Venezia 2021

Programma di ricerca scientifica per una laguna "regolata"

Linea 2.1

Qualità del sedimento lagunare a supporto della sua gestione sostenibile

D2.1.1.3

Design sperimentale

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Sommario

La gestione dei sedimenti all'interno della laguna di Venezia, con la costruzione delle strutture morfologiche necessarie al contenimento dell'erosione e al mantenimento delle caratteristiche intertidali della laguna, è cruciale. Il problema principale nel processo pianificatorio consiste nel valutare il corretto riutilizzo dei sedimenti dragati, mantenendo la qualità e la biodiversità complessiva dell'ecosistema lagunare e dei servizi ecosistemici che esso fornisce, quali quelli legati alle attività produttive (ad es. allevamento di molluschi bivalvi).

In questo contesto, è in corso la revisione della normativa applicata in Laguna (il cosiddetto "Protocollo Fanghi" del 1993) da cui dipendono le scelte gestionali relative alla movimentazione del sedimento. La comunità scientifica è in grado di offrire un valido supporto alla nuova classificazione attraverso una serie di approfondimenti che permettono una corretta valutazione della qualità dei sedimenti, attraverso l'integrazione di diverse tipologie di indagine che valutino la reale mobilità e biodisponibilità degli inquinanti del sedimento di fondo.

Inoltre, sarà necessario considerare e valutare gli effetti che la messa in esercizio del MOSE potrà avere sulle dinamiche sedimentarie, sulla qualità del sedimento, sugli organismi e sulle attività produttive legate alla molluschicoltura.

Attraverso l'integrazione di diverse tipologie di indagini sperimentali e modellistiche, la Linea 2.1 ha come obiettivo fondamentale l'ottenimento di informazioni necessarie a supportare una gestione sostenibile dei sedimenti. A questo fine verranno ampliate le conoscenze sulla qualità del sedimento, sulle dinamiche che la determinano e influenzano, nonché sull'interazione con gli organismi lagunari.

La linea di ricerca, costituita da diverse indagini strettamente integrate tra loro, è strutturata in quattro workpackages:

WP2.1.1 "Inventario delle informazioni disponibili e determinazione dei valori di fondo";

WP2.1.2 "Valutazione della qualità dei sedimenti per fini gestionali legati alla loro movimentazione";

WP2.1.3 "Studio del sedimento lagunare come sorgente secondaria di contaminazione";

WP2.1.4 "Valutazione degli impatti della messa in funzione del MOSE sulla produttività delle aree di molluschicoltura della laguna di Venezia".

L'obiettivo della Deliverable 2.1.1.3 "Design sperimentale", pianificata nel WP2.1.1, Task2.1.1.3 "Design sperimentale a supporto di WP2-3-4" per il mese 4 (fine febbraio 2019), è quello di fornire una pianificazione dettagliata delle attività sperimentali dei WP2.1.2-3-4, allo scopo di supportare il superamento delle lacune conoscitive individuate nella Deliverable 2.1.1.2 "Inventario delle conoscenze disponibili" e il raggiungimento degli obiettivi pianificati nei WP2.1.2-3-4 (si veda la Descrizione delle Attività (DoA) di Venezia 2021).

A tal fine la deliverable è strutturata in tre capitoli, ognuno dei quali è dedicato alle attività sperimentali pianificate nei WP2.1.2, WP2.1.3 e WP2.1.4. Seguono infine delle brevi conclusioni.

Per quanto riguarda il WP2.1.2, come riportato nel Capitolo 2, non è stato possibile pianificare e descrivere le attività sperimentali a causa di una situazione di stand-by nelle attività di caratterizzazione pre-dragaggio da parte dell'Autorità Portuale di Venezia (APV). Tale situazione è dovuta alla discussione ancora in corso sulla revisione del cosiddetto "Protocollo Fanghi" (1993). Non appena questa situazione sarà sbloccata, la presente deliverable verrà aggiornata per includere il dettaglio delle attività sperimentali che verranno condotte nel WP2.1.2.

