# The Potential of German Coastal Ecosystems: Conservation and Study of Fungal Diversity across the East Frisian Islands

**N. Sandmann** [a], J. Albers [b], B. Grauwinkel [b], C. Beemelmanns [c], H. Schrey [a]

[a] Department Microbial Drugs, Helmholtz Centre for Infection Research, Germany
[b] Arbeitskreis Pilzkunde, Naturwissenschaftlicher Verein zu Bremen, Germany
[c] Department Anti-Infectives from Microbiota, Helmholtz-Institute for Pharmaceutical Research Saarland, Germany


*Hygrocybe reidii*
(Baltrum, 2014)

*Phallus hadriani*
(Baltrum, 2014)

*Melanoleuca cinereifolia*
(Wangerooge, 2019)

*Tulostoma fimbriatum*
(Borkum, 2022)

*Leucoagaricus cinerascens* s.l
(Norderney, 2017)

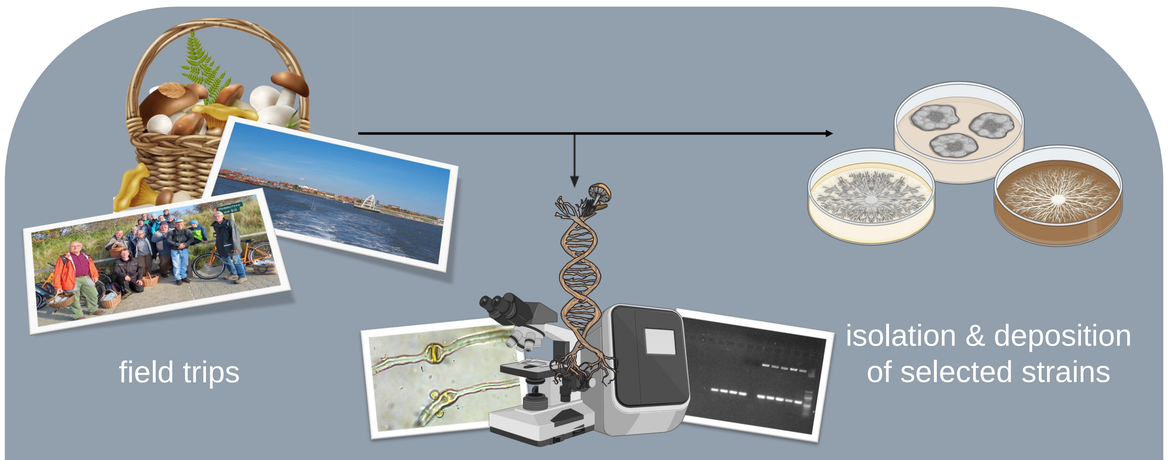
*Mycena brunnea*
(Juist, 2021)

*Trichoglossum hirsutum*
(Memmert, 2013)

*Russula clariana*
(Borkum, 2022)

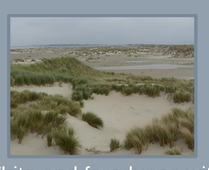
## East Frisian Islands

The East Frisian Islands (EFI), part of the UNESCO World Heritage Wadden Sea, form a unique and dynamic coastal ecosystem. Characterised by extensive beaches, a suboceanic climate, and coastal sand dunes with specialised vegetation, they provide diverse microhabitats. These range from dry and moist habitats, calcareous and largely decalcified dune types, as well as locations with high nutrient and nitrogen supplies in this dynamic area, influenced particularly by the sea (storm surges, wind, drift) or dung of birds and herbivorous mammals. This environmental diversity fosters a complex yet fragile ecosystem, supporting rare fungal species. Due to the delicate balance of these habitats, continued conservation efforts are essential to protect their biodiversity. Over the past 40 years, the NWV Bremen (AK Pilzkunde) has been dedicated to investigating and mapping the EFI mycosphere, contributing valuable insights into the fungal communities of this region. Interesting results are published [1].




