HZI HELMHOLTZ Centre for Infection Research

The potential of an outstanding ecosystem – inventory, conservation and investigation of fungal species from the National Park “Niedersächsisches Wattenmeer”

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East Frisian Islands (EFI)

Suboceanic climate with unique conditions:

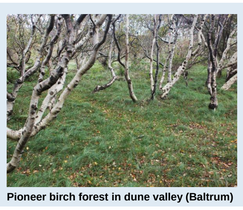
- Coastal sand dunes with specialized vegetation
- Nutrient/calcareous rich to poor soil with dry to wet conditions
- NWV Bremen (AK Pilzkunde): mapping/investigation of EFI mycosphere for more than 35 years

→ **Highly endangered habitat needs to be further investigated and preserved**


Secondary dune (Baltrum)


Tertiary dune (Wangerooge)


Salix repens shrubs (Wangerooge)


Pioneer birch forest in dune valley (Baltrum)

Project description

Unique setting prompted us to include EFI in our ongoing research:

- One of the seven inhabited islands is investigated each year
- Mapping, morphological/ecological investigation (leadership NWV)
- Fungal conservation (depositing cultures in official strain collections)
- Investigation of their cultures for novel secondary metabolites

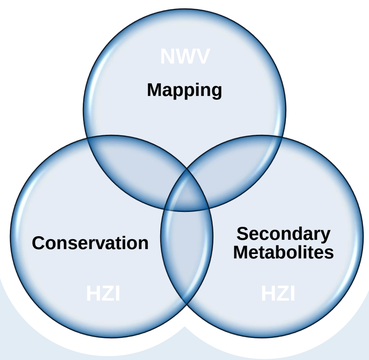
→ **Prolific conglomerate of endangered or rare species and vast fungal diversity on species and genus level**


Calocybe ionides

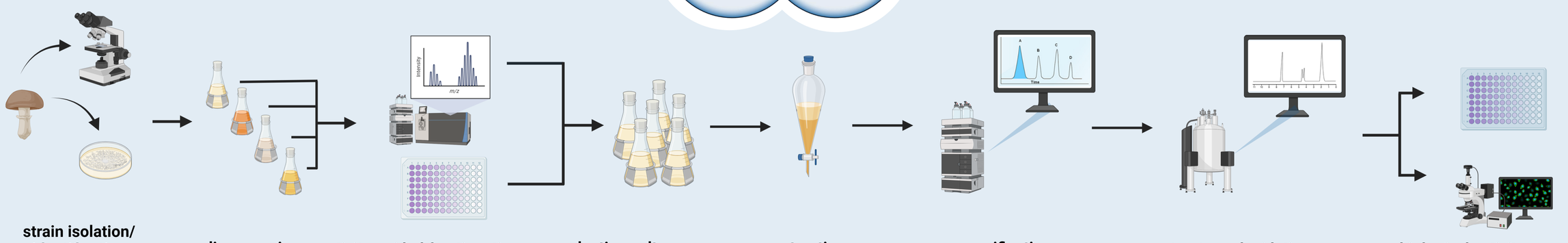

Hygrocybe miniata


Geastrum minimum


Peziza ammophila



WORKFLOW



strain isolation/ identification
microscopy, PCR

media screening
submerged cultures

activity guided fractionation
analytical HPLC, CV assay

production culture
volume incrase of strain

extraction
liquid/liquid, XAD

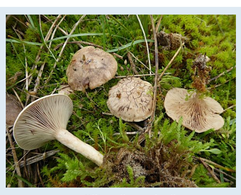
purification
FC, RPLC

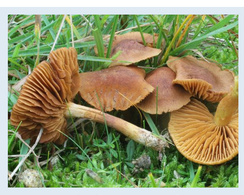
structure elucidation
HR-ESI-MS, NMR, CD

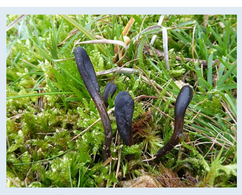
biological activity
cytotox, antimicrobial, antibiofilm

Preliminary results from our last excursions

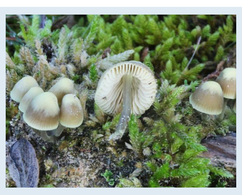
Borkum 2022: >300 taxa from **≈120 genera** were identified, **25 strains** deposited → **24** were **Red Listed**, **>10 forwarned**/ listed as **extreme rare**[1]