Per quanto riguarda il WP2.1.3, come riportato nel Capitolo 3, sono state definite le attività sperimentali per ciascuna delle due analisi incluse nel WP: lo studio dei processi all'interfaccia acqua-sedimento e lo studio della frazione fine del sedimento. Nello specifico, per lo studio dei processi all'interfaccia acqua-sedimento sono state individuate (in sinergia con le linee 2.2 e 3.3) cinque stazioni da campionare stagionalmente nei due anni per valutare le dinamiche e la diversità microbiche, e due stazioni da campionare, sempre stagionalmente, per valutare i flussi bentici e diffusivi. Per lo studio della frazione fine del sedimento verranno

invece individuate, in sinergia con il Tema 1, da due a quattro stazioni localizzate in aree caratterizzate da acque poco profonde e soggette a risospensione dei sedimenti. Tali stazioni saranno campionate stagionalmente mediante trappole di sedimentazione, ed i materiali sospesi raccolti ed adeguatamente trattati saranno caratterizzati dal punto di vista chimico-fisico ed ecotossicologico. Ulteriori campioni potranno essere eventualmente raccolti mediante campionamento della colonna d'acqua e successiva separazione del particolato sospeso mediante filtrazione o centrifugazione.

Per quanto riguarda il WP2.1.4, come riportato nel Capitolo 4, sono state individuate (in sinergia con la linea 5.2), quattro allevamenti di vongole (*Ruditapes philippinarum*) e due di mitili (*Mytilus galloprovincialis*) in cui campionare sedimento e biota prima della messa in funzione del MOSE (almeno tre volte in diverse stagioni) e durante il primo anno del suo funzionamento (almeno 4 volte). Su tali campioni verranno condotte le analisi già specificate nel DoA di Venezia 2021. Verranno inoltre posizionate due sonde multiparametriche e utilizzati dei biosensori che permetteranno di raccogliere informazioni su diversi parametri fisiologici e ambientali, come temperatura, salinità, ossigeno disciolto, tasso di filtrazione. I dati raccolti verranno correlati ai risultati ottenuti mediante analisi biochimiche, cellulari, molecolari e microbiologiche condotte su molluschi bivalvi di interesse commerciale (vongole *Ruditapes philippinarum* e mitili *Mytilus galloprovincialis*).

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1 Introduction

Sediment management in the lagoon of Venice, including the construction of morphological structures necessary to control erosion and to maintain the intertidal nature of the lagoon, is of crucial importance. The main problem related to the planning process is the evaluation of a proper reuse of dredged sediments, preserving the quality and the overall biodiversity of the lagoon ecosystem and of the ecosystem services that it provides, such as those linked to productive activities (e.g. shellfish farming).

In this context, the current legislation that regulates the management of dredged sediments in the lagoon (the so-called “Protocollo Fanghi”, 1993) is undergoing revision. The scientific community is able to provide a valuable support for the new classification of dredged materials, through a series of in-depth analyses aimed at a correct evaluation of sediment quality. This will be accomplished through the integration of different methods of investigation, capable to evaluate the actual mobility and bioavailability of sediment contaminants.

Moreover, it will be necessary to take into account and evaluate the effects that the commissioning of the MOSE system might have on sediment dynamics and quality, on organisms and on productive activities related to shellfish farming.

Through the integration of different methodologies for both experimental and modelling research, the primary objective of line 2.1 is to obtain the necessary information to support a sustainable management of sediments. To this end, this research line is expected to achieve a deeper knowledge on sediment quality, on the dynamics that determine and influence quality itself, as well as on sediment interaction with lagoon organisms.

The research line is structured into the following four workpackages (WPs):

WP2.1.1 “Inventario delle informazioni disponibili e determinazione dei valori di fondo”;

WP2.1.2 “Valutazione della qualità dei sedimenti per fini gestionali legati alla loro movimentazione”;

WP2.1.3 “Studio del sedimento lagunare come sorgente secondaria di contaminazione”;

WP2.1.4 “Valutazione degli impatti della messa in funzione del MOSE sulla produttività delle aree di molluschicoltura della laguna di Venezia”.

