Recommended Operating Procedure (ROP)

Aim of ROP (tick box)

☐ Munition detection or identification	☐ Toxicity
☒ Sampling	☐ In situ exposure studies
☐ Chemical analysis	☐ Bioassays
☐ Bioindicators/biomarkers	

1. Sediment sampling with gravity corer

version 1.0

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Scope

Sediment samples are needed for various studies from different kind of sea areas, and the sampling methods are also varying accordingly. This ROP describes the standard sediment sampling with a (dual) gravity core sampler, from a research vessel for the analysis of explosives, chemical warfare agents (CWAs) and their degradation products.

Summary of the method/ROP

The samples are to be taken with standard sampling equipment from a research vessel. Target is to have undisturbed sediment cores from the sea bottom. For high-quality samples, the weather has to be calm enough, for avoiding the mixing of the sediment. In addition, the person(s) who are responsible of the sampling must be experienced enough, for ensuring the quality of the samples. After sampling, the sediment is to be sliced immediately, and all the slices are marked, and stored in a freezer (at least -20 ^{o}C) until further analysis in the laboratory.

Safety aspects

For sampling, normal research vessel safety rules should be applied. If sampling is close to old munition, special restrictions on operating within the area may apply. The positions of the studied munitions should be known exactly. If available, equipment should be prescreened with CWA detector (ie. FID based), prior to opening. 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 prescreeening is not available, or CWA were detected on the equipment, all the persons who will take part to sampling operation or otherwise have to be present on the deck during handling of the sediment, should wear similar safety equipment.


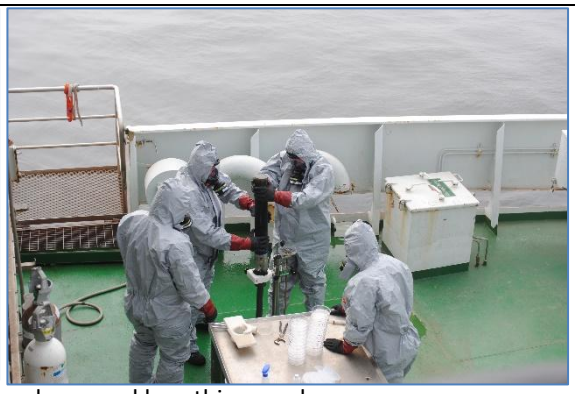

Fig. 1 & 2. Sediment sampling with protective clothes, gloves and breathing masks.

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

Documentation

Position, date, time and depth of the sampling must be recorded. Additionally, the person(s) who carried out the sampling, and the institute responsible for the sampling should be recorded. Each sample (slice) should have at the minimum the following information/code: station name, depth, slice (e.g. 7-8cm), how many tubes/cores taken and date. All the mentioned information and sample codes must be recorded also electronically (e.g. Excel table). The sample codes in the table must be identical with the container markings so that every sample can be tracked. For marking the containers, use always permanent marker to avoid mixing the samples. The electronic sample list containing all the information mentioned previously, should be sent among the samples to analyzing laboratory.
Suggested code should include Ship code, area code, cruise ID and station ID in addition to abovementioned minimal info, for fast recognition.

Also, basic hydrography, such as water temperature, salinity, oxygen and Secchi depth at the sampling location are recommended to be measured. Wind speed and wave height are marked for quality control. Sediment quality/composition of the core is to be analysed visually before slicing.

Methods

Equipment:

1. Samples are to be taken by winch with a gravity-core sampler. Suitable samplers are e.g. Gemax and Gemini, which have separate plastic tubes, where the sediment core is to be taken (fig. 3).
2. Rack with a piston, where the plastic tube is to be attached for slicing (fig. 4).
3. Slicing plate, which will be attached to the tube (fig. 5).
4. If more than 2 cores are to be taken, rubber stoppers and core stand for storage of cores before slicing.

