How a WW2 shipwreck still influences the surrounding sediment 70 years later

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Almost 300 shipwreck sites found in the Belgian part of the North Sea are registered in the database (www.maritieme-archeologie.be). These are mainly ships that were sunk during the First and Second World War. Shipwrecks often act as artificial reefs and are sometimes considered historical heritage. As solid heterogeneous substrates, shipwrecks are rapidly colonized by microorganisms, which allows other organisms to attach and form an assemblage with dynamic community interactions. These assemblages influence the shipwrecks' structural integrity and subject it to years-long (bio-)corrosion, which can ultimately cause leakage of fuels and heavy metals.

Sediment samples were taken around a Second World War shipwreck at increasing increments further away from the wreck in different directions. Ideally, this corresponds to a decrease in concentration of fuels and heavy metals, and a differential microbial response in the affected sediment. Subsamples were taken for both chemical and microbial analysis. Polycyclic aromatic hydrocarbon levels, as well as heavy metal levels, were determined for all sediment samples to investigate if there was any leakage visible in the sediments.

In addition, we performed DNA extractions on all sediment samples and on swaps taken from steel shipwreck fragments, after which we did 16S rRNA gene sequencing to map the microbial composition. The chemical and microbial fingerprint of the samples demonstrated that low-level leaking of the coal bunker still influences the surrounding sediments. Correlations between the pollutant concentrations and the differential relative abundance of specific OTU's indicated the microbial genera and families that might play a role in the biodegradation of the leaking pollutants. By understanding better how, even after 70 years, World War shipwrecks can still significantly influence the surrounding sediment, better management strategies could be developed to preserve these artificial reefs and remediate the areas surrounding them.

Keywords: Shipwreck microbiology; Polycyclic aromatic hydrocarbons; Heavy metal leaching