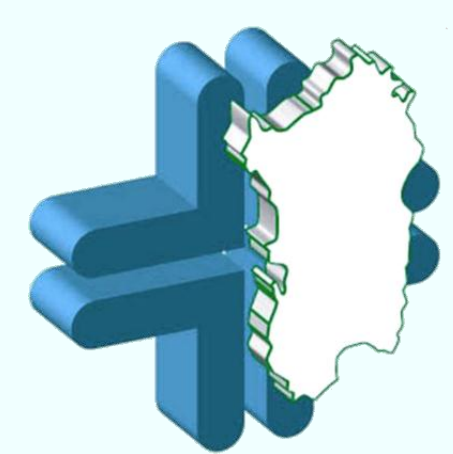




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CADMIUM LEVELS IN SAMPLES OF MEDITERRANEAN MUSSEL (*Mytilus galloprovincialis*) FROM THE COASTS OF SARDINIA (ITALY): HEALTH SURVEILLANCE AND PRELIMINARY ASSESSMENT OF EXPOSURE



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Background and aims

Mussels are filter feeders that feed on plankton and other microscopic sea organisms which are free-floating in water. They have the ability to accumulate numerous classes of chemical contaminants from environment which they live as heavy metals. That could be a safety risk for health consumers. However The shellfish farming activities are an important commercial resource for the economy of Sardinia that must be safeguarded also by continuous surveillance. The achieving of the highest possible level of health protection for the consumers of Europe's food is the central goal of the European Commission. The Commission's guiding principle, is to apply an integrated control approach of food "from farm to table" covering all sectors of the food chain. For this purpose Regulation (EC) No 1831/2003 ⁽¹⁾ sets maximum levels for certain contaminants in foodstuffs. National survey programs reserve particular attention to cadmium (Cd) and to the risk related to levels of this element in food. Cd can be associated with increased risk of cancer and is primarily toxic to the kidney. Population is exposed to Cd from multiple source but, excluding smoking people, generally food represent the major source. In 2009, panel of European Food Safety Authority (EFSA) on Contaminants in the Food Chain (CONTAM) ⁽²⁾ has recommended, in a scientific opinion, the Tolerable Weekly Intake (TWI) for Cd at 2,5 µg/kg BW, reducing the previous provisional TWI, fixed from Joint FAO/WHO Expert Committee on Food Additives (JECFA) at 7 µg/kg BW. In 2012, EFSA has published a Scientific Report ⁽³⁾ in which data of Cd levels in food on European market were reviewed and dietary exposure estimated using consumption data. The study reports the mean levels of contamination for broad food categories. Based on this scientific report EFSA concluded that "often is not the food with the highest Cd levels, but foods that are consumed in larger quantities that have the greatest impact on Cd dietary exposure".

The aim of this study is to evaluate data of Cd concentration in Mediterranean mussels (*Mytilus galloprovincialis*) sampled in Sardinia and to estimate the dietary exposure. Data collected in this study were compared with the levels of contamination present in literature ⁽⁴⁾. And in particular data from studies performed in several areas of Mediterranean sea as Sardinia, Tuscan, Lazio and Liguria coast ⁽⁵⁾, Spain ⁽⁶⁾, France ^(7, 8) or Adriatic sea as Trieste and Croatia coast ^(9, 10).

Methods

The Istituto Zooprofilattico Sperimentale with local health authorities, has conducted a survey of Cd and other heavy metals in mussel. This survey, during a three-year period (2009-2011), has sampled 565 samples of *Mytilus galloprovincialis* from commercial mussel beds around Sardinia from eight different areas (figure 1), with the major numerosity from Cagliari and Olbia areas.

Determination of Cd levels were performed in according to Regulation (EC) No 333/2007 ⁽¹¹⁾. The fresh homogenised sample of edible portion, was digested in nitric acid by closed-vessel microwave digestion by CEM MARS Xpress Microwave Digester; determination of Cd was performed by Agilent 7500ce ICP-MS. 115 Indium was used as internal standard element to compensate matrix effect and signal drift. Analytical procedure used, was validated in according with UNI EN ISO 17025/2005 and constantly monitored through participation to interlaboratory circuits. The quality control of the data is verified and assured using Certified Reference Material CRM 278R – mussel tissue (Certified Value: 0.348 mg/kg on dry basis).

