

Recommended Operating Procedure (ROP)

Aim of ROP (tick box)

- | | |
|---|---|
| <input type="checkbox"/> Munition detection or identification | <input type="checkbox"/> Toxicity |
| <input checked="" type="checkbox"/> Sampling | <input type="checkbox"/> In situ exposure studies |
| <input type="checkbox"/> Chemical analysis | <input type="checkbox"/> Bioassays |
| <input type="checkbox"/> Bioindicators/biomarkers | |

2. Sediment sampling with ROV

version 1.0

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Scope

Sediment samples are needed for various studies from different kinds of sea areas, and the sampling methods are also varying accordingly. This ROP describes the precise sediment sampling with an ROV attached sampler for the analysis of explosives, chemical warfare agents (CWAs) and their degradation products. This procedure allows collecting sediment samples directly next to detected objects and at selected distances to them.

Summary of the method/ROP

The samples are to be taken with a special sediment sampler attached to the remotely operated vehicle (ROV). This action aims to have surface sediment samples, collected precisely in the selected point(s) placed near to the detected objects. This technique allows performing transect sampling to determine the concentration of CWAs in sediments as the distance relative to the source increases. Collected samples will be mixed due to sampler characteristics and movements of the ROV platform. After sampling, the sediment is to be placed in plastic containers, marked, and stored in a freezer (at least -20 °C) until further analysis in the laboratory. Persons responsible for the transfer of samples from sampler to the storage containers must be experienced enough to ensure the quality of the samples. Also, the ROV pilot must avoid contact of the vehicle with a detected object(s).

Safety aspects

For sampling, normal research vessel safety rules should be applied. If sampling is directly next to detected munition objects, special restrictions on operating within the area will apply. The ROV platform (especially sampling containers) should be prescreened with a CWA detector (e.g. FID based) prior to the opening of the sampler containers. The person doing the prescreening should wear special safety equipment, including protective clothes, long-stemmed gloves (preferably made out of butyl rubber), rubber boots, and full-face breathing masks equipped with CWA-suitable filters (fig. 1 and 2). If prescreening is not available or CWAs were detected on the ROV, all the persons who will take part in sampling operation or otherwise have to be present on the deck during handling of the sediment should wear similar safety equipment.



Fig. 1 & 2. Sediment sampling with protective clothes, gloves and breathing masks

All sediment samples must be handled as if they contained high amounts of toxic CWAs. All equipment used in the sampling procedure must be rinsed with water and decontaminant solution.

Documentation

Position, date, time, and depth of the sampling must be recorded. Since the ROV position is different than the ship, ROV position, based on acoustic navigation (ie. USBL) should be used. Additionally, the person(s) who transfers sediments from the sampler to containers, the ROV pilot, and the institute responsible for the sampling should be recorded. Each sample container should have at the minimum the following information/code: unique number, station name, depth, and date. Samples codes and other mentioned information must be recorded electronically (e.g. Excel sheet) as well. The sample codes in the table must be identical with the container markings so that every sample can be tracked. For marking the containers, always use a permanent marker to avoid mixing the samples. The electronic samples list should be sent with the samples for analyzing the laboratory.

The electronic sample list should also include ship name, area name, cruise ID, and station ID, in addition to the abovementioned minimal info for fast recognition.

Additionally, basic hydrography such as water temperature, salinity, oxygen, and Secchi depth at the sampling location is recommended to be measured. (No wind info needed for the ROV.) The sediment quality/composition of the samples is to be analyzed visually.

Methods

Equipment:

1. Research vessel with the ability to work with the ROV platform¹
2. Ship winch or crane¹

3. ROV equipped with sediment sampler, video camera, lights, and acoustic sonar (preferably BlueView) (fig. 3)¹
4. Underwater navigational system (e.g. USBL) for precise positioning of the ROV¹
5. DGSP (or other precise GNSS system)¹
6. Plastic containers for storage of the collected sediment samples
7. Freezer that can hold a temperature of at least - 20°C
8. Spatula for transferring the sediments from sampler to container
9. CWA detector (e.g. FID based)
10. CTD/STD probe, oxygen probe, Secchi disk
11. Permanent marker for labeling the containers
12. Safety equipment
13. Decontaminant solutions (see proper ROP^{2,3})
14. A computer for preparing the electronic samples list