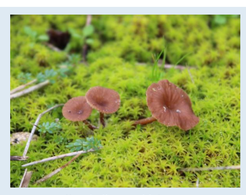

Clitocella popinalis

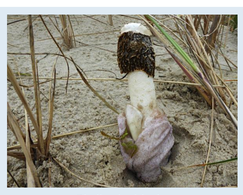

Cortinarius pratensis

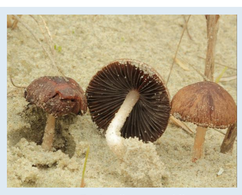

Glutinoglossum glutinosum

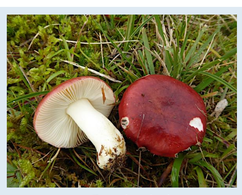

Lepiota erminea


Mycena chlorantha


Omphalina pyxidata


Phallus hadriani

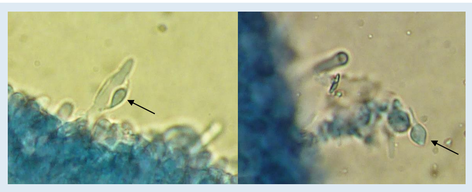

Psatyrella ammophila


Russula subrubens

Wangerooge 2019:

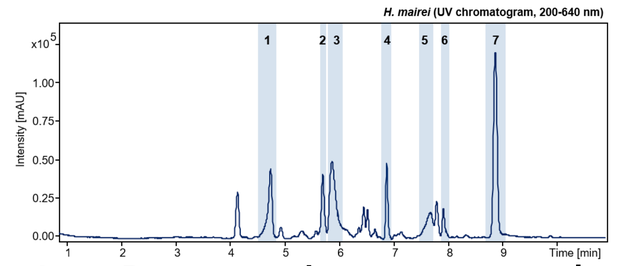

Hemimycena mairei

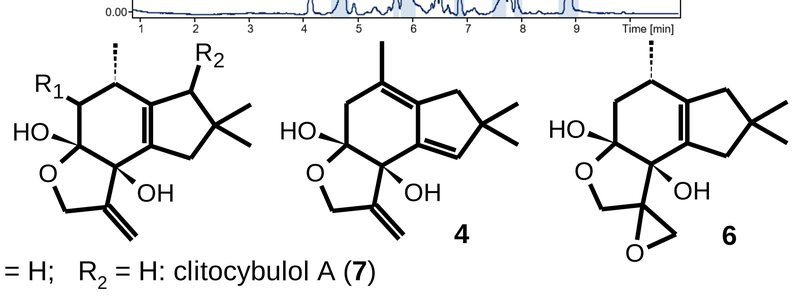

Habitat: tertiary dune


Spores (in cotton blue)

Hemimycena mairei (E.-J. Gilbert) Singer:

- Small mushroom with white cap and stem with thickish decurrent lamellae[2]
- Variable spores of irregular pear-like to dacryoid shape (spore size 7.8-9.2 x 4.5-5.0 µm)
- First reported for the EFI (two collections) on alkaline-rich shearing lawn and alkaline-rich gray dune grass field (tertiary dune)
- Red Listed as very rare in GER with threats that are unclear[1], current findings indicate an increase (GER, NL) in recent years[3]
- Due to its relative rarity and difficulties of identifying, little is known about this mushroom, in particular about its secondary metabolites





R_1 = H; R_2 = H: clitocybulol A (**7**)
R_1= OH; R_2= H: clitocybulol C (**5**)
R_1= H; R_2= *β*-OH: **2**
R_1= H; R_2= *α*-OH: **3**
R_1= OH; R_2= OH: **1**

→ **novel clitocybulols**

→ **(under)investigated species lead to novel chemistry**

Conclusion

Project will shed more light on this **outstanding** and **understudied habitat**

Rising sea level, increasing storm surges and already changing climate conditions make the **inventory**, **conservation** and **investigation** of fungal species from the EFI of **utmost importance for the present and near future**

NATURWISSENSCHAFTLICHER VEREIN ZU BREMEN von 1864

References: [1] www.rote-liste-zentrum.de, access 7.3.23/25.8.23; [2] Antonín & Noordeloos, IHW Eching, 2004; [3] www.verspreidingsatlas.nl/0056120, access 8.9.23;
Fotos: Albers, Grauwinkel, Schrey; created with biorender.com.