



MONITORING OF MEDITERRANEAN COASTAL AREAS: PROBLEMS AND MEASUREMENT TECHNIQUES

Livorno (Italy), June 2022

FORM FOR ABSTRACTS PRESENTATION

TITLE: First investigation of per-and poly fluoroalkylsubstances (PFAS) in striped dolphin <i>Stenella coeruleoalba</i> stranded along Tuscany coast (North Western Mediterranean Sea)
SESSION: FLORA E FAUNA
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ABSTRACT (MIN 3000 MAX 5000 CHARACTERS): <i>General frameworks and Objectives</i> Per- and poly fluoroalkylsubstances (PFAS) are a group of organic molecules synthetically produced and used in a wide range of commercial and industrial applications. Two well-studied groups include the perfluoroalkyl sulfonates (PFSA) and perfluoroalkyl carboxylates (PFCA). Perfluorooctanesulfonic acid (PFOS) is the most known PFAS. Due to his toxicity and bioaccumulability, in May 2009, PFOS and its related compounds were added to the Annex B “Restriction” of the Stockholm Convention on Persistent Organic Pollutants and they were also included in the list of priority hazardous substances which must be monitored in EU water bodies as stated by the Marine Strategy Framework Directive (2008/56/CE). Global distribution of PFAS in waters (1) and in aquatic organisms (2; 3), have been documented in many studies, demonstrating their persistence in the environment and their bioaccumulation and biomagnification. According to the scenario reported above, PFAS represent emerging chemicals that are of environmental concern for marine mammals (4). At the same time, marine mammals share the coastal environment with humans and consume similar food, thus they may also serve as indicators for environmental change and ecosystem health (5). ARPAT AVL (Environmental Protection Agency for Tuscany Region) is accredited in accordance with UNI EN ISO 17025 for the determination of PFOS in whole fish samples. In the same analysis, other PFAS, namely short- and long-chain PFCA and PFSA and sulphonamides, are analyzed and quantified. In this study we have used the analytical method based on an extraction step QuEChERS and on a subsequent revelation step based on ultra-high performance liquid chromatography coupled with high resolution mass spectrometry (UHPLC-HRMS Orbitrap). In this way we were able to detect, confirm and quantify a pool of 18 target PFAS (PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnA, PFDoA, PFTTrDA, PFTeDA, PFBS, PFHxS,



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PFOS, PFDS, PFHpS, PFPeS, FOSA) on samples of striped dolphin's tissue.

The sets of tissue samples (blood, liver and muscle) were taken from 21 striped dolphins (*Stenella coeruleoalba*, Meyen 1833) stranded along Tuscany coast between 2020 and 2021. For each specimen date, exact localization of stranding, status of conservation of the dolphin and, when possible, total length, weight and sex were recorded.

PFOS, PFHxS and FOSA were found in all samples with PFOS blood concentration level ranging from some tens to some hundreds of $\mu\text{g}/\text{Kg}$.

The concentrations follow the trend $\text{PFOS} > \text{FOSA} > \text{PFHxS}$ and the PFOS concentration appears to be inversely proportional to the animals' mass, as reported in the most recent literature (6). The PFOS/FOSA blood concentration ratio has a threshold at about 20 Kg, with two distinct numerical intervals related to the age of the animals (younger or older than 1 yr).

PFNA, PFDA and PFUnA are the perfluorinated carboxylic acids (PFCA) that are present in greater concentrations in analyzed samples with maximum concentrations of few tens of $\mu\text{g}/\text{Kg}$.

The presence of these high concern substances in striped dolphins underlines a remarkable impact of anthropic activities on wildlife, and prompts further researches about the impact of PFAS on marine mammal conservation and health.

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