



Technical Guideline No. 01 – Collection of water samples

Jan Brant

2014

To be used in conjunction with:

**GUIDELINES FOR THE ENVIRONMENTAL MONITORING
AND IMPACT ASSESSMENT ASSOCIATED WITH SUBSEA
OIL RELEASES AND DISPERSANT USE IN UK WATERS**

1 Purpose and Scope

Water samples can be collected for a number of reasons during an emergency. The most common use of water samples is chemical analysis and ecotoxicological assessment. In both of these situations, it is important that the container used for sampling is free of contamination prior to being deployed.

This document covers the deployment and retrieval of vessels for obtaining water samples at a range of depths from just subsurface to >1000 m. It does not include survey design, or detail on preservation and storage of samples after collection. It also does not include analysis of samples.

This document supports and should be used in conjunction with environmental monitoring guidelines for subsea oil releases (Law et al., 2014).

2 Health and Safety considerations

While most of the equipment discussed in this document can be deployed via a winch, there is still an element of manual handling in collection of water samples, particularly using a Winchester sampler. Care should be taken to avoid overstretching or awkward twisting. When deploying gear from the deck of a boat, appropriate PPE should be worn. This includes, but is not limited to, toe protected waterproof boots, lifejacket and hard hat. Before the survey starts, the SIC and ship's safety officer should ensure that all scientists and crew have been adequately briefed in relation to the safe operating procedures relating to grab sampling and processing. Staff should be aware that a rosette sampler can be extremely hazardous if swinging on the end of a winch wire. They should therefore avoid the immediate area around the operations if not directly involved in deployment and recovery.

3 Procedure

3.1 Surface sheen collection

The oil surface pad sampler consists of a hinged aluminium frame with a handle. A sorbent sheet is placed within the sampler and touched flat onto the water surface in order to obtain a sample of surface oil.

- i. Square sheets of polypropylene oil sorbent are placed into the oil surface pad sampler frame, which is then securely fastened. The procedure is carried out wearing nitrile gloves and using forceps to hold the sorbent sheet.
- ii. The sampler is then touched on the surface of the water, exposing the sorbent material to the water surface. Oil present is immediately absorbed onto this surface.
- iii. The sorbent pad is removed from the frame using forceps and placed into a glass bottle which has been pre-rinsed with pentane.
- iv. Samples are frozen immediately to carriage back to the laboratory.
- v. Samples are labelled with date, time, ship/sampling vessel, GPS location and station number.

3.2 Collection of water up to 50 m depth

All efforts to minimise sample contamination should be made. Avoid sampling through obvious slicks or 'scum' patches. Always attempt to sample as far away from ship sides as is safe to do so. If sampling from a small boat collect the water from the bow whilst gently steaming against the prevailing current, or from the windward side if moored or drifting.

The sampling vessel should be placed about 20 - 30 cm below the surface to avoid sampling the surface micro-layer. This can be done by hand where appropriate.

Where samples need to be taken at greater depth or where the sampler is significantly above sea level (e.g. research vessel deck) the Winchester Sampler should be deployed. For sampling at depths greater than 10 m, it is convenient to deploy the water sampler clipped to an oceanographic hydrowire rather than wholly by hand. The sampler consists of a stainless steel frame with a P.T.F.E. stopper that can be triggered open by the operator (see figure 1).

- i. Securely lock the Winchester bottle (pre-rinse with pentane) into the sampler and ensure that the P.T.F.E. stopper is in place.
- ii. Attach suitable lengths of clean rope securely to both the sampler frame (retrieving line, rope A) and the central triggering mechanism (operating line, rope B). Attach the other end of rope A securely to the ship.
- iii. Lower the sampler to the appropriate depth and trigger by pulling on rope B.
- iv. Rinse the vessel with sample water and discard before taking the final sample
- v. Once the bottle is full (this can sometimes be gauged by monitoring when the bubble stream from the bottle stops) release the trigger to seal the bottle and pull up the sampler. The sample bottle should be removed and sealed immediately.
- vi. Samples are labelled with date, time, ship/sampling vessel, GPS location and station number. Samples are stored cool (4 °C) until analysis.