The goal of Deliverable 2.1.1.3 “Design sperimentale”, planned in WP2.1.1, Task2.1.1.3 “Design sperimentale a supporto di WP2-3-4” by month 4 (end of February 2019), is to provide a detailed planning of the experimental activities of WP2.1.2-3-4, with the aim to support addressing the knowledge gaps identified in Deliverable 2.1.1.2 “Inventario delle conoscenze disponibili” and the objectives planned in WP2.1.2-3-4 (see Description of Activities (DoA) of Venezia 2021).

To this end the deliverable is structured into three chapters, each of them describing in details the experimental activities planned in WP2.1.2, WP2.1.3 and WP2.1.4, respectively. Then, a short conclusion section follows.

2 Design of experimental activities aimed at investigating the quality of sediment to support their management

WP2.1.2 has the following objectives: i) the implementation of suitable experimental activities in lagoon waterways that will be subject to dredging, in order to complete the current knowledge on sediment quality, according to different aspects or "lines of evidence" (chemistry, bioavailability/bioaccumulation, ecotoxicology, genomic, biomarkers); ii) the integration of data and information (both from the literature and from experimental activities) through the Weight of Evidence approach, in order to evaluate sediment quality through a risk assessment procedure.

Therefore, the results of this WP will allow to support the experimentation and implementation of the new legislation on sediment management.

As reported in the Description of Activities (DoA) of Venezia 2021, experimental activities foreseen in WP2.1.2 concerns the sampling of sediment cores (1 m depth) from waterways in the lagoon of Venice, followed by specific chemical and ecotoxicological analysis to be performed by UNIVE and UNIPD. Sampling campaigns were planned in winter 2018 and winter 2019, to be preferably carried out in synergy with on-going dredging activities by APV (Autorità Portuale di Venezia). To this end, in December 2018 APV was contacted to investigate their willingness to collaborate on this specific task and to agree about sampling sites and dates in the period from beginning of January to end of March 2019. APV fully supported the idea of collecting additional sediment cores for WP2.1.2 during their characterization campaigns (which are usually performed before starting any dredging activity), however, they could not provide any plan for the indicated period due to a stand-by in characterization activities caused by the on-going discussion regarding the revision of the so-called "Protocollo Fanghi" (1993). This stand-by situation is still existing and, if it will not be solved before the end of March 2019, the first WP2.1.2 sampling campaign will be postponed to the period from October 2019 on. In fact, due to specific constraints related to the growth of biota to be used by UNIPD for ecotoxicological and bioaccumulation testing (see T2.1.2.4-6 for details), such analysis cannot be performed in the period from April to September.

As soon as this situation will be solved, this deliverable will be updated by reporting all the details regarding the experimental activities that will be performed in WP2.1.2.

3 Design of experimental activities aimed at investigating sediment as secondary source of contamination

WP2.1.3 includes two specific in-depth analyses: i) a study about the processes at the water-sediment interface with the aim to deepen the knowledge (also in relation to the commissioning of MOSE system), about the role of sediment as a secondary source of contamination and as modifying factor for food web; and ii) a study about the ultrafine fraction of sediment (below 4 μm) with the aim to understand its role in in the overall quality of the aquatic compartment.

Accordingly, specific experimental activities have been planned for each of these two in-depth analyses, as presented in the following paragraphs.

3.1 Investigating processes at the water-sediment interface

Microbial dynamic and diversity

Five stations will be sampled seasonally for two years to assess microbial dynamics and diversity. The stations are located in 3 different sub-basins: station 5-Palude della Rosa (sub-basin T, 45°29'.952 N - 12 °25'.043E also sampled by task 3.3.4.1 and 3.3.4.2), station 2-Porto Marghera (sub-basin L, 45 ° 27'.426 N- 12 ° 15'.670 E, also sampled by task 3.3.4.1 and 3.3.4.2) Tresse and Sacca Sessola (sub-basin L, also sampled by task 2.2.4.1) and station 15-Chioggia (sub-basin C, 45 °13'.938 N- 12 °17'.184E also sampled by task 3.3.4.1 and 3.3.4.2) (Figure 1).

Figure 1: Sampling stations for investigating the processes at the water-sediment interface.