Results

Results show that average concentration of Cd in the mussels is 0.109 ± 0.101 mg/kg FW and range between <0.010 - 0.987 mg/kg FW. All samples don't exceed the regulatory limit for Cd in bivalve molluscs (≤ 1.0 mg/kg FW). The highest concentrations were found in samples collected in industrialized areas with recognized pollution.

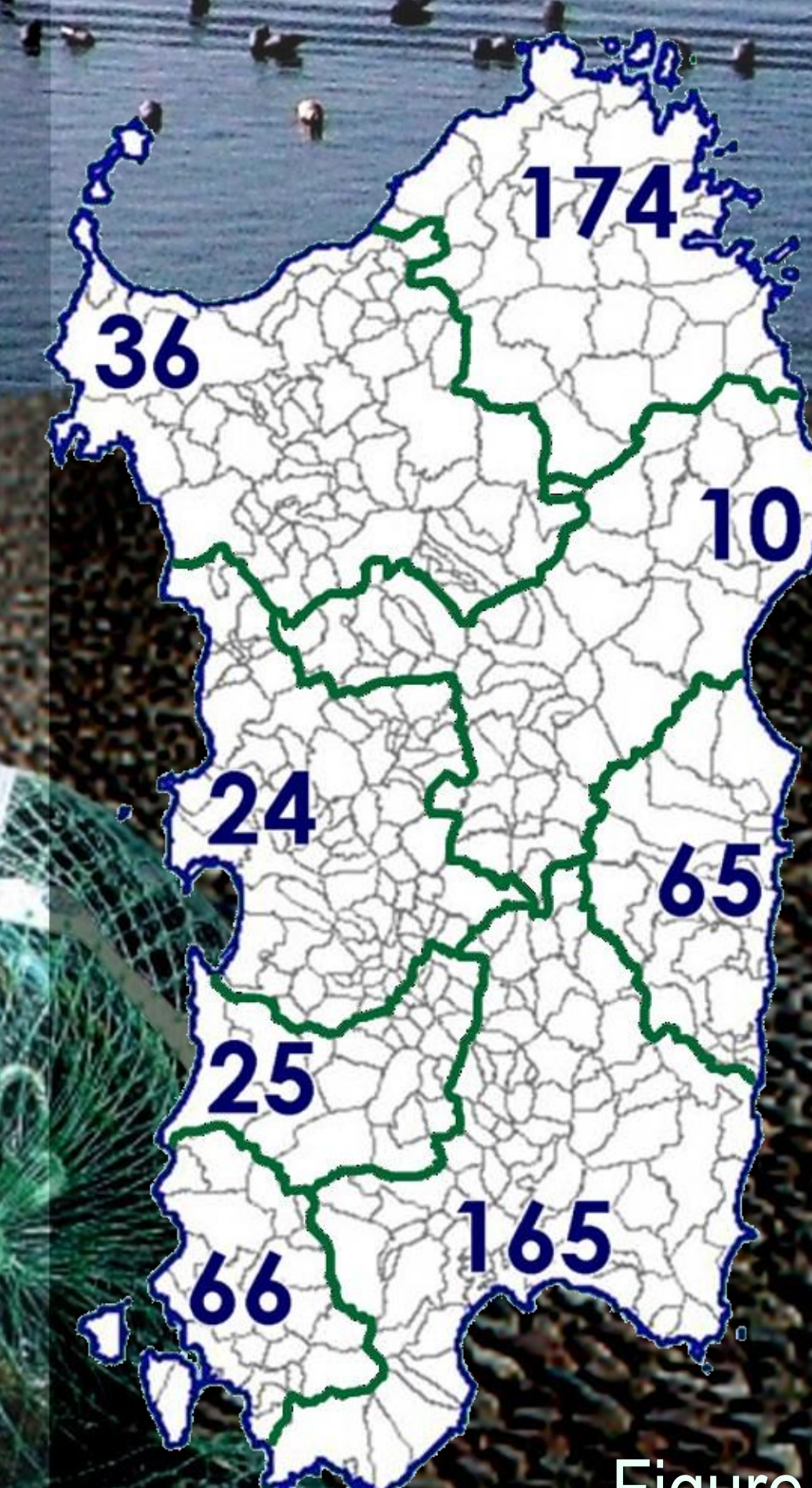
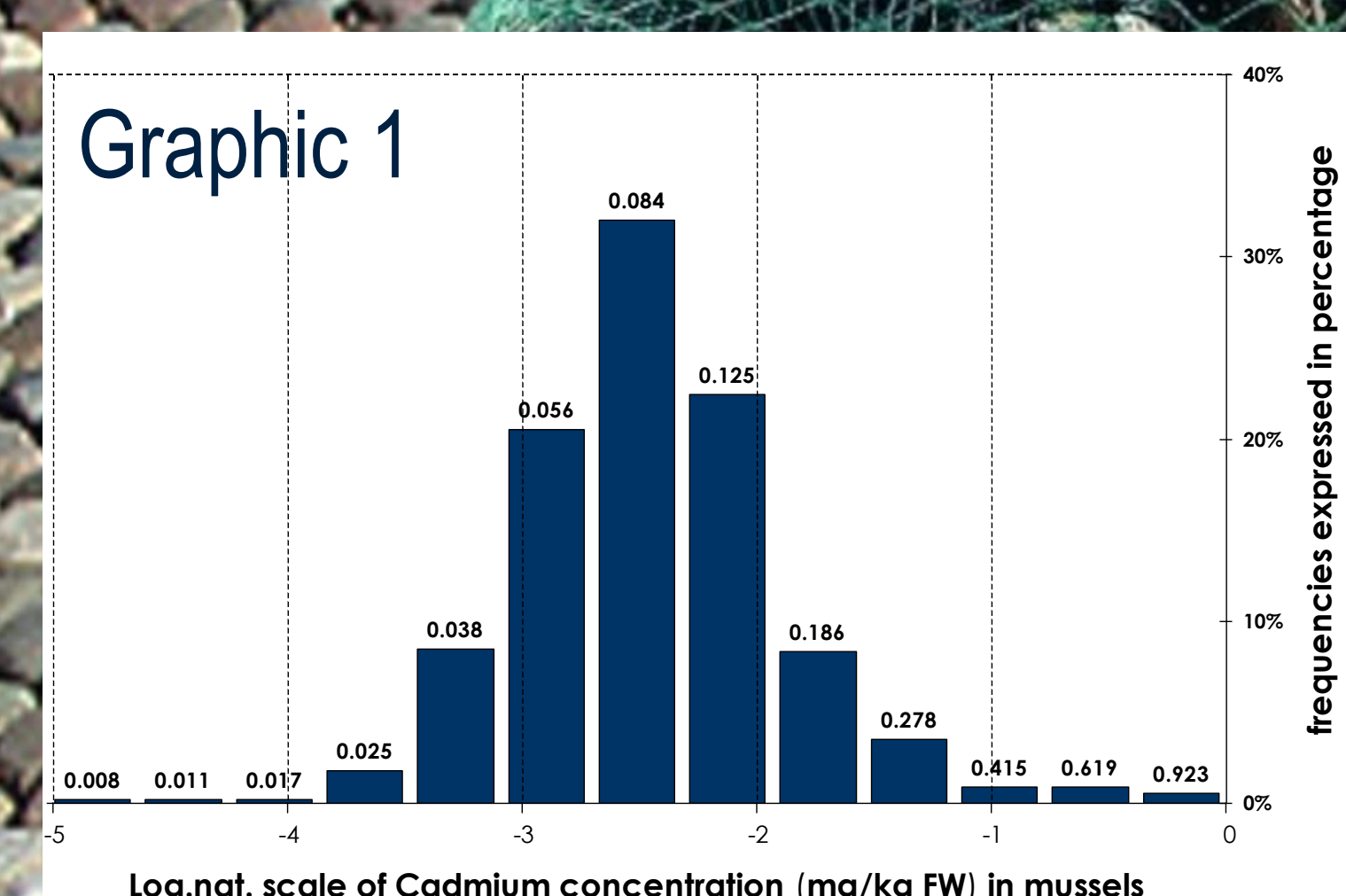
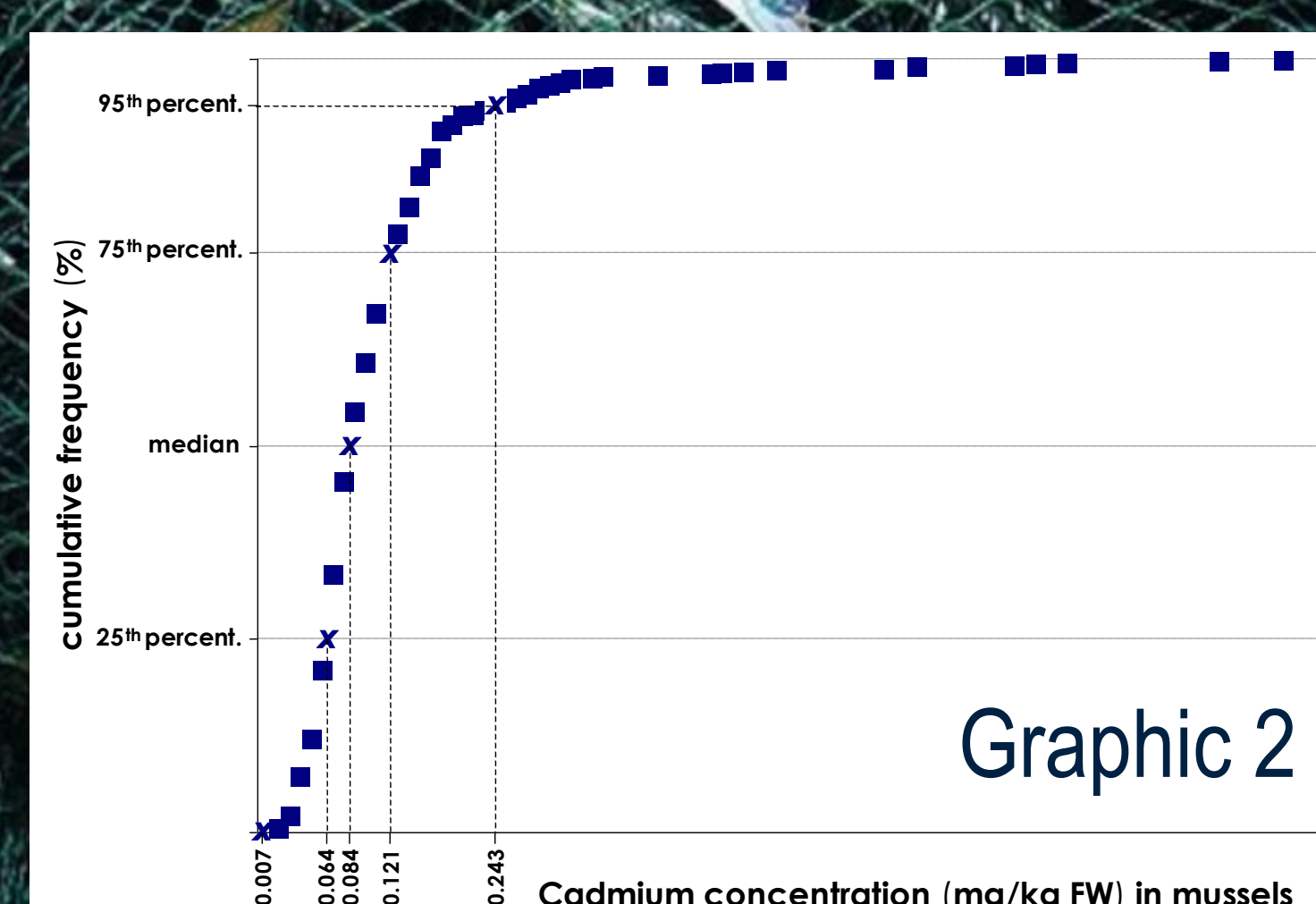


Figure 1



Data show a Distribution Frequency Non-Normal, skewed to the right hand side and with a median value of 0.084 mg/kg FW. With log transformation distribution data is more symmetric, as shown in graphic 1, but by Shapiro-Wilk test is rejected the idea that concentration value comes from a log-normal distribution with 95% confidence, since the smallest P-value is <0.05.



Graphic 2

Graphic 2 shows cumulative frequency of the concentration; at 75th percentile the concentration is 0.121 mg/kg FW, close to one tenth of legal limit and the border line data lie over the 95th percentile, corresponding to 0.243 mg/kg FW.

Conclusions

The mean of Cd concentration found in this study (0.121 mg/kg) is of the same order of magnitude of that found in recent literature and of that reported from EFSA ⁽²⁾ for water molluscs (0.319 mg/kg). For health risk assessment, this value, according to exposure assessment based on TWI set to 2.5 µg/kg BW by the CONTAM Panel of EFSA, contributes only small proportion of the adult TWI estimates of this metal. Then shows that, even people who eat well above average amounts of mussels would still be below the safety guidelines taking into account the rest of the diet, as documented by "Scientific Report of EFSA on Cd dietary exposure in the European population" ⁽³⁾.

References

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