Assessing recent anthropogenic disturbances and environmental recovery in the Nalón estuary (Asturias, N Spain)

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- **Estuaries** are highly dynamic and complex coastal systems
- The **sedimentary record** allows tracing the historical environmental quality evolution of these ecosystems

Natural drivers

- Tidal regime, waves
- Floods
- Sediment supply
- Temperature, salinity, turbidity

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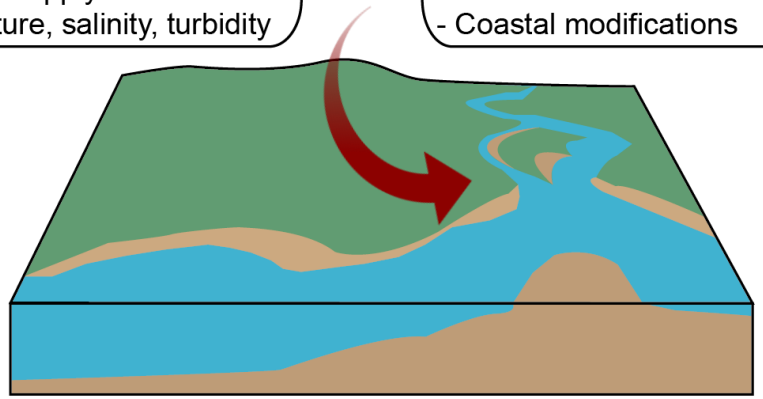
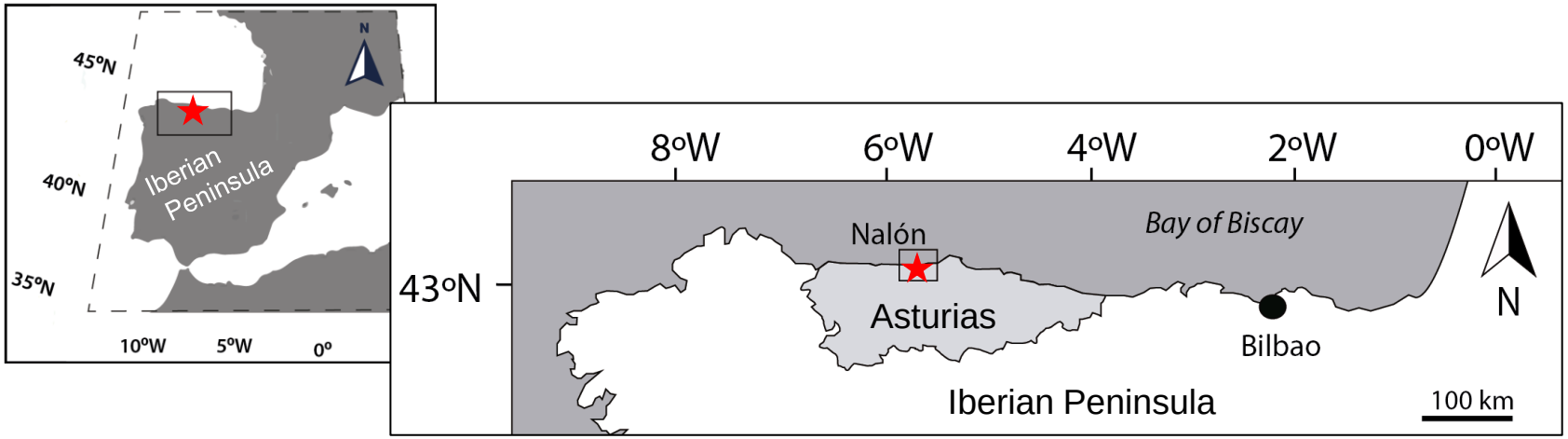
Anthropic drivers