The stations were chosen in order to cover at least three different sub-basins of the Venice lagoon (St. 5, 2, 15) all characterized by stability or deposition according to Zonta et al. (2018). St.2 (Marghera) and St.5 (Palude della Rosa) are historical stations that have been sampled for understanding and quantifying the

industrial anthropic impact (vs less impacted area Palude della Rosa) on the lagoon ecosystem. The data derived from St. 15, in the southern basin, will extend our knowledge in terms microbial diversity and dynamics at the water-sediment interface. The area of Tresse and Sacca Sessola have been chosen since they are characterized by high concentration of Hg according to Zonta et al. (2018). They represent hot-spots of persistent contamination and this study will provide novel information on the diversity, dynamic and metabolism of these microbial communities over the timespan of the project. The data will enhance our understanding of the behaviour of the contaminated microbial communities at the water-sediment interface during the MOSE functioning (e.g. decrease in hydrodynamism).

The upper sediment (0-1 cm) will be sampled by coring or van Venn grabs and processed accordingly for abundance and metaG analyses. Sterile spatulas and minicores will be used to subsample the sediment in triplicates.

On board, part of the sediment will be frozen in dry-ice to preserve DNA (~5-10 g per triplicate). In the laboratory (OGS), DNA will be extracted from the sediment using the commercially available kit for high-yield soil-sediment extraction and then quantified. The DNA will be then sent to the sequencing facility to get metagenomic data.

On board, part of the sediment for microbial abundance analysis will be fixed with a solution of 0.22 µm filtered seawater with 4 % formaldehyde solution (~ 2 cc of sediment per triplicate) and kept cold until further processing within 24 hours. The samples will be washed and resuspend in a 1:1 solution of 1X PBS and ethanol for longer storage. In OGS, the samples will be processed following the protocol for estimating cell abundance in the sediment (Lunau et al., 2005).

On board, samples for grain-size analysis and humidity will be collected (~5 cc of sediment) and analyzed in OGS.

The first sampling campaign has been done this February 2019.

Nutrient and dissolved organic carbon fluxes

Two stations will be sampled seasonally, capitalizing the sampling scheme of Task 2.2.4.1 to assess the benthic and the diffusive fluxes. These stations are located in the L sub-basin Tresse and Sacca Sessola (sampled by task 2.2.4.1). Within the activity of Task 2.2.4.1, benthic chambers will be deployed and sediment cores (6 cm diameter, 2-3 cores) will be collected. Nutrients and dissolved organic carbon (DOC) will be sampled from the benthic chamber along a time series (~4-6 hours; T initial, T intermediate, T final) and from the overlaying water and pore water of the sediment cores (~0-1 cm and 1-2 cm). DOC and nutrient samples will be kept frozen until further analysis in OGS. Task 2.2.4.1 will provide the oxygen consumption data from the benthic chambers.

The task 2.1.3.1 will generate data on microbial dynamics and diversity (metagenomic-based 16S) and putative functional genes (metagenomic-based gene prediction) that are related to contamination (for instance heavy metals, antibiotics, persistent organics) and pathogenicity over two years (4 seasons) in 5 stations in the Venice lagoon. This data set will be integrated with size-grain data and contamination data (from literature) in order to generate a "contamination map" with a time dimension of the water-sediment interface based on the microbial fingerprint (diversity and putative functional gene).

The benthic chamber- and flux-based data coupled with the microbial dynamics and diversity will deepen the understanding on the water-sediment interface as a hot spot of activity in time and in contaminated areas.

3.2 Investigating the ultrafine fraction of sediment

The following experimental procedures will be adopted to sample and characterize the fine and ultrafine fractions of the lagoon sediment.

Sampling:

The collection of suspended materials in water bodies is usually carried out by two different methods: 1) a time-integrated sampling by sedimentation traps placed on the surface of bottom sediments, 2) water sampling, followed by the separation of suspended particles through filtration or centrifugation.

The sampling activities will be carried out in shallow-water areas affected by resuspension and will adopt mostly the first method, which is designed to provide time-integrated samples, in an adequate quantity for the subsequent analysis. Sampling will be programmed and carried out at two to four sampling sites in accordance with Theme 1, in different seasons. Sites with different levels of contamination will be chosen.

Additional samples will be eventually collected according to the second method, in case of events that will cause the resuspension of great quantities of materials, such as for example floods or strong wind conditions.

