METROLOGICALLY SOUND ASSESSMENT OF ELEMENTAL COMPOSITION DIFFERENCES IN SEA CUCUMBER FROM DIFFERENT ORIGINS

Iryna Rehan [1],Carla Palma [1], Vanessa Morgado [1,2], Pedro M. Félix [3], Ricardo Bettencourt da Silva [2]

[1] Instituto Hidrográfico, Rua das Trinas, 49, 1249-093 Lisboa – Portugal
[2] Centro de Química Estrutural - Faculdade de Ciências da Universidade de Lisboa, Edifício C8, Campo Grande, 1749 - 016 Lisboa – Portugal
[3] MARE – Marine and Environmental Sciences Centre, Faculdade de Ciências da Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal

TASK

Assessment of the impact of location, specie, habitat and type of tissue in metals' mass fraction of sea cucumber.

METHODOLOGY AND CHALLENGES

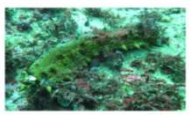
- Analysis of sea cucumber samples by atomic spectrometry after acid digestion.
- Since sea cucumber tissues were analysed in the same spectrometric calibrator, this fact introduces artificial/metrological correlation on results. Monte Carlo Simulations of measurements allow taking results correlation into account to protect comparisons for these complex correlations. Truncation of simulated measured concentration values below zero improves the assessments!

CASE STUDY

Variation of mass fraction with locations

Holothuria forskali, Delle Chiaje, 1823

Holothuria arguinensis, Koehler & Vaney, 1906



Holothuria tubulosa, Gmelin, 1791

Cadmium 48 Cd 112.41

Capture locations

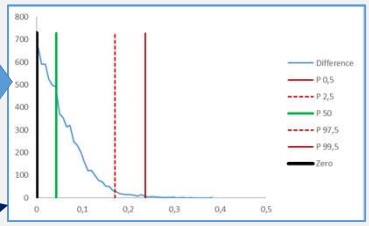
S1 - N 38.507656° W -8.920444°

S2 - N 38.477392° W -8.972697°

S3 - N 38.434133° W -9.063683°

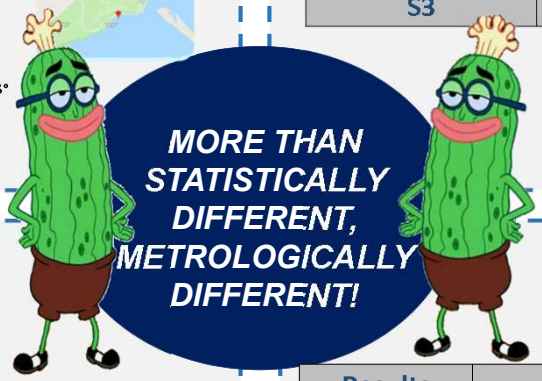
MEAN MASS FRACTIONS, *w* (mg kg^{-1})

Simulated measured Cd mass fraction in gonads of *H. tubulosa* collected in location S1 from a rocky habitat



Single value from S1 mean (truncation example)

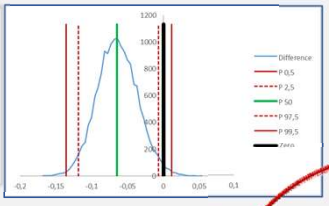
Simulated mean values (0.5th and 99.5th percentiles)		
Location	P0.5 (mg kg^{-1})	P99.5 (mg kg^{-1})
S1	0.250	0.375
S2	0.317	0.430
S3	0.217	0.324



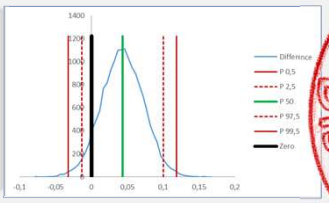
MORE THAN STATISTICALLY DIFFERENT, METROLOGICALLY DIFFERENT!

MASS FRACTIONS DIFFERENCE (mg kg^{-1})

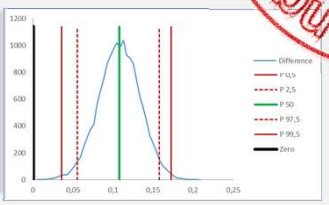
Difference: *w*(S1) – *w*(S2)



Difference: *w*(S1) – *w*(S3)



Difference: *w*(S2) – *w*(S3)



Asymmetric Distribution

CONTINGENCY TABLE

Results	S1	S2	S3
S1			
S2	p = 0.0141 S2 has higher concentration		
S3	p = 0.0654 S1 has higher concentration	p = 0.026 S2 has higher concentration	

Cement factory near to S2!

FINAL REMARK

The developed tool allows a correct interpretation of the information (not possible by using "traditional" statistical tools)!

AKNOWLEDGMENT

This work was financed by the Operational Program Mar2020, MAR-02.01.01-FEAMP-0052, "Newcumber – Advances towards the sustainable rearing of sea cucumbers". Vanessa Morgado thanks University of Lisbon for her PhD grant.

Cofinanciado por:

V. Morgado, C. Palma, R. J. N. Bettencourt da Silva, *Monte Carlo Evaluation of Instrumental Quantification Uncertainty: Elemental analysis by atomic spectroscopy*, Submitted for publication.