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Call for proposal 2019 Strategic

MARLESS (MARine Litter cross-border awarenESS and innovation actions)

Priority Axis: Environment and cultural heritage; Specific objective: 3.3 - Improve the environmental quality conditions of the sea and coastal area by use of sustainable and innovative technologies and approaches

D3.2.2 Methodology report with the add of the new approaches and standardization protocols

Activity 3.2.2

WP 3

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PROJECT MARLESS

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Contents

1. Monitoring methodology applied in MARLESS project

In the framework of Marless Italia-Croatia Interreg project the following parameters were investigated: abundance and composition of marine litter, Specific methodology was used in the MARLESS project modifying and following the methods of monitoring and analysis described in: Galgani et al. (2013): Guidance on Monitoring of Marine Litter in European Seas. MSFD Technical Subgroup on Marine Litter (TSG-ML) European Commission, OSPAR (2010): Guidelines for Monitoring Marine Litter on the Beaches in the OSPAR Maritime area, NOOA (2013): Marine Debris Monitoring and Assessment: Recommendations for Monitoring Debris Trends in the Marine Environment, while considering the UNEP/MAP MEDPOL (2013): Monitoring Guidance Document on Ecological Objective 10: Marine Litter. By implementing the same guidelines, a high level of consistency and data quality was secured. All applied methodology is described in the D 3.1.3 Agreement on a method to use.

2. Finding beaches with the same morphology and typology: A major challenge in monitoring beach marine litter

Marine litter monitoring at the beach is essential for understanding the sources and impacts of marine litter and for developing effective mitigation strategies. However, one of the biggest challenges in monitoring marine litter on beaches is finding beaches that share the same morphology and typology. The most common problem encountered during the MARLESS project was finding beaches that matched the same characteristics in terms of typology (sand, gravel, etc.) and morphology (length and width) of the selected beaches. Beach morphology refers to the physical structure of a beach, including its slope, shape, and size, where beach typology refers to the type of beach, e.g., sandy beach, pebbly beach, or rocky beach. Beaches with different morphology and typology may have different levels of marine litter, making it difficult to compare data from different beaches. There are a number of reasons why it can be difficult to find beaches with the same morphology and typology. First, beaches are dynamic systems that are constantly changing due to natural processes such as waves, tides, and currents. This means that the morphology and typology of a beach can change over time. Second, beaches can differ greatly in their characteristics, even within the same region. For example, two sandy beaches in the same region may have different slopes, shapes, and sizes.

When selecting beaches for marine litter monitoring, it is important to ensure that the beaches represent the region. This means selecting beaches with a variety of morphologies and typologies, as well as beaches that are located in different areas of the region.

There are some reasons why it is important to select beaches for marine litter monitoring that are representative of the region:

- To identify the most common types of marine litter in the region. Different regions have different sources of marine litter. For example, beaches in regions with a lot of shipping traffic may have more marine litter from ships, while beaches in regions with a lot of recreational activites may have more marine single use plastic litter. By monitoring beaches in different regions, we can identify the most common types of marine litter in each region.
- Identify areas with the highest levels of marine litter pollution. Marine litter pollution can vary greatly within a region. For example, beaches in areas with strong currents may have higher levels of marine litter pollution than beaches in areas with weaker currents. By

monitoring beaches in different regions, we can identify areas with the highest levels of marine litter pollution.

- Identify trends in marine litter accumulation over time. Marine litter accumulation can change over time due to a variety of factors, including changing consumption patterns, changing litter management practices, and climate change. By monitoring beaches in different regions over time, we can identify trends in marine litter accumulation.

Once the beaches for monitoring have been selected, it is important to develop a standardized monitoring protocol. Following these suggestions can overcome the challenge of finding beaches with the different morphology and typology for monitoring marine litter on the beach. In this way, meaningful data can be collected that can serve as the basis for effective mitigation strategies.

3. Improving Floating Macro and Microlitter monitoring: The monitoring of the two parameters together on the same transect

Monitoring of floating macro- and micro-litter is essential for understanding the sources and impacts of marine litter and for developing effective strategies to mitigate pollution. However, traditional monitoring methods are often time consuming and expensive.

One way to improve the efficiency and effectiveness of marine macro- and microlitter monitoring is to monitor both parameters together on the same transect. A variety of methods can be used to accomplish this, including visual surveys, net trawls, and manta trawls.