Experimental design:

The particulate matter collected in sedimentation traps will be wet sieved at 1 mm (or to a lower grain-size if possible) to remove coarser materials, homogenized and analyzed for grain-size distribution by laser diffraction (Mastersizer3000).

The obtained sample will then be used to prepare the "Suspended particulate phase" (SPP) according to the procedure proposed in USACE (2016). Specifically, the sample will be mixed with reconstructed marine water in a ratio 1:4 on a volume basis and subject to rotational agitation for 30 minutes at room temperature. This procedure is deemed to be more suitable than conventional batch stirring, in which particles are more likely to attach to the container walls. At the end of the agitation period, the mixture will be allowed to settle for 1 hour. Then the supernatant (SPP), containing the liquid and the material remaining in suspension, will be collected by siphoning off without disturbing the settled material.

Aliquots of the SPP thus obtained will be subject to centrifugation under different conditions (i.e. different Rotation Per Minute - RPM), and the supernatants will be collected to obtain a series of operationally-defined SPP sub-samples, which will be characterized and subject to ecotoxicity testing.

Particles remaining in the pellets after centrifugation or particles obtained by membrane filtration of SPP samples will be also characterized.

SPP and solid samples characterization:

The sedimentation rate of the ultrafine particulate contained in SPP samples will be determined by analytical centrifuge (LumiSizer), while the dimensional characterization will be carried out by laser diffraction analysis (Masterisizer).

Different techniques will be applied to solid samples, for morphological/mineralogical analysis (SEM, XRD) and grain-size analysis (Laser diffraction, Masterisizer). These analyses will be carried out both on samples as such and after appropriate chemical treatment for the removal of organic matter.

The ability of fine and ultrafine particles to absorb pollutants will also be analyzed and quantified using spectroscopic, thermogravimetric and mass spectrometric techniques.

Ecotoxicological assays:

SPP samples, appropriately diluted in order to obtain a range of particle concentrations, will be subject to ecotoxicological assays, using the bioluminescence inhibition test with *Aliivibrio fischeri*. Based on the results of the Microtox test (i.e. occurrence of acute effects towards bacteria) it will be also taken into consideration the application of the larval development test with bivalves that play a fundamental role in the lagoon ecosystem (*Crassostrea gigas* or *Mytilus galloprovincialis*).

4 Design of experimental activities aimed at investigating the potential effects of MOSE on productive activities related to shellfish farming

The experimental activities here described will support WP2.1.4 that aims to investigate the potential effects that the commissioning of the MOSE system might have on the ecosystem and on productive activities related to shellfish farming. To this end, relevant physiological parameters in bivalve molluscs as well as environmental parameters will be measured before and during the first year of MOSE's commissioning. In addition, cellular, biochemical, molecular and microbiological analyses will be carried out on clams collected in the farming area of Chioggia. Generated data will then be integrated through a Weight of Evidence-based methodology to be developed in WP2.1.2. Obtained results will allow us to provide a global evaluation of MOSE impacts on shellfish farming.

4.1 Sampling activities

The experimental activities will be performed in synergy with the research activities reported in 5.2 (Prof. Roberto Pastres). As reported in Figure 3, a total of 4 clam (*Ruditapes philippinarum*) and 2 mussel (*Mytilus galloprovincialis*) farming sites will be investigated.