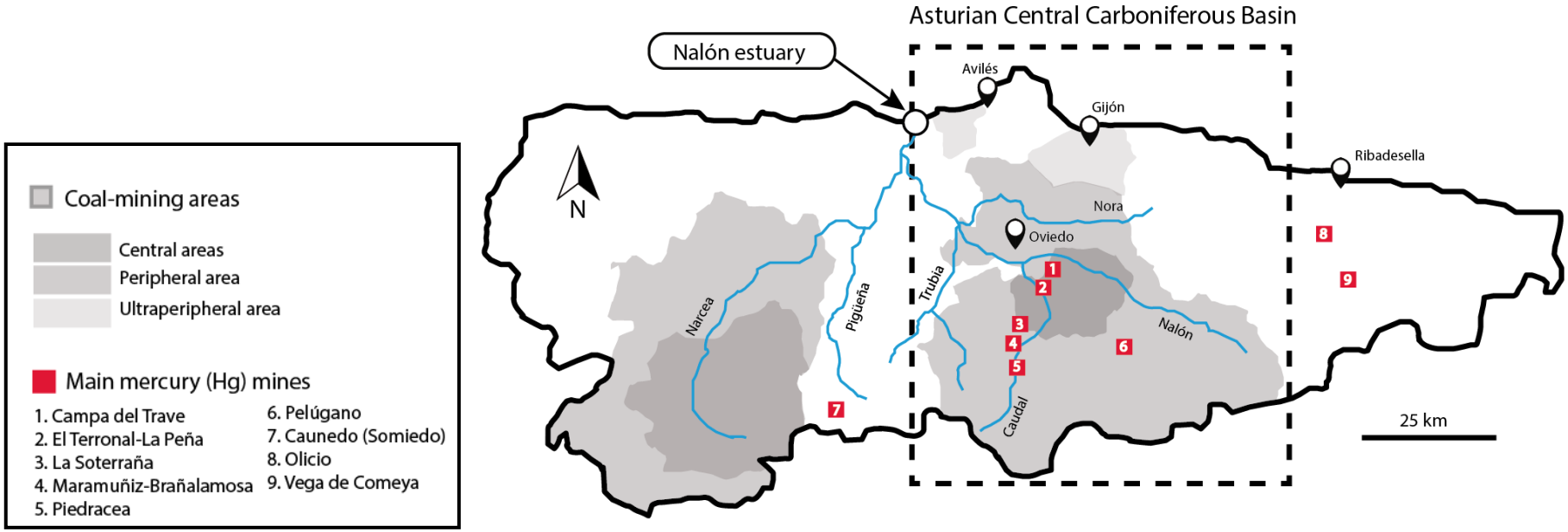
- Industrial-mining discharges
- Land-use changes
- Urban wastes
- Coastal modifications



Purposes ?

- Assess the impact of **pollution**
- Establish **environmental guidelines**
- Develop coastal **management policies**


45°N
40°N
35°N
10°W
5°W
0°
Iberian Peninsula
N
8°W
6°W
4°W
2°W
0°W
43°N
Nalón
Bay of Biscay
Asturias
Bilbao
Iberian Peninsula
100 km
N


Asturian Central Carboniferous Basin
Nalón estuary
Avilés
Gijón
Ribadesella
Nora
Oviedo
Narcea
Pigüeña
Trubia
Nalón
Caudal
N
25 km
Coal-mining areas
Central areas
Peripheral area
Ultraperipheral area
Main mercury (Hg) mines
1. Campa del Trave
2. El Terronal-La Peña
3. La Soterraña
4. Maramuñiz-Brañalamosa
5. Piedracea
6. Pelúgano
7. Caunedo (Somiedo)
8. Olicio
9. Vega de Comeya

Objectives:

- Reconstructing the environmental transformation history of the estuary

Proxies:

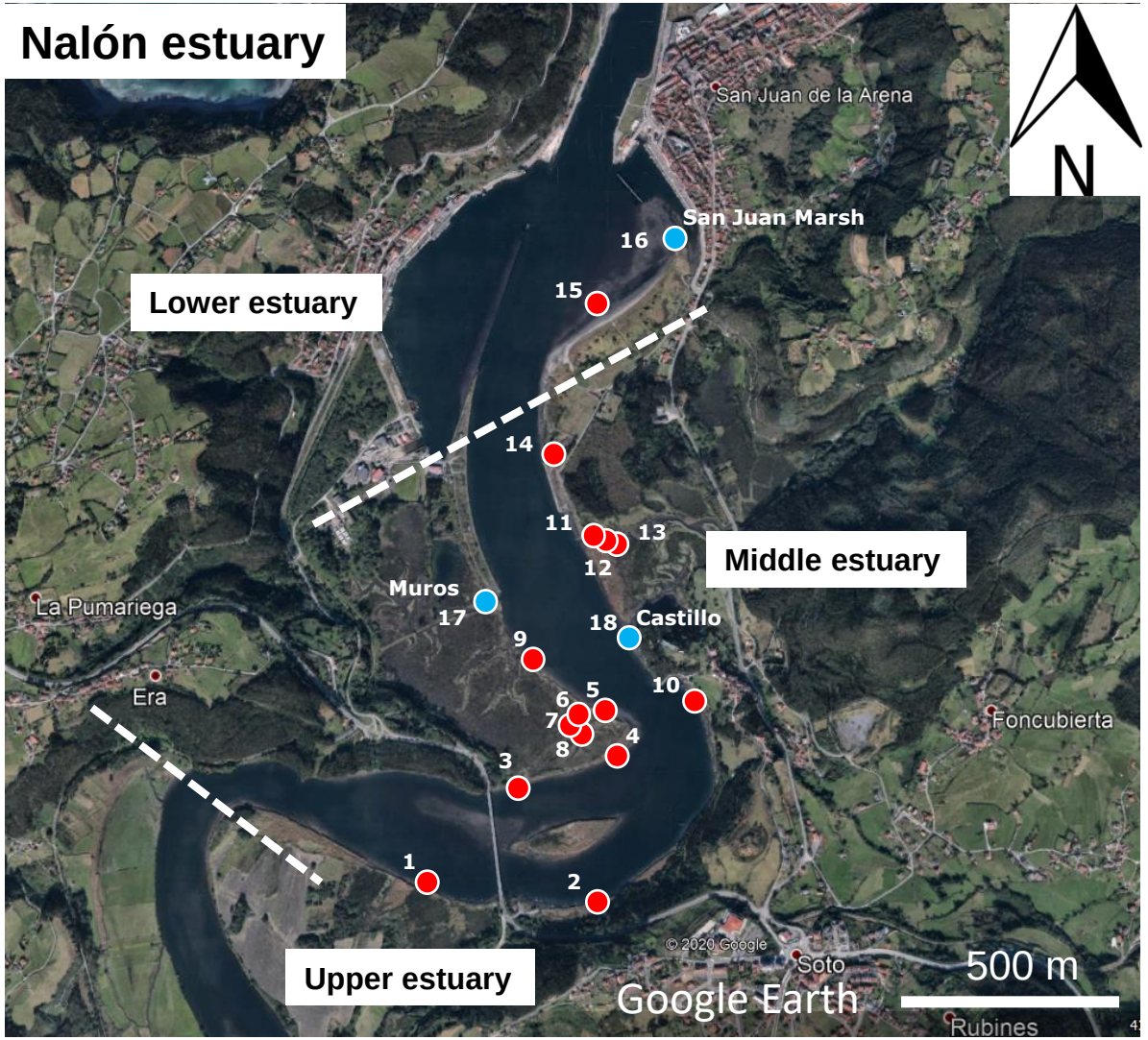
- Foraminiferal stratigraphy
- Grain-size
- Trace metals
- Radionuclides (^{210}Pb, ^{137}Cs)
- Magnetic susceptibility

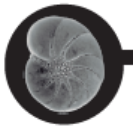
Materials:

- 3 cores
- 18 Surface samples

Surface sample

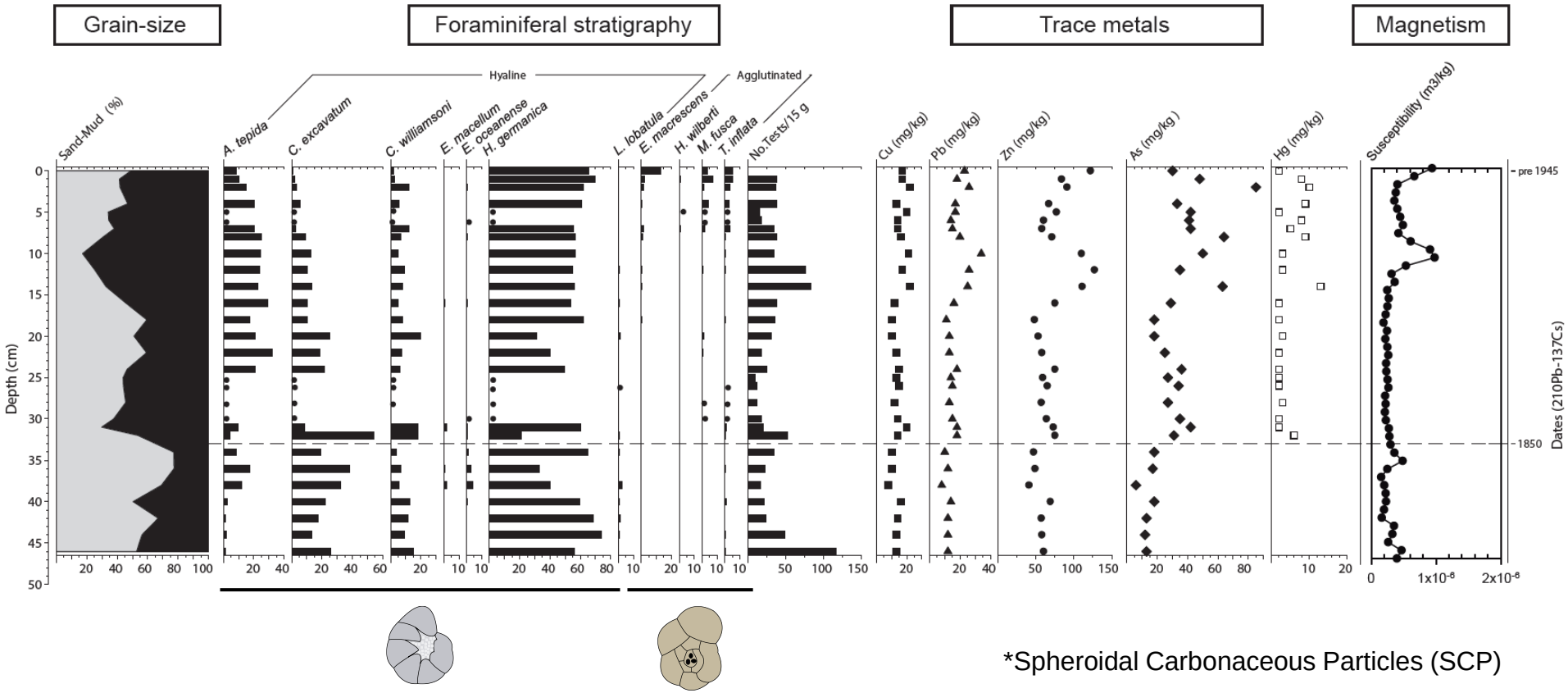
Core + Surface sample



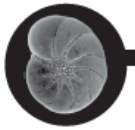


CASTILLO CORE (~1850 - Prior-1945)

- Overall low foraminiferal tests
- Trace metal concentrations above the regional background (Hg)
- Increasing susceptibility and SCP
- Mining (Coal and Hg) – Dredging?



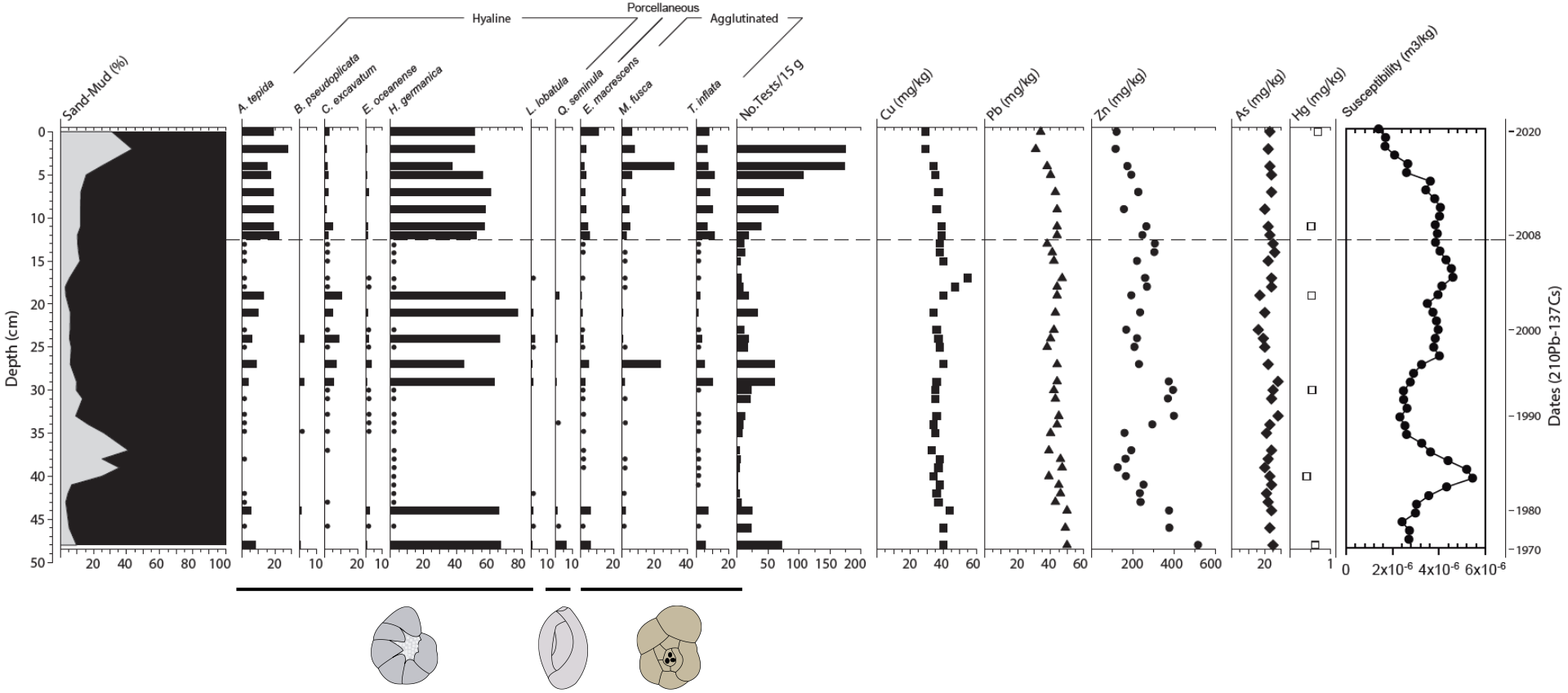
*Spheroidal Carbonaceous Particles (SCP)



