grant applications. We will highlight ways that successful EU-applications have benefitted from including EMBRC in their projects to tackle challenges important across our seas.

SWERVE – moving forward

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The Swedish Research Vessel Infrastructure for Marine Research (SWERVE) was initiated in 2024 to align the national research vessel infrastructures managed by different organizations to a) provide access to Swedish RVs and platforms based on scientific excellence rather than institutional alignment, b) promote coordinated quality development among vessels, staff and organisations, and c) ensure that data collected by Swedish RVs adhere to international standards following FAIR principles. Since its start, SWERVE has funded 6 research projects, resulting in 5 research voyages, held 3 workshops to further the technical expertise amongst Swedish Marine Technicians, carried out cross calibration exercises for onboard sensors, started implementation of data delivery to Zenodo and more. It has recently been announced that VR will continue to support the efforts of SWERVE, with the start of SWERVE2.0 in 2027. This presentation will provide an update on achievements of SWERVE so far, including information on where you can access vessel data, and highlights from the recent voyages. It will also outline the timing and funding of ship time in the coming years, as well as other opportunities that SWERVE will be enabling.

Forecasting coastal hazards to drinking water production on Gotland

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The island of Gotland is a very popular tourist destination in Sweden, reaching nearly 2 million ferry and plane passengers per year. Gotland has a limited capacity in groundwater reservoirs that superimposes on increased demand during summer when tourists visits peak leading to recurring water stress. Desalination of sea water to drinking water complements the municipal water supply with a maximum drinking water producing capacity reaching 70% of the total island's demand. The operation of the two major desalination treatment plants (located at Kvarnåkershamn and Herrvik) becomes disturbed during summer by extreme sea weather events (high ocean velocities and cold water spells due to strong upwelling events) and related hydro-sedimentary and biological processes related to algae growth that are predicted to intensify under the climate change. Developing an apt forecasting system for these coastal hazards to inform sustainable management of Gotland's water resources is a priority. The ALGOTL project funded by the Swedish research council for sustainable development (FORMAS) is a collaboration between Stockholm University, the Swedish Meteorological and Hydrological Institute (SMHI) and Region Gotland that aims to develop a forecast framework for algae blooms and related hazards to support the management of water resources on Gotland, with focus on the desalination plants. In this presentation, I am going to present the multi-faceted approach of the ALGOTL project and show the results from a beta-version of stakeholder-tailored early warning system (EWS) for strong current transport- and cold spells of bottom temperature at Kvarnåkershamn and Herrvik. The EWS is based on the sea state forecast ocean model produced by SMHI and disseminated via Copernicus Marine Services (CMEMS) and was run and tested during summer 2025 with (somewhat limited but still appreciated) feedback from the technical personal of the desalination plants. In the writing moment of the abstract, we are discussing with the Region Gotland the results from the beta version and next steps to proceed regarding the future implementation of the EWS. The companion talk of the PhD student Matteo Masini (submitted as separate abstract) will show results from analysis of the study case of the disturbance to the operation of the desalination plants due to coastal expression of the passage of the Hans Storm development of alternative forecast system to the desalination plants based on regression models with wind as predictor.