

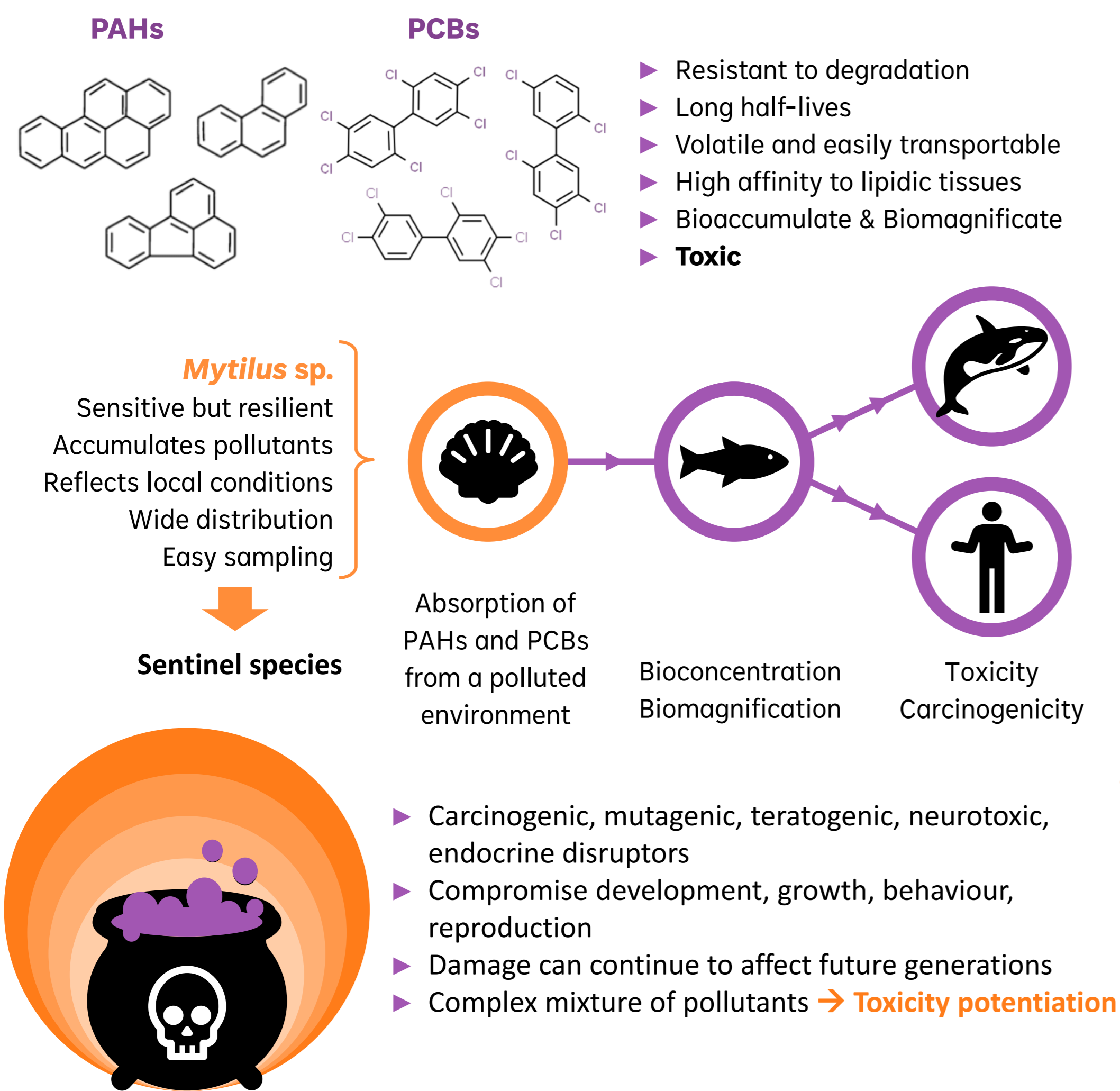
Determination and Risk Assessment of PAHs and PCBs in Seawater and Blue Mussels from Vila-do-Conde, Portugal

Ana Margarida Esteves^{1,2}, Rodrigo Alves^{1,2}, Eduardo Rocha^{1,2}, Maria João Rocha^{1,2}

¹Laboratory of Histology and Embryology, Department of Microscopy, ICBAS – School of Medicine and Biomedical Sciences, University of Porto, R. Jorge Viterbo Ferreira 228, 4050-313 Porto, Portugal.