MUROS CORE (1970-2020)

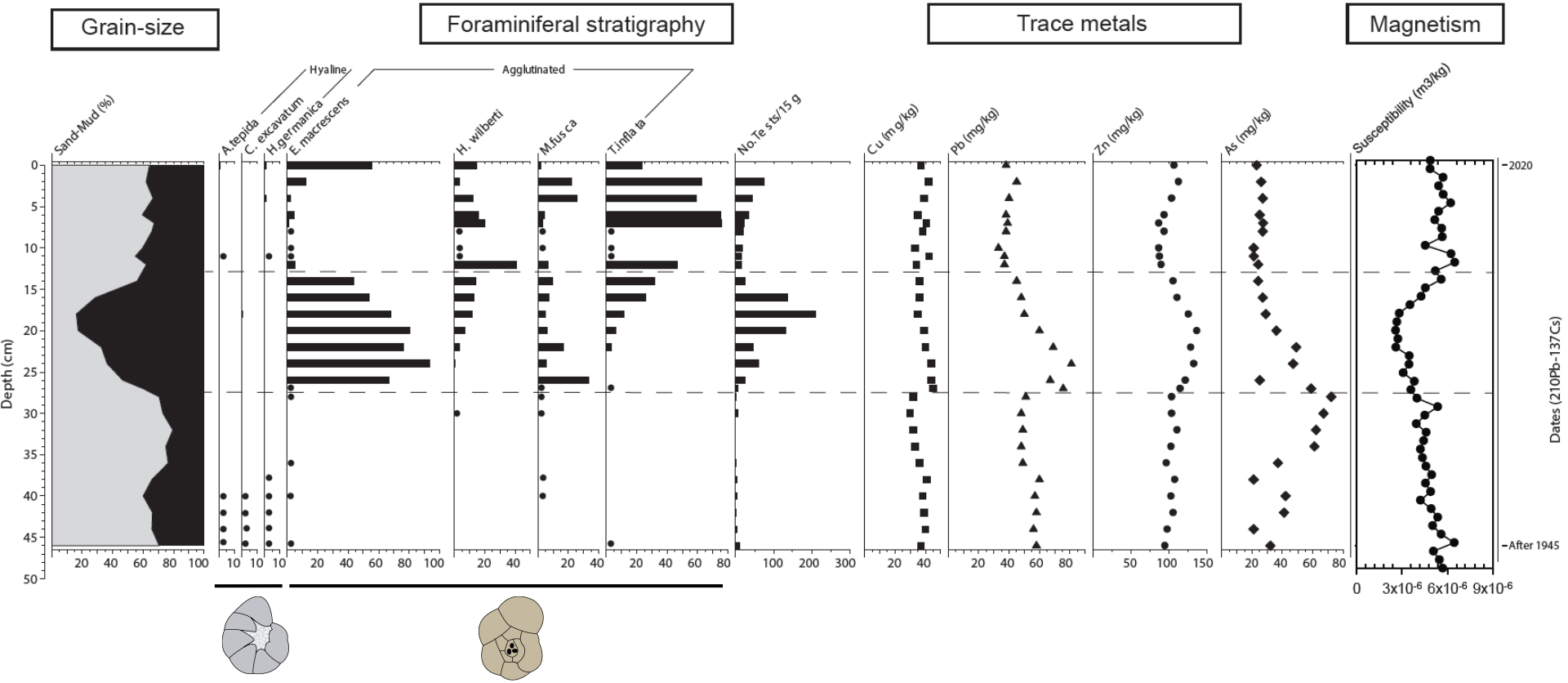
- Very low-Moderate low foraminiferal tests
- Trace metal concentrations below the regional background
- Very high susceptibility and SCP
- The end of extensive ore mining and dredging activities

