2023 CALL FOR TECHNICAL AND SCIENTIFIC CONSULTANCY OF THE PELAGOS AGREEMENT

Final Administrative Report

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General info:

Project title	Call 3 - ASSESSMENT OF CHEMICAL AND BIOLOGICAL POLLUTION STATUS IN THE SANCTUARY
Consultant(s)	Prof. Maria Crisitna Fossi Dr. François Galgani Dr. Matteo Baini
Duration of the consultancy (beginning – end)	December 2023-May 2025
List of the deliverables submitted (number of the deliverable, title and date of submission)	1- PRELIMINARY TECHNICAL REPORT (March 2024) 2- SECOND TECHNICAL REPORT (July 2024) 3- Final Report "ASSESSMENT OF CHEMICAL AND BIOLOGICAL POLLUTION STATUS IN THE PELAGOS SANCTUARY" (March 2025) 4- Booklet "Anthropogenic pollutants in the Pelagos Sancuary" (March 2025)

Abstract:

Anthropogenic pollution, which affects biodiversity, ecosystem functioning and human health, has become one of the major threats to marine ecosystems. Human activities, including industrial production, urbanisation and intensive agriculture, have resulted in widespread environmental releases of pollutants. These pollutants, including heavy metals, persistent organic pollutants (POPs), plastics and other chemicals, are accumulating in marine ecosystems and organisms, leading to severe ecological impacts. Marine pollution is of particular concern in semi-enclosed basins such as the Mediterranean Sea, where limited water exchange and high levels of anthropogenic pressure contribute to pollution levels. The Pelagos Sanctuary, an important habitat for several cetacean species, is highly affected by pollution due to its proximity to densely populated coastal areas, intense maritime traffic, and other human-induced stressors. For effective conservation and mitigation strategies, it is essential to understand the distribution, sources and impacts of these pollutants

The consultancy focused on assessing the status of chemical pollution in the Pelagos Sanctuary. The primary objective was to provide a scientifically grounded and spatially explicit evaluation

of contaminant distribution, identify potential exposure risks to marine mammals, and contribute to the development of effective management and mitigation strategies. This goal was achieved through the acquisition, integration and analysis of existing data derived from peer-reviewed scientific publications, technical reports, open-access databases (i.e. EMODNET, MSFD etc.), and previous national and international projects relevant to the study area.

The adopted methodology was based on a structured and multi-phase approach. An extensive bibliographic review was conducted to gather data on the presence and distribution of chemical pollutants and marine litter. These data were then critically screened and processed to enable spatial analyses. Subsequently, contaminant and risk maps were generated, including the elaboration of a Risk Exposure Index (REI) that combined contaminant concentrations (chemical substances and litter) with species-specific distribution and abundance data (provided by Call 1). This allowed for a spatially resolved assessment of potential exposure risk for cetaceans across the Sanctuary. The final phase involved the synthesis and communication of the results through the design and production of an information booklet, intended to support dissemination and stakeholder engagement.

The results highlighted a widespread and diffuse pattern of pollution throughout the Sanctuary, indicating that contaminant distribution is not confined to discrete areas but rather reflects a broader and more homogeneous spatial trend. This underscores the need for integrated management approaches that consider both coastal and offshore zones. The risk assessment revealed that species such as the striped dolphin (*Stenella coeruleoalba*) and bottlenose dolphin (*Tursiops truncatus*) are more likely to be affected by contamination due to their habitat preferences and proximity to anthropogenic sources, while other species like the sperm whale (*Physeter macrocephalus*) and fin whale (*Balaenoptera physalus*) appear less exposed, although data gaps in the offshore environments limit the robustness of this conclusion.

The comprehensive integration of data from multiple sources, including ongoing monitoring activities under the Marine Strategy Framework Directive (MSFD), allowed for a more holistic understanding of the environmental status of the Sanctuary. At the same time, the analysis identified significant spatial and thematic knowledge gaps, particularly in poorly monitored compartments, highlighting the urgent need for targeted field campaigns and improved monitoring protocols. The study further emphasized the importance of species-specific risk assessments, taking into account ecological traits, behavioural patterns, and interactions with environmental pressures across life stages and habitats.

Despite limitations linked to the lack of high-resolution data in certain areas, the methodology developed within this consultancy constitutes a valuable operational tool. It provides a flexible

platform capable of integrating new datasets and accommodating additional environmental stressors, such as underwater noise, emerging contaminants, and climate-related variables. The framework's potential for dynamic updating enhances its utility for long-term monitoring, early-warning systems, and scenario-based risk modelling.

In conclusion, the consultancy demonstrated that addressing pollution in the Pelagos Sanctuary requires a coordinated, science-based approach that integrates spatial information on contaminants and biota with risk assessment tools. The outcomes support the prioritisation of monitoring and mitigation efforts, and offer a solid basis for policy development and adaptive management strategies. The results reaffirm the need for a multi-faceted, ecosystem-based framework to ensure the conservation of biodiversity and the resilience of marine ecosystems within this vulnerable and ecologically significant area.

In the framework of a future call focusing on this topic, the next steps should aim to enhance and consolidate existing risk assessment frameworks by conducting a systematic analysis of the latest available data. A key objective will be to prioritise contaminants based on their persistence, bioaccumulative potential and ecotoxicological relevance, paying particular attention to substances that are currently unregulated. At the same time, efforts should be directed towards defining and refining compound-specific risk thresholds tailored to the ecological and physiological characteristics of the cetacean species found in the area. Despite the difficulty of obtaining long, robust time series, historical datasets should be explored to identify long-term trends in contaminant levels and assess potential seasonal variability in pollutant concentrations. Additionally, developing species-specific susceptibility matrices to different contaminants is essential for improving exposure assessments and supporting a more accurate, science-based evaluation of ecological risks. These steps should provide a robust foundation for prioritising future monitoring efforts and informing targeted conservation and management actions.