²Team of Animal Morphology and Toxicology, CIIMAR/CIMAR – Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Terminal de Cruzeiros do Porto de Leixões, Av. General Norton de Matos s/n, 4450-208 Matosinhos, Portugal.

INTRODUCTION



GOALS

- 1 Provide data and verify fluctuation patterns
- 2 Investigate potential sources
- 3 Evaluate the environmental and health risks

METHODS



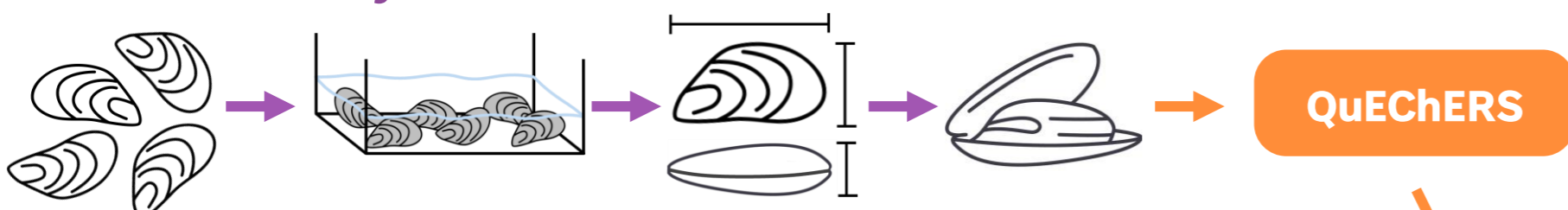
Water Samples (2 L)

- ▶ 2017 - 2021
- ▶ One harvest per season (n = 12)

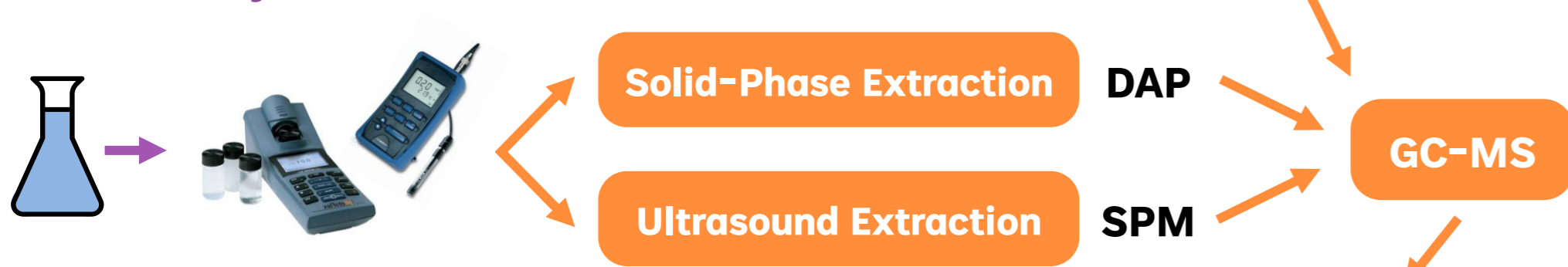
Animal Sampling

- ▶ 2017 - 2021
- ▶ One harvest per season (n = 12)

Mussel biometry and PAHs + PCBs extraction^[1-3]



Water analyses and PAHs + PCBs extraction^[1-3]