Grain-size | Foraminiferal stratigraphy | Trace metals | Magnetism

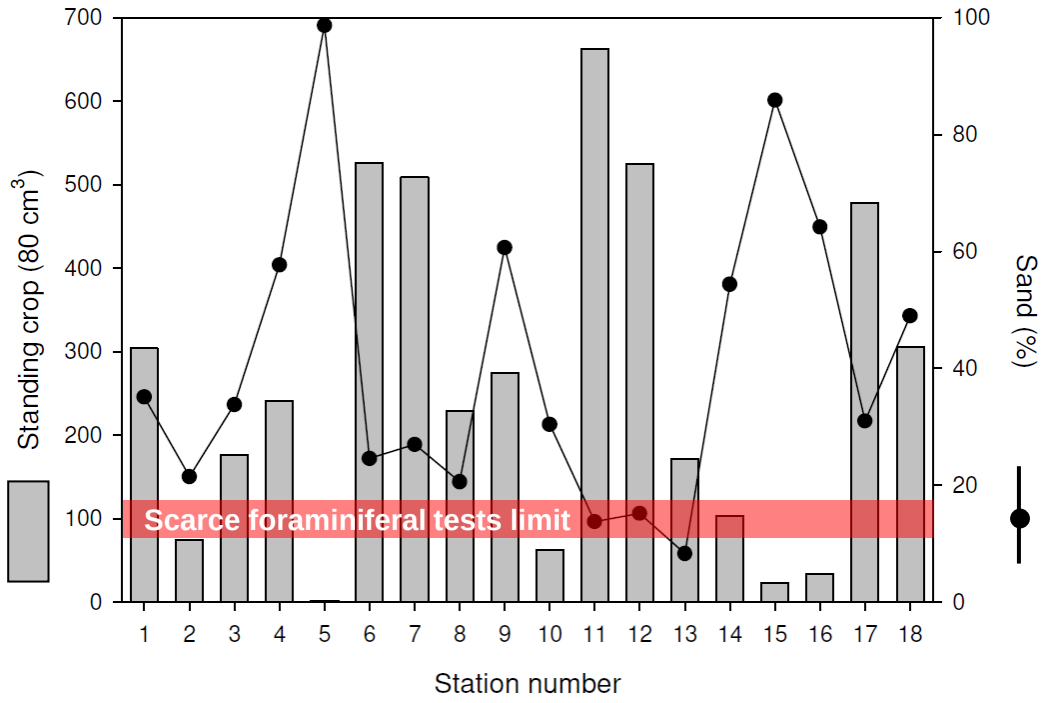


- Overall low foraminiferal tests
- Trace metal concentrations below the regional background
- Very high susceptibility and SCP
- Intertidal flat → Salt Marsh

SAN JUAN MARSH CORE (After-1945 - 2020)



SURFACE SAMPLES (CURRENT CONDITIONS)



- Are **the standing crop values** (No. Living foraminífera/80cm^3) high?
- Is the Nalón estuary being **naturally-driven** nowadays **or** is there any **anthropic stressor?**

?

1

The sedimentary record has allowed us tracing the environmental history transformation of the Nalón estuary since the 19th century until present.

2

~1850 – 2010 CE

Overall **poor ecological conditions**

Geochemical (Hg) and magnetic imprints

2010 – 2020 CE

Moderate **environmental recovery**

Persisting **"hot-spots"** of scarce microfauna

3

The main environmental drivers appear to be ore mining activities carried out upstream since the late 19th century until the early 21st century, along with coastal management modifications (e.g., dredging, artificial dams). Future studies will help to unravel in a more precise way these processes.

THANK YOU FOR YOUR ATTENTION

ANY QUESTIONS?

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