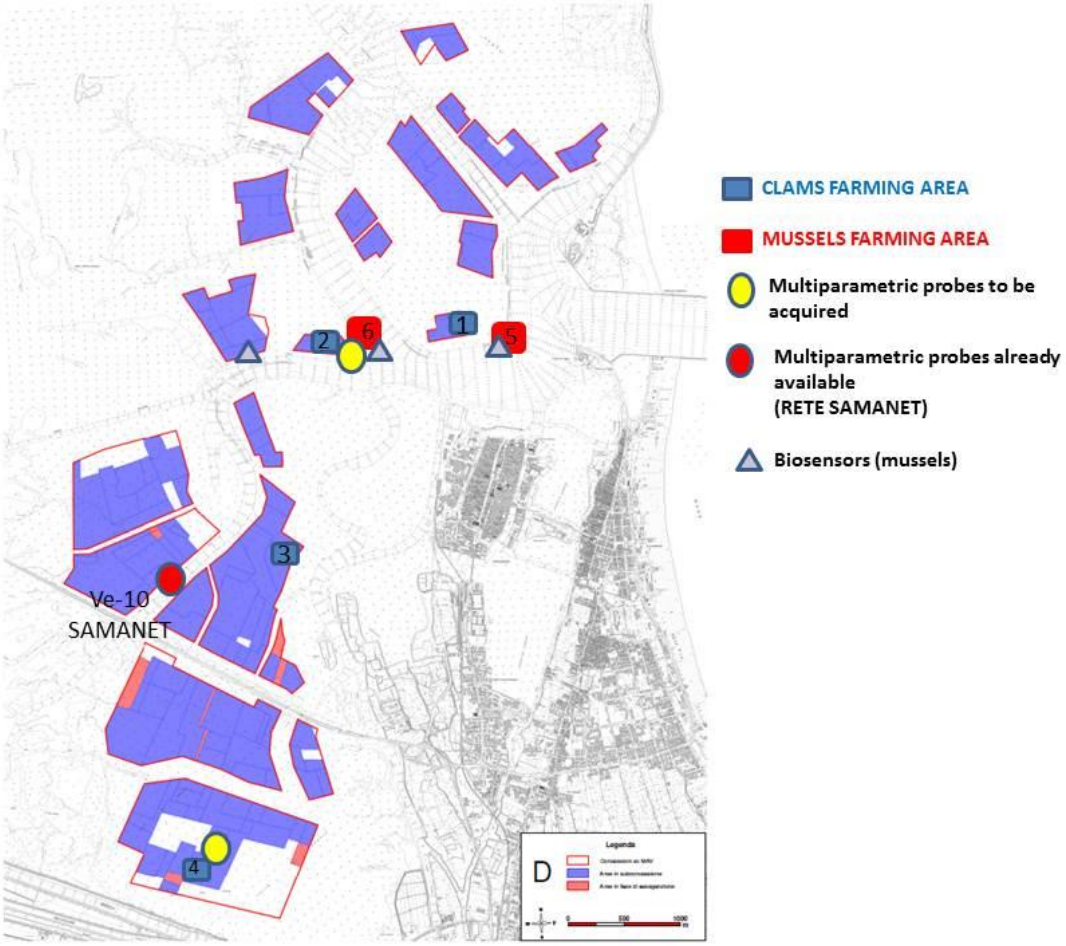

Figure 3. Map reporting the sampling sites. Sites 1-4 and 5-6 refer to clams (*R. philippinarum*) and mussels farming areas that will be investigated, respectively. Biosensors will be also applied in three different mussels farming sites (indicated as triangles in the map).

Sampling activities will start on July 2019 and will be performed before (at least 3 sampling times in different seasons) and during the first year of MOSE's commissioning (at least 4 sampling times). The exact sampling periods will be defined once it will be clear when the MOSE will enter into function. A multiparameter probe will be placed close to the clam farming site 2. In addition, depending on quotation and available budget, a second multiparameter probe will be placed close to the clam farming site 4. Multiparametric probes will allow us to measure in continuous environmental parameters such as temperature, salinity, pH, turbidity, Chlorophyll a and Dissolved Oxygen. Biochemical, cellular, molecular and microbiological analyses performed in clams and mussels will be correlated to each environmental parameter.

At each sampling time/site a total of approximately 200 clams/mussels will be collected and transferred to the Department of Biology (University of Padova) and to the Stazione Idrobiologia (Chioggia, University of Padova). From each animal the digestive gland, gills and haemolymph will be taken for transcriptional, biochemical and microbiological analyses. In addition, animal pools will be composed to carry out chemical analyses to determine the concentrations of heavy metals, organotin compounds, polycyclic aromatic hydrocarbons (PAHs), hexachlorobenzene (HCB), dioxins (PCDD/Fs)and hydrocarbons in the soft tissues of animals. During the sampling the main environmental parameters will be recorded (e.g. temperature, salinity, oxygen, pH). Sediments will be also collected for chemical analyses.

