

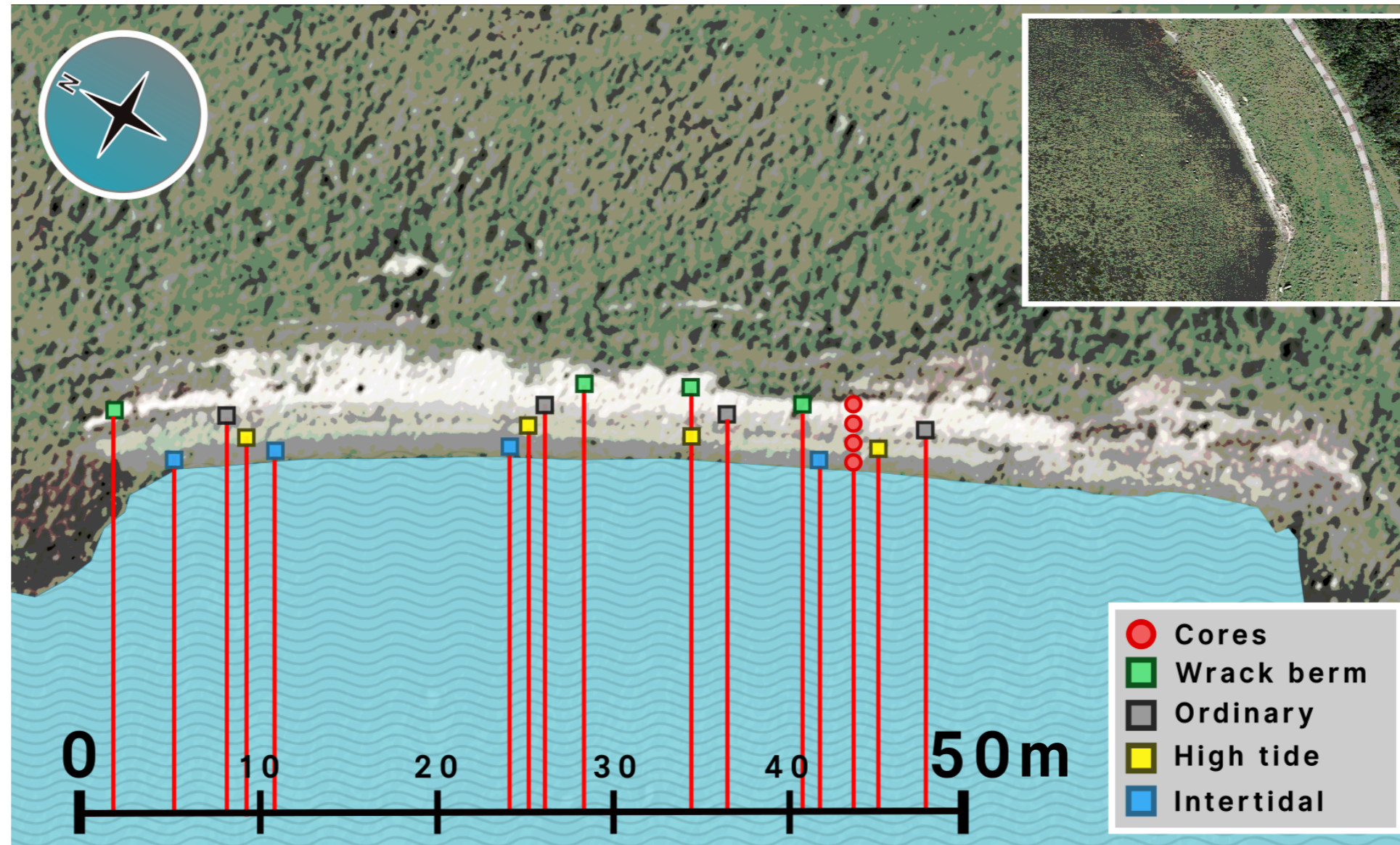
PLASTIC BEACHES

HOW PREVALENT AND ABUNDANT ARE MICROPLASTICS IN ROSKILDE FJORD BEACHES?