Grey dune
(Spiekeroog, 2018)

Moist shrubland dominated by *Betula, Salix* and *Alnus* spp.
(Juist, 2024)



White and foredunes with characteristic vegetation
(Norderney, 2017)

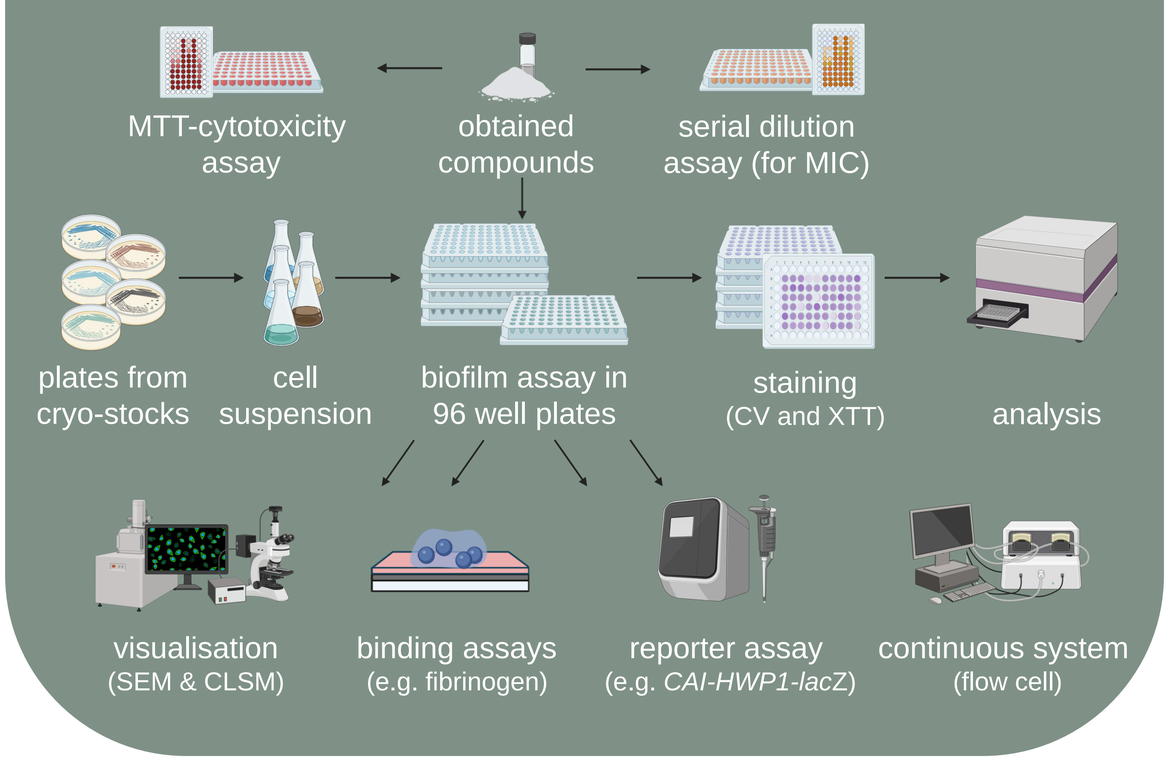
Coastal salt marsh with tidal creek
(Juist, 2024)

## Isolation and characterisation

The EFI constitute a highly endangered habitat that demands further research and conservation efforts. To support these objectives, annual field expeditions are conducted in collaboration with NWV Bremen (AK Pilzkunde). Over several years, the mycologists have systematically documented fungal diversity, concentrating on one island each year. During these surveys, the mycosphere is carefully monitored to identify ecological relationships and possibly changes. Fungal strains are isolated and morphologically characterised in the field. Subsequently, selected strains undergo molecular characterisation in the laboratory to provide greater taxonomic resolution. These strains are then deposited in official culture collections, such as the DSMZ, to ensure their long-term preservation.