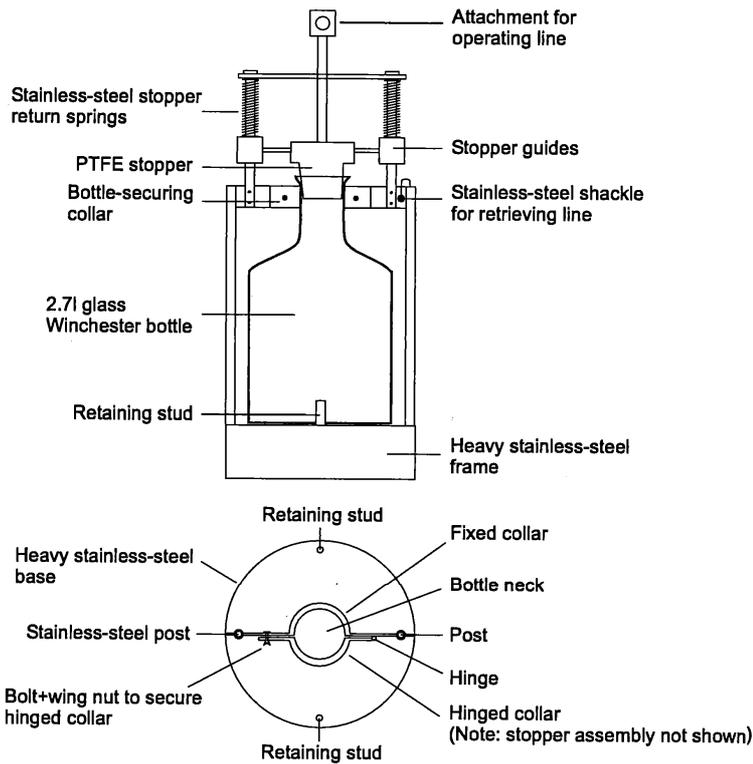


Figure 1. Shallow water Winchester sampler

3.3 Collection of water samples from up to 2000 m depth

For collection of water at depths > 50 m, the Winchester sampler becomes impractical. In addition, there may be a requirement to sample at several depths at a single location, and this is most easily undertaken with a rosette sampler. In calm conditions with a small amount of drift over a flat seabed you can take the rosette down to within 1 m of the bottom. In rough seas, or with a rocky seabed, you will need to keep the rosette further from the seabed (2-5 m).

In order to minimise contamination of samples, inert materials such as Teflon 'go-flo' liners should be used within the Niskin bottles for hydrocarbon sampling. These should be rinsed with pentane prior to use.

- i. Attach bottles by pulling down the plunger and lifting the bottle onto the locator pin. The plunger should then lock into place (figure 2). Use the wire clips to secure the bottle through its carry handle. When attaching bottles, if not all 24 bottles are required, they should be spaced out evenly to balance the rosette.
- ii. Prime bottles for firing, by unclipping the bottom plug wire shown in Figure 3



Figure 2



Figure 3



Figure 4

- iii. Using the ladder, climb onto the rosette. Take the strain of the rubber in one hand and using the other, hook the loop of the top plug firing wire into the sure-fire catch show in Figure 4.
- iv. If the catch does not hook the wire correctly the sure-fire catch may not be correctly seated. To seat the catch push down on the mechanism inside the sure-fire until it clicks.
- v. Attach the bottom plug wire to the top wire as show in Figure 3, ensure the wire will move freely through the carry handle.
- vi. Ensure all required sensors are fitted and are rated to the depth of water/pressure to be sampled. It is normal to measure conductivity, temperature and depth, but other sensors can also be fitted. A fluorimeter operating in the UV range will allow subsea plumes of dispersed oil to be detected while the rosette is descending. These data can be returned to the vessel in real time. This allows decisions to be made about the depths at which samples will be taken as the rosette ascends through the water column.
- vii. Ensure that all cables are attached and that all sensors are functioning.
- viii. Deploy the rosette over the side of the vessel with a winch with a slinging for communication cables.
- ix. Trigger sample collection at selected depths, or, if appropriate, within a sample plume.

- x. Retrieve rosette from the water and, wearing protective nitrile gloves, decant the contents of the Niskin bottles into pre-rinsed Winchester bottles
- xi. Samples are labelled with date, time, ship/sampling vessel, GPS location and station number. Samples are stored cool (4 °C) until analysis.

3.4 Other water sampling methods

Water samples can also be obtained by remotely operated or autonomous vehicles. This might be appropriate where the risks associated with sampling immediately over the plume are deemed to be high in terms of worker safety. The number of samples that can be obtained tends to be fewer than by (e.g.) rosette sampler, and the operation will vary from unit to unit, so manuals should be the first point of reference. The principles however remain the same. Sampling vessels should be clean and pre-rinsed with pentane. They should be prevented from opening near the surface so that the sea surface microlayer is not sampled, and should be triggered at a depth that is appropriate to the survey design.

4 References

Law, R.J., Brant, J.L., Kirby, M.F., Lee, J. Morris, D. and Rees, J. 2014. Guidelines for the environmental monitoring and impact assessment associated with subsea oil releases and dispersant use in UK waters. Science Series Technical Report. Cefas, Lowestoft, 58 pp.



www.cefas.defra.gov.uk/premiam