Introduction



Plastics in marine environments are degrading into smaller and smaller pieces, and the fates and impacts of microplastics are not well understood due to a lack of data. One possible fate of microplastics is deposition onto and integration into beaches. Beaches have long been used to monitor trends and composition of macroplastic marine debris, and in this report, the prospect of conducting similar studies for beach microplastics is explored through a case study at two beaches in Roskilde fjord.



Facts



Microplastics
plastics smaller than 5 mm

Size range used here
>0.5mm to <5mm

Annual plastic production¹
380 million metric tons (2015)

Annual plastic input² from land into the sea
9 million metric tons (2015)

Total plastics produced¹
8300 million metric tons (2017)

Floating plastics³
5.25 trillion particles weighing 269,000 metric tons (2014)

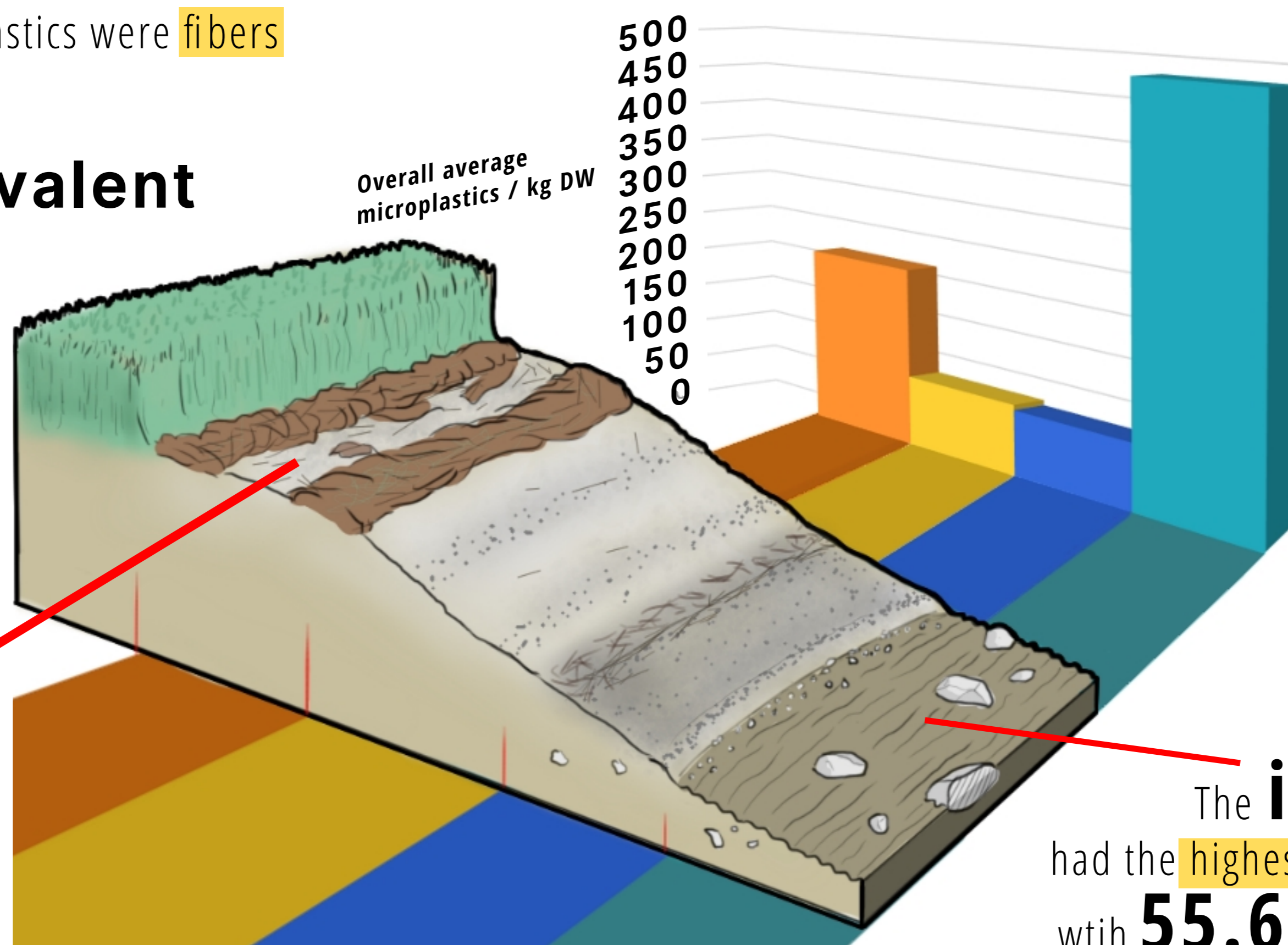
Plastic stocks in beaches⁴
2000 kg / km²
(5% of ocean total)