4.2 Biosensors

Mussels-biosensors provided by the Royal Netherlands Institute for Sea Research (NIOZ) will be also employed within three different mussel farming areas (Figure 3). Biosensors (see Figure 4) will be able to measure in continuous environmental and physiological parameters such as temperature, pressure (depth) and valve opening as a proxy for filtration rate in three mussel farming areas located at different distances from MOSE gates installed at Chioggia inlet. Data collected by biosensors at site 5 and 6 will be correlated to biochemical, cellular, molecular and microbiological analyses performed in mussels.

Figure 4. Biosensors that will be employed within mussels farming areas indicated in Figure 3.

4.3 Chemical analyses

Chemical analyses in clams/mussels soft tissues will be performed by UNIPD as external service to reveal organotin compounds, Polycyclic aromatic hydrocarbons, Hexachlorobenzene, polychlorinated biphenyls (PCB), dioxins and furans (PCDD/Fs). Chemical analyses to reveal heavy metals in clams/mussels and sediments will be performed by the Department of Environmental Sciences, Informatics and Statistics of the University of Venice. Additional sediments chemical analyses to detect Polycyclic aromatic hydrocarbons, Hexachlorobenzene, polychlorinated biphenyls (PCB), dioxins and furans will be evaluated according to available budget.

4.4 Biochemical analyses

The biochemical analyses will be focused on clams collected in the 4 investigated sites, and in mussels collected at site 5 and 6 (Figure xxx). For each sampling time, cellular and biochemical analyses will be performed in a total of 5 pools for each sampling time/site. Cellular and biochemical analyses will be performed in different tissues of animals (digestive gland, gills and haemolymph) by measuring different biomarkers, indicative of neurotoxicity (acetylcholinesterase), oxidative stress (antioxidant enzymes), oxidative damage (lipid peroxidation), and immunosurveillance. In particular, of the immunomarkers, the number of circulating haemocytes and the volume and diameter of the haemocytes will be measured; the stability of cell membranes, the activity of hydrolytic enzymes and cell proliferation will also be evaluated in haemocytes. The potential neurotoxicity of the contaminants will also be assessed by measuring the degree of inhibition of acetylcholinesterase (AChE) in the gills. Furthermore, in the gills and in the digestive gland, the activity of important antioxidant enzymes will be evaluated, such as superoxide dismutase (SOD) and catalase (CAT).

4.5 Transcriptomic and microbial community structure

Transcriptomic and microbial communities characterization will be performed on 5 replicates for each condition (6 sites) and sampling time (7 times comprising before and during the first year of MOSE's functioning).

The transcriptomic analyses will be performed starting from RNA extracted from the digestive gland. After quantification and quality control of the extracted RNA, genomic libraries will be prepared and sequenced by Illumina technology. Molecular analyses will be aimed at identifying possible molecular modifications due to changes in different environmental parameters. The transcriptomic profiles will also be correlated with the chemical concentrations detected in the sediment and in the animals. The transcriptomic data will constitute a specific "transcriptomic" line of evidence for the determination of the risk associated with the activities of MOSE.

Microbial communities characterization will be carried out on sediment samples (3 replicates for each site / time) and on gills and digestive gland of the clams (5 replicates for each site / sampling time). This will allow to characterize the modifications of the microbiota and to relate them to possible modifications in the environmental parameters. Genomic libraries will be prepared after amplification of the coding gene for the 16S ribosomal subunit. The libraries will subsequently be sequenced by Illumina technology and analysed using software already available at the Department of Comparative Biomedicine and Nutrition (UNIPD).

Conclusions

This deliverable provides a detailed planning of the experimental activities of WP2.1.3 and 4, with the aim to support addressing the knowledge gaps identified in Deliverable 2.1.1.2 “Inventario delle conoscenze disponibili”, and the objectives planned in WP2.1.3 and 4 (see Description of Activities (DoA) of Venezia 2021).

As only deviation from the DoA, experimental activities in WP2.1.2 could not be planned and described due to a stand-by situation in characterization activities by APV caused by the on-going discussion regarding the revision of the so-called “Protocollo Fanghi” (1993).

As soon as this situation will be solved, this deliverable will be updated by reporting all the details regarding the experimental activities that will be performed in WP2.1.2.

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