## Antibiofilm activities

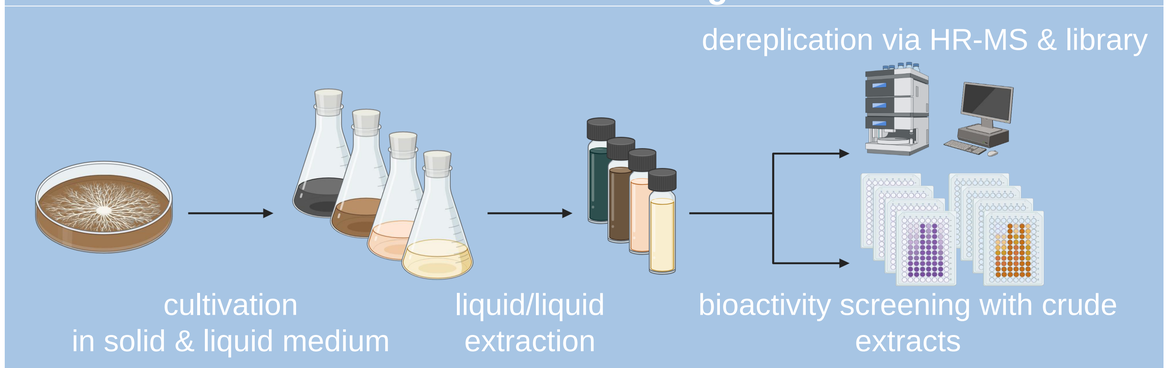
The obtained compounds will be assessed for their ability to disrupt preformed biofilms and inhibit biofilm formation of key pathogenic microorganisms, including *Aspergillus fumigatus*, *Candida albicans, C. auris, Cryptococcus neoformans, Pseudomonas aeruginosa* and *Staphylococcus aureus*. In parallel, MTT cytotoxicity assays and serial dilution tests to determine the minimal inhibitory concentrations (MICs) will be conducted. If antibiofilm activity is detected, additional techniques will be used to elucidate and visualize the underlying mechanisms.



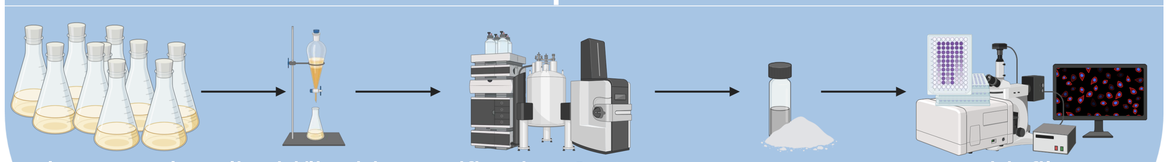

## Media screening and isolation of target compounds

Selected fungal strains are screened in various culture media (OSMAC approach). Crude extracts from these cultures are tested for their ability to dissolve biofilms and additional bioactivities in serial dilution assays. This investigation of the secondary metabolism aims to reveal novel antibiofilm compounds, focusing on their activity against fungal biofilms. Scaled-up bioprocess production will enable isolation and structural elucidation of active principles using high-resolution electrospray ionisation mass spectrometry (HRESI-MS), nuclear magnetic resonance spectroscopy (NMR), and additional spectral analyses.

### Media screening




### Upscale




NATURWISSENSCHAFTLICHER VEREIN ZU BREMEN von 1864
DFG Deutsche Forschungsgemeinschaft



**Photos:** J. Albers, B. Grauwinkel, H. Schrey; **Images:** created with biorender.com by N. Sandmann **References**: [1] Albers J, Grauwinkel B (2020) in Boletus 41(2)

IMPRESSUM

Dieses Projekt ist gefördert von der Deutschen Forschungsgemeinschaft (DFG):
The potential of German wetland ecosystems – an investigation of the biodiversity and secondary metabolite production of Basidiomycota with focus on their antibiofilm properties (No. 534769897)

Dr. Hedda Schrey & Nina Sandmann
Abteilung Mikrobielle Wirkstoffe
HZI Braunschweig