Advantages of joint monitoring of floating macro- and micro-litter on the same transect:

- Improved efficiency: monitoring both parameters together on the same transect can save time and resources.
- Better understanding of the relationship between macro- and microlitter: monitoring both parameters together can provide insight into the relationship between macro- and microlitter. For example, if macro- and microlitter are found to be correlated, this may indicate that macro- and microlitter share common sources.
- More accurate data: Monitoring both parameters together can help ensure that data are more accurate and representative. For example, if macro- and micro-litter are monitored separately, there is a risk that too many or too few samples will be collected in some areas.

Challenges of monitoring macro- and micro-litter together on the same transect:

- Different sampling methods may be required: Macro- and microlitter may require different sampling methods. For example, visual surveys may be used to monitor macrolitter, while net trawls or manta trawls may be used to monitor microlitter.
- Data analysis can be more complex: Monitoring both parameters together can generate a large amount of data. Analysis of this data can be complex and may require specialized software.
- Training may be required: Personnel may need to be trained in the use of the various sampling methods and data analysis software.

Methods for monitoring floating macro- and micro-litter on the same transect:

- Visual surveys: Visual surveys can be used to monitor macrolitter. Personnel walk or boat along a transect and record any macrolitter they see.
- Manta Trawls: Manta trawls can be used to monitor both macro and micro litters. A manta trawl is a large net towed aside a boat along a transect. All macro- and micro-litter caught in the net is collected.

Data collected from aquatic macro- and microlitter monitoring can be analyzed using a variety of methods, descriptive statistics can be used to summarize the data and spatial analysis can be used to map the distribution of macro and micro litter and identify areas of high pollution.

Monitoring macro- and microlitter together on the same transect can improve the efficiency and effectiveness of macro- and microlitter monitoring. However, there are some challenges that need to be considered, such as the need for different sampling methods and the need for training.

4. Using a flowmeter when sampling surface microlitter to avoid data misinterpretation and improve accuracy

Microlitter is a growing concern in marine ecosystems, and it is important to accurately monitor its abundance and distribution. However, traditional sampling methods, such as visual surveys and net tows, can be inaccurate, especially for small microlitter items. One way to improve the accuracy of microlitter monitoring is to use a flowmeter. A flowmeter measures the volume of water that passes through a given area over a certain period of time. This information can be used to calculate the amount of microlitter that is present in the water.

Benefits of using a flowmeter when sampling surface microlitter

- Improved accuracy: Flowmeters provide a more accurate measure of microlitter abundance than traditional sampling methods. This is because flowmeters measure the volume of water that is sampled, whereas traditional methods often only measure the area that is sampled.
- Reduced data misinterpretation: Flowmeters can help to reduce data misinterpretation by providing a more accurate measure of microlitter abundance. This is important because microlitter can be difficult to identify and quantify visually.

Challenges of using a flowmeter when sampling surface microlitter

- Cost: Flowmeters can be expensive to purchase and maintain.
- Training: Personnel may need to be trained in using flowmeters and collecting data accurately.
- Data analysis: Data collected by flowmeters is difficult to analyze and compare with data obtained by other methods.

The data collected from flowmeters can be analyzed using a variety of methods, such as descriptive statistics, inferential statistics and geospatial analysis. Using a flowmeter when sampling surface microlitter can improve the accuracy and efficiency of microlitter monitoring. This can help to reduce data misinterpretation and provide more reliable information about the abundance and distribution of microlitter in marine ecosystems.

5. Bottom litter monitoring with scuba divers during volunteer eco actions: A cost-effective and efficient approach

Bottom litter monitoring is essential for understanding the sources and impacts of marine litter, and for developing effective mitigation strategies. However, traditional bottom litter monitoring methods, such as trawls and grab samplers, or dedicated diving surveys can be expensive and time-consuming, and can only cover small areas.

One way to make bottom litter monitoring more cost-effective and efficient is to involve scuba divers during volunteer eco actions. Scuba divers can quickly and easily survey large areas of the seabed for litter, and they can collect litter items that would otherwise be difficult or impossible to sample with traditional methods.