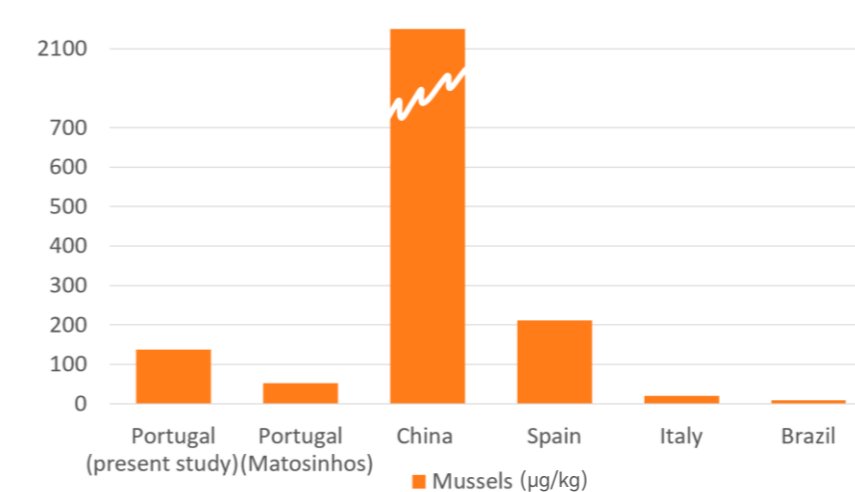
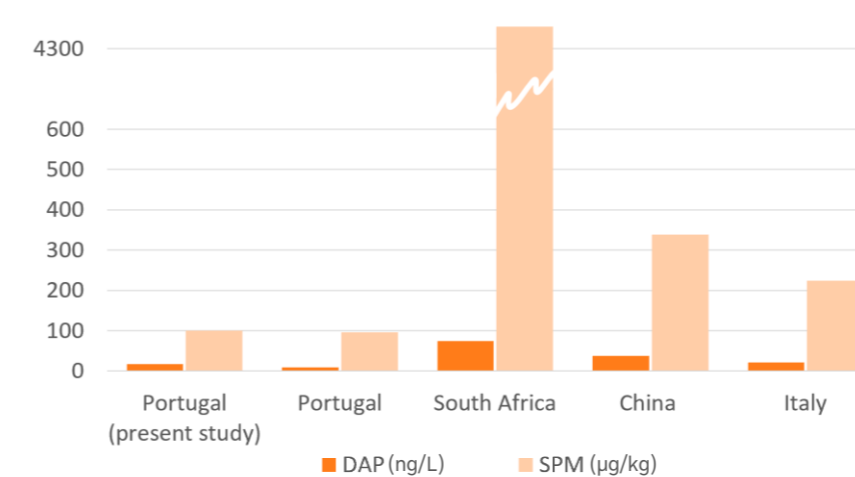
DAP – Dissolved Aqueous Phase
SPM – Solid Phase Matter

GC-MS – Gas Chromatography-Mass Spectrometry

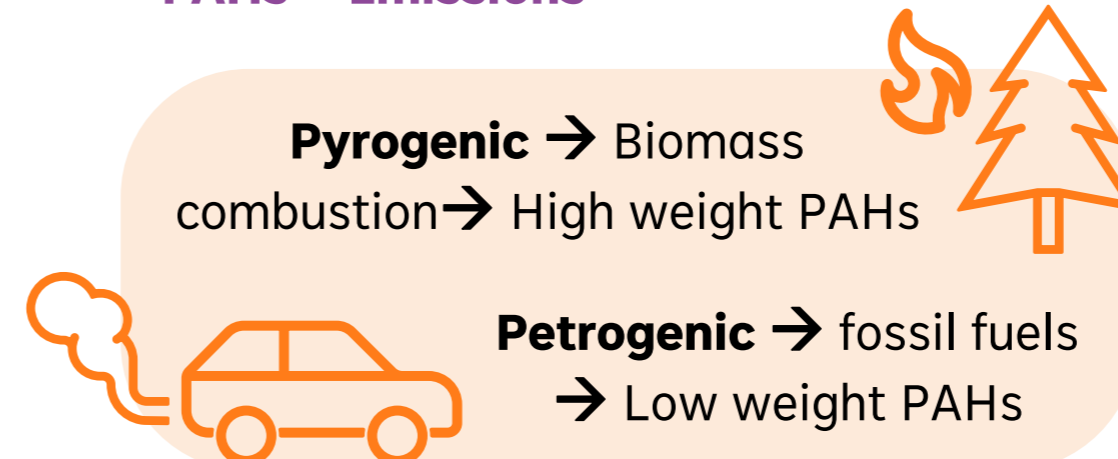
16 Priority PAHs
7 Indicator PCBs

RESULTS AND DISCUSSION

PAHs – Concentrations



PAHs – Emissions



Seawater

- ▶ DAP - **Petrogenic**
- ▶ SPM - **Pyrogenic**

Mussels

- ▶ 2018, 2019 and 2021: **Petrogenic**
- ▶ 2020: **Pyrogenic**

PAHs – Risk assessment

$$\frac{\sum TEQ}{\sum RQ} \left. \vphantom{\frac{\sum TEQ}{\sum RQ}} \right\} \text{Low - Moderate environmental risk}$$

