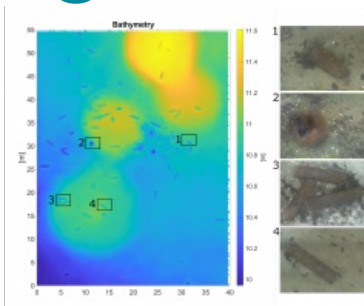
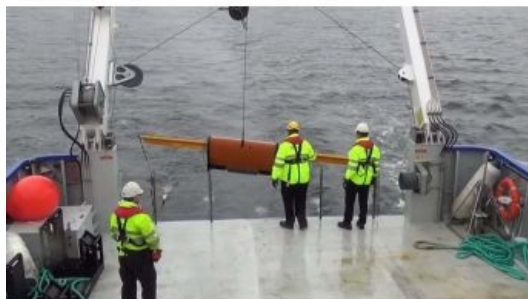
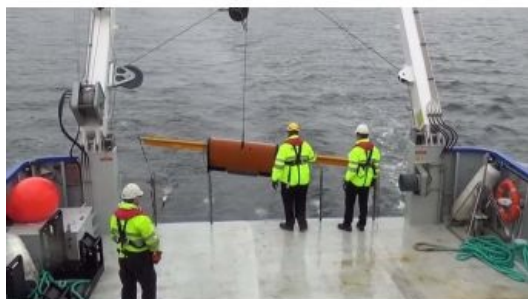


# A closer look at advances in UXO surveying



In our profession, object detection takes the form of hydrographic surveys that are carried out to detect wrecks, anchors, pipelines and ammunition. The latter is better known as UXO surveys, which are conducted in shallow and deep water. We have selected a series of articles that zoom in on the detection of unexploded ordnance in the sea, ranging from workflows and data quality factors to the

interesting innovations in this field over the past few years.



## Uncovering the secrets of German marine munitions dumpsites

On a sunny November morning, a scientific team from GEOMAR and EGEOS boarded the research vessel *ALKOR*. After five long days in quarantine and upon receiving negative COVID-19 test results, it was finally possible to embark on the trip to munitions dumpsites in the German Baltic Sea. The working schedule was tight, and the dry lab was packed with computers for data acquisition and processing. As *ALKOR* left Kiel harbour, the sea

was calm and smooth. Although not many people are aware of the thousands of tons of dumped munitions from World War II (WWII) rusting below the sparkling surface, the contamination is very real, with around 300,000 tons of munitions located within the German waters of the Baltic Sea.

[Read the story here](#)



Munitions objects in the German dump site Kolberger Heide in the Baltic Sea.

## Sub-bottom object detection

While nautical charting mainly focuses on bathymetry and objects that form a hazard to shipping, offshore construction and dredging require sub-bottom information. There is nothing worse in any project than finding wrecks or unexploded ordnance (UXO) after construction has started. The detection of covered cables and pipelines is also an important survey objective. There have been some interesting innovations in this field over the past few years and, while this article does not attempt to be exhaustive, it provides an overview of the various types of system available.

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## Dangerous war remnants

Countless ships and aircraft were lost at sea in the two world wars. Many of these went down with a large amount of fuel and munitions onboard, not to forget the countless sailors and airmen who lost their lives and are entombed in the wrecks. After the wars, redundant ammunition was dumped in the sea, sometimes together with the ships that carried it to the dumpsite. As a result, there are many thousands of wrecks and many tons of conventional munitions and chemical warfare agents in the sea. The question is how these affect our everyday lives.

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## Submerged munitions, no hazard left undetected

Munitions in the sea pose a risk to the sustainable development of the ocean economy. In particular, they are a global challenge during the construction of wind farms, pipelines and other infrastructure. To ensure high-quality performance during the execution of maritime munitions detection and clearance operations, industry experts and scientists from Germany have defined a set of requirements. These are particularly important in the detection phase, and therefore require the attention of hydrographic surveyors.

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## Data quality factors for marine UXO surveys

The detection of unexploded ordnance (UXO) in the sea is a demanding task. UXO survey data is acquired using a variety of sensors in different configurations and can span large areas. To make sure that the resulting highly complex dataset is fit for purpose, a well-defined workflow is crucial. Researchers working on the BASTA project are therefore developing quantitative data quality factors to indicate how survey data should be acquired for the detection of a specified reference object.

[Read the story here](#)



To measure smaller objects, gradiometers (consisting of multiple magnetometers) can be towed behind an ROTV. (Courtesy: EIVA)

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<https://www.hydro-international.com/content/news/a-closer-look-at-advances-in-uxo-surveying>

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