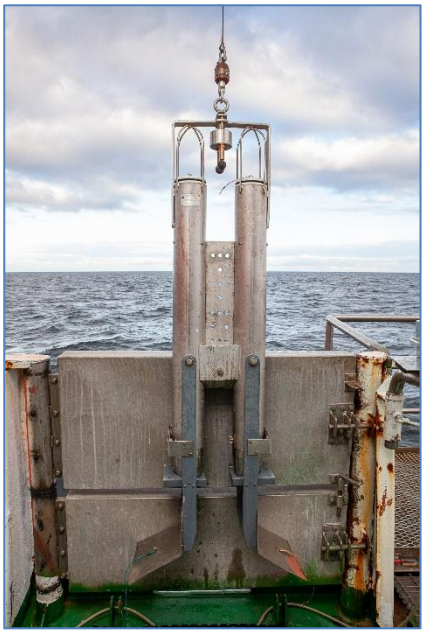

Fig. 3. Gemax gravity corer

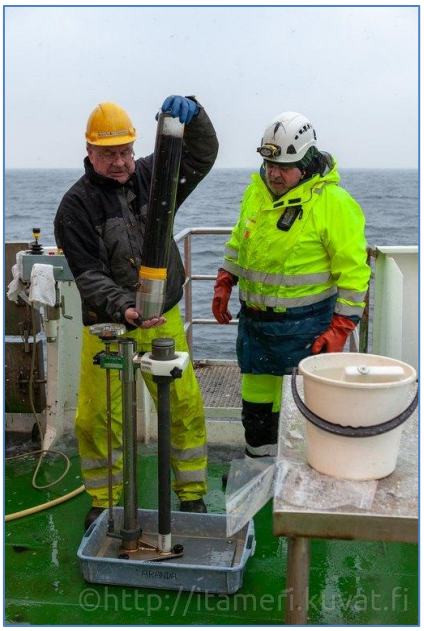

Fig. 4. Sediment core, and the piston rack .

Fig. 5. Sediment slicing plate.

Performing the sampling operation:

1. Attach the plastic tube into the gravity-corer
2. Attach the sampler to the winch wire with a shackle. Spinning of the sampler is to be prevented by a swivel in the wire (spinning will otherwise mix the sediment surface while the sample is taken up).
3. Add lead weights to the sampler if needed (if the sediment is not soft enough)
4. Deploy the sampler down in the water column, preferably not faster than 1,3 meters per second. Otherwise the movement of the sampler might turn unstable.
5. When bottom is getting closer, slow the deployment to 1,0-0,8 meters per second.
6. When the sampler is on the bottom, it takes the sediment core automatically. If the waves are creating movement to the vessel, it is essential to give a bit loose to the wire at this point. This requires lots of experience from the person operating the winch. Lifting of the sampler has to be done gently, for avoiding mixing of the sediment in the tube.
7. When the sampler is on the deck, take the tube out of it, and analyse the quality of the sample: sediment surface should be horizontally as straight as possible, and near bottom water should be clear. If the sediment is mixed, discard the sample, and take a new one.
8. Block the top and bottom of the core with rubber stoppers and store it on a dedicated stand in vertical position, or transfer it directly to the piston rack.

9. Slice the sediment carefully, by using the piston-rack. Usually at least the top 10cm is sliced into 1cm sections. In the deeper layers, the sections can be 5cm if appropriate.
10. Marking to each sample (slice) container will be as follows: station name, depth, slice (e.g. 7-8cm), how many tubes/cores taken, date.
11. Freeze all the samples in - 20^{o}C until analysis in the laboratory.

Remarks concerning the quality of the samples:

1. Heavy weather (waves) might prevent sampling, since movement of the ship (up and down) can mix the sediment in the sampler too much.
2. Ship must be kept still (preferably in DP) while sampling. Horizontal movement of the ship will lead to a disoriented sample.
3. Keep the plastic tube straight at all time, and avoid any movement, which can cause mixing of the sediment.
4. Store all the slices in separate plastic containers (fig. 6). Don't fill 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 to more than a half of the bags volume.
5. For chemical analysis (explosives and CWAs), the recommended sample amount is 50-100 g. Slices can be pooled if necessary.

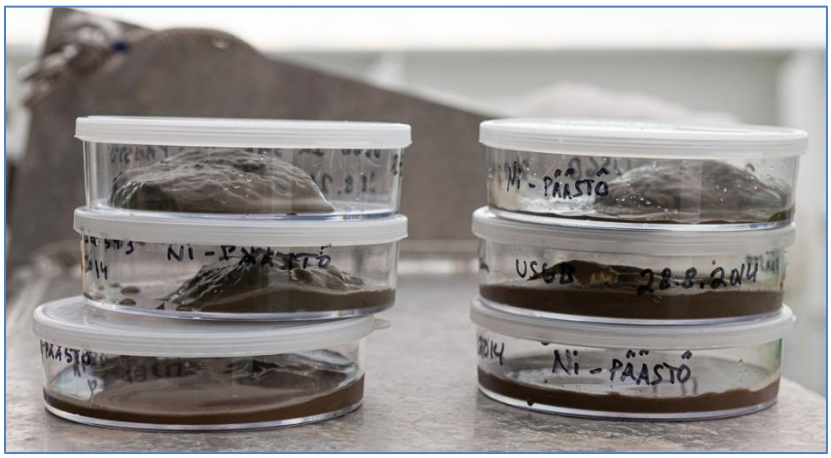

Fig. 6. Plastic containers for sediment samples.

References

[1] Kankaanpää, H. Finnish Environment Institute, Quality Management System standard: ISO9001:2015

Change history

1.0	11.3.2020	First edition
1.1	18.5.2021	Definition of the document was changed from SOP to ROP

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