77.7% of the microplastics were **fibers**

Microplastics were **prevalent** in all beach zones,

but the **distribution** across beach zones was **heterogeneous**

The **wrack zone** had **73.6%** of microplastics below 5 cm



Micropastic abundance was **moderately associated** with **organic matter**

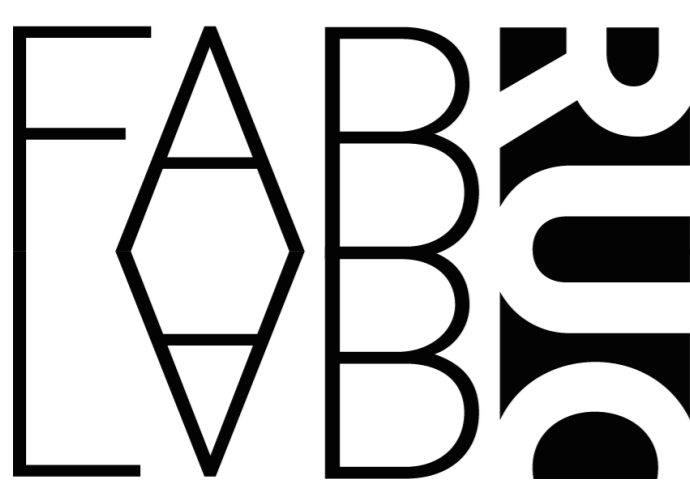
deposited either **loosely together** or **entangled**

The **intertidal zone** had the **highest abundance** of microplastics with **55.6%** of the overall abundance

RUC

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Sources

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Methodological challenges

The scale of the microplastic issue, as an environmental issue and per definition, makes it both an urgent and difficult research area. Working with practically invisible particles requires delicate care and consideration, if reliable results are to be produced. Contamination can occur from airborne microfibrils and from equipment, whilst losses are also inevitable, especially when procedures involve many sample treatments and transfers.

Microplastic quantification through visual inspection is a meticulous procedure that requires patience, diligence and experience to perform accurately. Recounts performed to test counting consistency yielded higher counts in almost all samples, indicating that time spent on quantification is an important variable in outcomes of microplastic studies. Furthermore, confident microplastic identification through visual inspection assisted by low-tech test like the flame test is increasingly difficult at the lower end of the microplastic spectrum, especially given the presence of organic matter.

Validity of the results

The results reported here must be seen in light of the methodological challenges described above, within the local context of Roskilde fjord and with an appreciation of the fact that this is a pilot study that lays the groundwork for further studies with more samples at every depth. Given that we only sampled one transect of cores, with one core per zone, coupled with the fact that our results generally had high standard deviations, our depth findings are especially uncertain. Until more studies of this kind have been conducted, we are unable to say if our findings are unique, or part of a general pattern across danish beaches.

Lastly, the reported results pertain only to microplastics within the reported size range, thus excluding the smallest microplastics from our results. Likewise, our examination of the relationship between microplastics and organic matter was conducted in relation to organic matter within the fine earth fraction, excluding macrodetritus.

Recommendations

Microplastics studies can partially be brought to a citizen science level comparable to beach macroplastic monitoring programs, through guided sampling programs, but extraction, processing, quantification and analysis requires proper facilities and experienced researchers. Careful planning should be conducted before commencing, aiming in particular to reduce procedural steps to a minimum, whilst seeking alignment with standardized procedures. Special attention should be given to the quantification step, both in terms of contamination control, and the visual inspection itself, which should be allocated a large portion of time.

