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In recent years, the impact of microplastics (MPs) on marine ecosystems has become a growing concern, attracting attention from governments, society, and researchers around the world. This increased awareness has led to a rise in studies on MPs in the marine environment, including monitoring their occurrence, understanding their behavior and fate, developing analytical methods, and examining their effects on ecosystems and organisms. Despite these advancements, there remains a critical gap in quantitative assessments that are essential for formulating effective, risk-based management strategies tailored to real-world scenarios. One promising approach to address this gap involves the assessment of ecological risks posed by MPs using species sensitivity distributions (SSDs). While significant progress has been made in generating toxicity data and monitoring smaller-sized MPs, the lack of standardized methodologies continues to hinder efforts, introducing substantial uncertainties in risk assessments. To address this, the present study utilizes comprehensive microplastic monitoring data from Tokyo Bay, combined with SSDs derived through multiple approaches such as a Bayesian modeling, to quantify ecological risks. Additionally, this study explores how variations in MP size classifications and differences in key assumptions influence the outcomes of these risk assessments, providing valuable insights into improving the robustness and reliability of future risk assessment frameworks with SSDs.

4.11.P-We354 'NurdleTrack' – Source Identification and Hazard Assessment of Marine Plastic Nurdle Spills

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Unintentional spills of plastic nurdles from shipping containers represent the second largest source of primary microplastic to the marine environment, with an estimated annual release of >200 kTons. Given their high production volumes and natural buoyancy, polyolefins (PE and PP) are unsurprisingly the most commonly found nurdle types on beaches. With the increasing focus on nurdles as a potential environmental hazard, source identification, chemical hazard assessment, and the development of effective spill response are crucial processes.
With NurdleTrack, we offer analytical chemical tools that can simultaneously address both source identification and hazard assessment within a short response time. A multi-tiered fingerprinting approach is presented, utilizing physical characteristics followed by thermal desorption and pyrolysis GC-MS in combination with multivariate statistics to robustly assess the source of field-collected nurdles derive from any suspect source of pollution or spill event. Chemical composition determined from the same screening is further subject to in silico hazard assessment based on a combination of experimental and modelled physico-chemical and toxicological properties obtained from open-source databases.
Verification of the proposed pipeline through field and laboratory assessments will be presented. We have successfully applied the chemical fingerprinting protocol to four previous nurdle spill events (South Africa 2017 and 2020, Trans Carrier Norway 2020, Xpress Pearl Sri Lanka 2021). Validation of the hazard assessment protocol using a combination of predicted and observed toxicity of commercial and field-collected nurdles (from the Galicia spill in 2023) towards a model test species (marine microalgae Skeletonema costatum) and an inter-tidal test species (Common periwinkle, Littorina littorea) is further presented. The impact of UV-degradation on the fate and toxicity of polyolefin nurdles is assessed through accelerated degradation in the laboratorty and compared to field-collected samples that have been in the environment for an extended period of time. This is critical for understanding how material changes can be integrated into source identification and to understand how response approaches can mitigate environmental impacts.

4.11.P-We355 Application of a Matrix Scoring Technique: A Reliable Methodology for the Sourcing of Macrolitter from River-Sea Interfaces?

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Marine litter and plastic pollution are a major concern and prominent topic in public discourse, science and governance. Global efforts to reduce anthropogenic litter require information about the emission sources to effectively mitigate the problem. While the scientific community seems to agree most sources are land-based and enter the ocean via sewers, stormwater overflows and rivers, there are significant

uncertainties in the quantification and identification of the sources due to the lack of established and standardised methodologies. In this work, we present how a Matrix Scoring Technique, first introduced by Tudor & Williams (2004) and adjusted by CEDRE (France), is applied as harmonised method in the TREASURE (Targeting the REduction of plAStic oUtflow into the noRth sEa) project to assess macrolitter pollution in river-sea interfaces. Our goal was to compare the sources of riverine and marine litter from the riverbanks and beaches in the area of the Yser estuary in Belgium. A source is defined here as the activity or sector that released the litter in the environment, e.g. fishing, tourism, buildings and constructions. Both the riverine and marine macrolitter batch were sorted and classified according to the Joint List of Litter Categories for Marine Macrolitter Monitoring (J-List). Each litter category was allocated to its potential source by assigning probability ratios to the entirety of all predefined source options. The developed likelihood matrix delivers an estimate of the contribution of each source activity. Each contribution was proportionally assessed, giving insights into the main sources and how they change from inland to the North Sea. A preliminary assessment indicated that the major contributions to riverine litter were from coastal tourism and recreation, hunting, and buildings and constructions whereas the beach litter was associated with coastal tourism and recreation, fish and shellfish fishing, and hunting. With the application of the Matrix Scoring Technique, we are not only applying an innovative methodology to the complex problem of litter pollution but also creating a knowledge basis for further support towards targeted governance and legislation, including the evaluation of the effectiveness of policy measures. The identification of sources is determining for the design of policies that help create safe, sustainable, and litter-free environments for current and future generations.

4.11.P-We357 Assessment of Sediment Neurotoxicity Through Effect-Based Methods: A Case Study in a Lagoon in Central Italy

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The quality of sediments in coastal lagoons is a critical environmental concern, as they can act as reservoirs for several persistent contaminants that threaten aquatic ecosystems and human health. These pollutants may originate from anthropogenic activities and natural processes and can be transferred in the foodchain. For several substances (e.g. mercury) neurotoxicity represents an important mode of action. This study investigates the neurotoxic potential of sediments from a Lagoon in Central Italy, integrating in vivo assays and biomarkers to assess the potential impact on aquatic organisms. Sediment sampling was carried out in areas of the lagoon where methylmercury was already known to be present at different concentrations in the biota. Sediment elutriates were analyzed using a behavioral assay on Artemia salina larvae, employing an internal laboratory method to evaluate locomotor responses, including swimming speed, distance covered, and phototactic preferences when exposed to sediment samples. Additionally, acetylcholinesterase (AChE) activity was measured in Anguilla anguilla specimens captured from the lagoon to assess potential neurotoxicity at the enzymatic level. Preliminary results indicate alterations in behavioural parameters of Artemia; these findings seem to show the presence of neurotoxic contaminants in lagoon sediments. This study highlights the importance of integrating behavioral and biochemical endpoints to evaluate the ecological risk of sediment-associated pollutants in lagoon environments emphasizing the need for continued monitoring and targeted efforts to protect these vulnerable habitats.

4.11.P-We358 Spatial Distribution of PAHs, Ni, and V, and Ecotoxicological Risk Estimation in Sediments from Terminos Lagoon Located Near a Petroleum Extraction Area in the Southern Gulf of Mexico

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The Terminos Lagoon, a Ramsar site, covers approximately 7060 km2, is located adjacent to the Cantarell oil field in Campeche Sound, and is connected to the Southern Gulf of Mexico Marine Ecoregion. The objectives of this study were to determine the concentration of 16 priority polycyclic aromatic hydrocarbons (PAHs), Ni, and V in surface sediments, infer their emission sources using diagnostic ratios of PAH isomers and Ni-V, and estimate the ecotoxicological risk using the Mean Effect Range Medium Quotient (M-ERM-Q) of the three most frequent PAHs (naphthalene, phenanthrene, and benzo[a]pyreno) and Ni in sediments. PAHs ranging from 3.1 to 248.9 ng g^{-1}, Ni = 11.0-104.0 mg kg^{-1}, and V = 2.0-35.0