Estimated Daily Intake
Target Hazard Quotient
Carcinogenic Risk

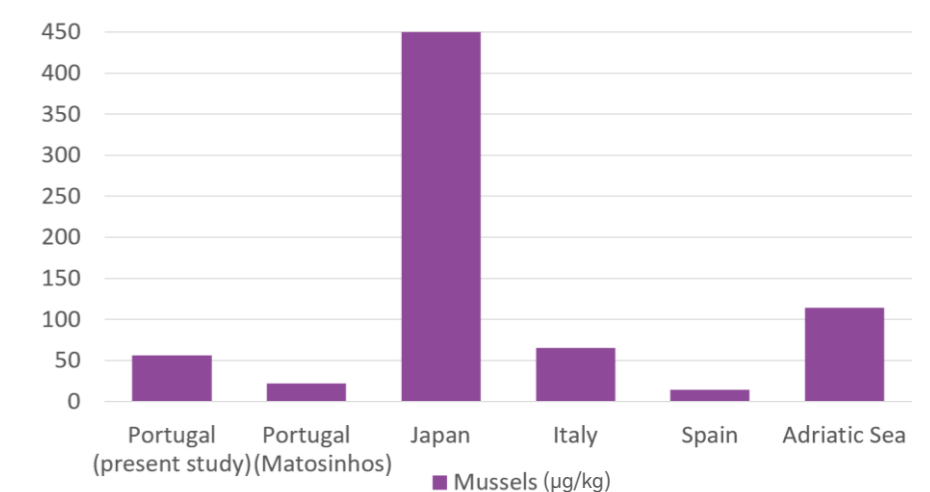
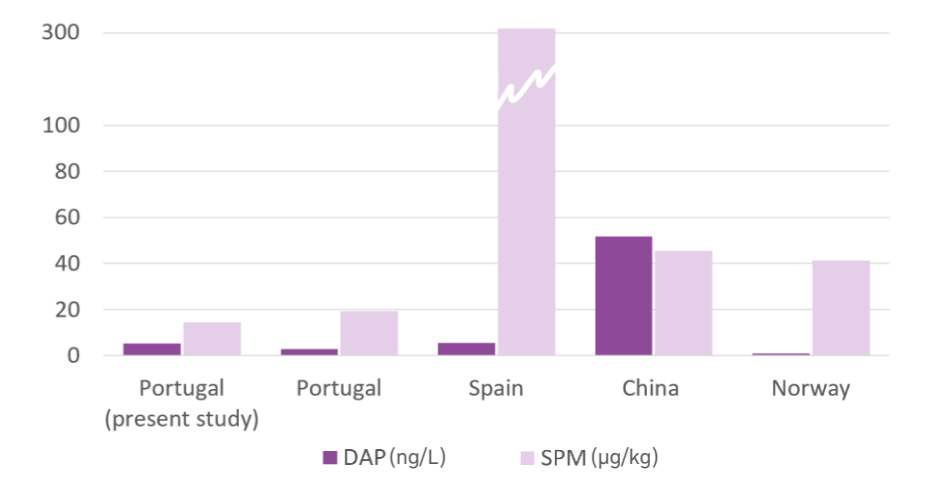
High mollusc consumption

Portuguese population vulnerable to **cancer development**

Maximum PAHs limits (Molluscs)^[4]
5.0 - 30.0 µg/kg
Exceeded in **all sampling sites !!**

Maximum PCBs limits (Molluscs)^[4]
6.5 pg/kg - 75 ng/kg
Exceeded in **one site!**

PCBs – Concentrations



PCBs – Possible emissions

Documented fires in **industrial buildings** and/or **warehouses**

↑Cl groups ▶ ↑toxicity + ↑resistance

Seawater

- ▶ DAP and SPM - PCBs **with 5 and 6 Cl groups**

Mussels

- ▶ PCBs **with 6 Cl**

PCBs – Risk assessment

$$\frac{\sum TEQ_{-TH}}{\sum TEQ_{-WHO}} \left. \vphantom{\frac{\sum TEQ_{-TH}}{\sum TEQ_{-WHO}}} \right\} \text{Low environmental risk}$$

CONCLUSIONS

- ▶ Anthropogenic activities → are the main sources of PAHs;
- ▶ PCBs persist in the environment;
- ▶ Environmental risk → **Moderate level**;
- ▶ High levels of contaminants in mussels;
- ▶ Maximum legal limits are exceeded → **cancer development risk**
- ▶ High daily intake rate of bivalves → Portuguese population especially vulnerable;
- ▶ Monitorization and extended research to the entire Portuguese coast is recommended

REFERENCES

- [1] Madeira et al. (2014). Environ Sci Pollut Res, 21: 1528-1540
- [2] Madeira et al. (2014). Environ Sci Pollut Res, 21: 6089-6098
- [3] Rocha et al. (2017). Environ Monit Assess, 189, 1-14.
- [4] Commission Regulation (EU) no. 2023/915. OJEU, L 215:4-8