Benefits of monitoring bottom litter with scuba divers during volunteer eco actions

- Cost-effective: Scuba divers can volunteer their time to monitor bottom litter, which can significantly reduce the cost of monitoring programs.
- Efficient: Scuba divers can quickly and easily survey large areas of the seabed for litter.
- Comprehensive: Scuba divers can collect litter items that would otherwise be difficult or impossible to sample with traditional methods.

Challenges of monitoring bottom litter with scuba divers during volunteer eco actions

- Safety: Scuba diving can be dangerous, and it is important to ensure that all divers are properly trained and equipped.
- Data quality: It is important to train volunteers in how to collect and record data accurately.
- Consistency: It is important to ensure that monitoring surveys are conducted in a consistent manner so that data can be compared over time.

How to monitor bottom litter with scuba divers during volunteer eco actions

To monitor bottom litter with scuba divers during volunteer eco actions, follow these steps:

1. Recruit and train volunteers. Volunteers should be properly trained in scuba diving and in how to collect and record data accurately.
2. Select a monitoring site. The monitoring site should be representative of the area that you are monitoring.
3. Develop a monitoring protocol. The monitoring protocol should specify the methods that will be used to collect and record data.

4. Conduct the monitoring survey. Divers should swim along a transect and collect all litter items that they see.
5. Record the data. Divers should record the type, quantity, and location of all litter items that they collect.
6. Analyze the data. The data collected from the monitoring survey can be analyzed to identify trends and patterns. The data can also be used to test hypotheses about the sources and impacts of marine litter.

Monitoring bottom litter with scuba divers during volunteer eco actions is a cost-effective and efficient approach to collecting data on the abundance and distribution of bottom litter. This data can be used to inform the development of effective mitigation strategies to reduce marine litter pollution.

6. Mussels as bioindicators of microlitter in marine organisms

Mussels (eg. *Mytilus galloprovincialis*) are good organisms to use to monitor microlitter in marine organisms because they are:

- Widely distributed: Mussels are found in all oceans and in a variety of habitats, including coastal waters, estuaries, and rivers. This makes them a good choice for monitoring microlitter in different parts of the world.
- Sessile: Mussels are sessile organisms, meaning that they attach to a surface and stay in one place for most of their lives. This makes them easy to collect and sample.
- Filter feeders: Mussels are filter feeders, meaning that they filter food particles from the water. This means that they are constantly exposed to microlitter in the water column.

Using mussels to monitor microlitter in marine organisms has a number of benefits, including:

- Cost-effectiveness: Mussels are a relatively inexpensive organism to collect and sample.
- Efficiency: Mussels can filter a large volume of water in a short period of time, making them an efficient way to collect microlitter samples.
- Accuracy: Mussels are known to accumulate microlitter particles in their tissues, making them a reliable indicator of microlitter pollution in the marine environment.

One of the main challenges of using mussels to monitor microlitter in marine organisms is that mussels can also accumulate other pollutants, such as heavy metals and organic chemicals. Another challenge is that the amount of microlitter that mussels accumulate can vary depending on a number of factors, such as the size of the mussels, the species of mussel, and the location of the mussels. This means that it is important to carefully design the monitoring study to ensure that the data collected is representative of the marine ecosystem being monitored.

Using mussels to monitor microlitter in marine organisms is a cost-effective, efficient, and accurate way to collect data on the abundance and distribution of microlitter in the marine environment. This data can be used to inform the development of effective mitigation strategies to reduce marine litter pollution.

LITERATURE:

Commission, Ospar. 2010. “Guideline for Monitoring Marine Litter on the Beaches in the OSPAR Maritime Area.”

Galgani, F., G. Hanke, S. Werner, L. Oosterbaan, P. Nilsson, D. Fleet, S. Kinsey, et al. 2013. “Monitoring Guidance for Marine Litter in European Seas.” *MSFD GES Technical Subgroup on Marine Litter (TSG-ML). DRAFT REPORT, 120p*. https://agris.fao.org/agris-search/search.do?recordID=ES2022B04066.

Lippiatt, S., S. Opfer, and C. Arthur. 2013. “Marine Debris Monitoring and Assessment: Recommendations for Monitoring Debris Trends in the Marine Environment.” repository.library.noaa.gov. https://repository.library.noaa.gov/view/noaa/2681.

Litter, Msfd Technical Subgroup. 2013. “Guidance on Monitoring of Marine Litter in European Seas.” European Commission . https://doi.org/10.2788/99475.