Fig. 3 Example ROV equipped with sediment sampler, video camera, lights, and the BlueView sonar

Performing the sampling operation:

1. Prepare the ROV for the underwater mission (onboard check of each crucial ROV elements: propellers, camera, lights, acoustic sonar, and sediment sampler).
2. Setup the underwater navigational system.
3. Deploy the ROV into the water.
4. Reach the desired sampling area with the ROV.
5. Activate sediment sampler and collect samples.
6. Ensure that samples were collected by checking the status of the sampler if possible.
7. Resurface the ROV platform.
8. Connect the ROV to the ship winch or crane when it remains in the water.
9. Gently recover the ROV. Mind keeping the ROV outside the outline of the vessel.
10. Visually inspect the ROV in order to detect CWA contamination and/or malfunction of the sediment sampler (fig. 4).
11. Use safety equipment.
12. Rise the platform with water when it remains outside the vessel outline.
13. Transfer the ROV into the outline of the vessel.
14. Check the sampler container and the whole ROV with the CWA detector.
15. Label properly storage containers with a permanent marker.

15. Slowly open the sampler container(s) and transfer sediment samples with the help of a spatula into before prepared storage containers. The amount of each sample should be about 50 – 200 g wet weight. Don't overfill the plastic container with the sediment sample, since the volume of the sample increases when frozen. This might cause the containers to break. Packing the sediment samples in plastic bags is not recommended. If plastic bags are still used, the samples should be packed in double bags in order to minimize the risk of cross-contamination. The plastic bags should not be filled more than a half of the bag's volume (fig. 5).
16. Visual inspect collected samples.
17. Perform decontamination of the ROV², ship deck², used equipment² and personnel³.
18. Freeze storage containers with collected samples in - 20°C until analysis in the laboratory.
19. Conduct hydrographic measurements with CTD/STD probe, oxygen probe, and Secchi disk.

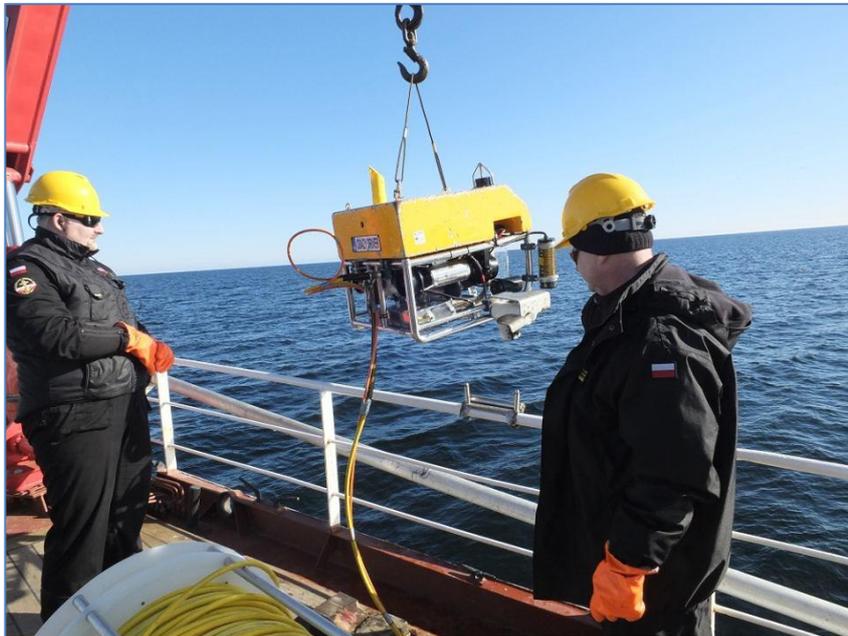


Fig. 4 Visual inspection of the ROV outside the vessel outline after recovery from the water



Fig 5. Plastic containers for sediment samples

Conclusions (if applicable)		
References		
¹ DAIMON Toolbox Fact Sheet 1.2: Identification and visual inspection of detected munition-like objects		
² DAIMON Toolbox Fact Sheet x.x: Sampling safety procedures		
³ DAIMON Toolbox Fact Sheet x.x: People safety procedures		
Change history		
1.0	15.4.2020	First edition (based on the ROP of “Sediment sampling with gravity corer”)
1.1	18.5.2021	Definition of the document was changed from SOP to ROP.
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