

Recommended Operating Procedure (ROP)

Aim of ROP (tick box)

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|---|---|
| <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 | |

3. Sediment sampling with Box corer and Van Veen grab

version 1.0

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Scope

Standardized sediment samples are required in various studies. Numerous sampling techniques are therefore applied in regard to the type of sediment and the output quality of the further analyses. Box Corer and Van Veen grab are the two effective tools that are used to collect suitable samples for the qualitative and/or quantitative data useful in the analysis of either explosives, chemical warfare agents (CWAs), their degradation products or infauna monitoring. Both sampling tools are a time-saving alternative for the gravity-core sampling and may be used for hard sediments.

Summary of the method/ROP

Both Box Corers and Van Veen grabs come in various sizes allowing researchers to collect marine sediment samples at all depths.

Box Corer is designed to minimize the disturbance of the sediment surface during samples collection. It is an essential tool for quantitative investigation and can sample overlying water together with sediment. Depending on the area of the box it allows a multiple subsamples extraction. In more shallow water sampling the alternative hand-held lightweight tools are available, i.e.: Eckman bottom grabs.

Van Veen grab is a simple and efficient tool allowing qualitative investigation of the surface layer of the sediment. In some cases, when sampling is performed by an experienced worker, it does, however, allow obtaining both quantitative and qualitative sub samples. When compared with Box Corer, the draw-back of this method is the mechanical disturbance of the layering of the sediment.

Regardless of the applied method, the target quality sediment samples should be undisturbed. Scientific staff responsible of the sampling procedure must be experienced enough, to estimate the

quality of the samples. Overlying water should be safely removed before sediment cutting and subsampling. Collected sediment samples have to be stored in a freezer (at least -20 °C) until further analysis in the laboratory.

Safety aspects

Sediment sampling should be performed only after acoustic and visual inspection of the sampling site via SSS, AUV or ROV. Exact positions of neighboring munitions should be known exactly upon sampler's deployment. Besides that, standard research vessel safety rules should be applied. Ideally, prior to opening the sampler should be prescreened with a CWA detector (i.e. FID based). Staff responsible for prescreening and sampling the prescreening should wear special safety equipment, including protective clothes, long-stemmed gloves (preferably butyl rubber), rubber boots and full-face breathing masks, equipped with CWA-suitable filters (fig. 1 and 2).



Fig. 1 & 2. Sediment sampling in 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 decontaminating solution right after use.

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 should have at the minimum the following information/code: station name, depth, collected layer thickness (e.g. 0-1 cm, 0-5 cm) 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 effective 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. Quality/composition of the sediment should be analyzed visually during sampling.

Methods

Equipment:

Box corer sampler:

1. Samples are to be taken by winch with a box corer sampler (fig. 3 & 4).
2. A stand to support the box with a round bottom.

3. A ruler or any kind of length measure to appoint the surface layer thickness (fig. 5).
4. A spoon, scoop or spatula for collecting the topmost layer of the sediment (fig. 6).

In case of Van Veen grab (fig.7), only points 3. and 4. are applicable.



Fig. 3. Box corer.
sample.



Fig. 4. Box corer with sediment



Fig. 5. Rulers.
sediment



Fig. 6. Spoons for collecting the
sediment



Fig. 7. Van Veen grab (www.iopan.pl)

Procedure for box corer operation:

1. Attach the metal box to the box core sampler.
2. Attach the sampler to the winch wire with a shackle.
3. Add lead weights to the sampler if needed, depending on the sediment density. Avoid overweighting the sampler, due to minimize the risk of sediment spillage from the top of the box.
4. Deploy the sampler down the water column, according to the producers requirements in order to obtain the required quality of the samples.
5. Move the sample frame close enough to the ship outline to conduct prescreening. Perform the prescreening for CWA in air and in sediments attached to the outside of the box. Rinse the outside of the sampler with running water while it remains outside the vessel outline, to clear the elements essential for opening the sampler and extracting the box. Assure that the water is not entering the box from the top.
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, to avoid mixing and spillage of the sediment from the sampler. Correctly collected sediment sample should fill out at least 50% of the sampler box volume.
7. Secure the bottom of the box filled with sediment and carefully take it out from the sampler, to avoid mixing or disruption of sediment.
8. If the box is overfilled or the sediment is mixed, discard the sample, and take a new one. In case of overfilling in box corer, consider reducing the equipment weight if applicable.

Procedure for Van Veen grab operation:

1. Deploy the sampler down the water column, according to the producers requirements in order to obtain the required quality of the samples.
2. Move the sample frame close enough to the ship outline to conduct prescreening. Perform the prescreening for CWA in air and in sediments attached to the outside of the box. Rinse the outside of the sampler with running water while it remains outside the vessel outline, to clear the elements essential for opening the sampler. Assure that the water is not entering the sample from the top.
3. When the sampler is on the bottom, it closes automatically and takes the sediment. 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, to avoid mixing and spillage of the sediment from the sampler. Correctly collected sediment sample should not overflow from the top of the Van Veen grab.
4. The sample should be collected from the top of the sediments collected via the upper windows of the sampler.

Procedure equivalent for box corer and Van Veen grab operation:

1. Use a spoon, spatula or a scoop to carefully scrape an eligible surface layer of the sediment (depending on the thickness of interest) and transfer the sample into a marked container.
2. Marking to each sample container will be as follows: station name, depth, layer thickness (e.g. 0-5 cm), date (fig.8).
3. Freeze all the samples in - 20°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. 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 to more than a half of the bags volume.
4. For chemical analysis (explosives and CWAs), the recommended sample amount is 50-100 g.



Fig. 8. Plastic containers for sediment samples.

Conclusions (if applicable)

References

Przeslawski R, Berents P, Clark M, Edgar G, Frid C, Hughes L, Ingleton T, Kennedy D, Nichol S, Smith J. 2018. Marine sampling field manual for grabs and box corers. In Field Manuals for Marine Sampling to Monitor Australian Waters, Przeslawski R, Foster S (Eds). National Environmental Science Programme (NESP). pp. 172-195

Change history

1.0	17.4.2020	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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