DAIMON Toolbox Fact Sheets:

Methods to Study the Impact of Dumped Munitions on Marine Biota

Assessment category: Munitions detection and identification

Toolbox component: Munitions identification

Fact Sheet 1.2: Identification and visual inspection of detected munitions-like objects

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What is it?

This procedure provides validation of data collected according to DAIMON Toolbox Fact Sheet 1.1: Munition detection procedure with a hydroacoustic and magnetometry equipment (Grabowski 2019). Identification and visual inspection of selected objects are conducted based on a video camera and hydroacoustic equipment mounted on a ROV platform.

What does it tell you?

Captured materials (movies, images, and sonograms) provides information about the exact appearance of objects, allowing to identify them as munition target upon characteristic features compared to historical documentation and sources. Additionally, based on video footages, the state of corrosion can be estimated. The ROV platform should be also equipped with sediment sampler in order to collect sediment samples for further analysis in close proximity to detected munition objects.

How to measure it?

*Matrix***:** Surface sediments, water column

*Equipment***:**

- Research vessel with the ability to work with the ROV platform
- Digital global positioning system (DGPS)
- Remotely operated vehicle (ROV) platform equipped with:
  - digital video camera
  - additional lights
  - BlueView sonar (acoustic camera)
  - omnidirectional sonar
  - sediment sampler
- Underwater navigational system (USBL)
- Ship winches

- Underwater navigational software (HYPACK, QINSy, etc.)
- BlueView post-processing software
- Video capturing and processing software
- Historical materials: munition catalogs provided by EGEOS or Polish Naval Academy as outputs of the DAIMON project

Method: After deploying the ROV platform into the water, it should reach the sea bottom. Then, on the basis of detail seabed map obtained according to DAIMON Fact Sheet 1.1 (Grabowski 2019), bearing and distance to an interesting object are determined and ROV's operator should proceed to reach the target. The ROV should cruise from about 0.5 m to 1 m above the sea bottom, observing its surface and the water column in front of the platform by means of the BlueView sonar, and a video camera. When the ROV reaches the object, a visual inspection needs to be conducted. The identification is carried out on the principle of comparing the image from the video camera with historical materials. As far as possible, a visual inspection of the designated object or area should be done in at least two planes in order to carry out thorough inspections. The last step to fill up the following procedure is to collect sediment samples in close proximity of inspected objects.

The use of the BlueView sonar for navigation, detection, and inspection of objects is necessary for areas with poor visibility.

Example equipment and additional information about conducting identification and visual inspection of detected munition-like objects can be found in Grabowski et al. (2018) and Bełdowski et al. (2018).

How to analyse and assess the data?

Data analysis is focused on the processing of captured video footages and selecting individual frames with well visible objects. Due to poor visibility in the Baltic Sea dumpsites, image processing techniques such as mean calculation from multiple still frames and histogram normalization or contrast enhancement are sometimes required. It can be done with standard raster images processing software (e.g., Adobe Photoshop, GIMP, etc.). Additionally, certain object's dimensions can be measured based on sonograms created with the BlueView sonar and processed with the proper software. Detailed information about conducting of this type of measurements can be found in BlueView software manual.

References

Bełdowski J., Jakacki J., Grabowski M., Lang T., Weber K., Kotwicki L., Paka V., Rak D., Golenko M., Czub M., Söderström M. (2018). *Best Practices in Monitoring.* In: Bełdowski J., Been R., Turmus E. (eds) Towards the Monitoring of Dumped Munitions Threat (MODUM). NATO Science for Peace and Security Series C: Environmental Security. 2018. pp. 213 - 240. Springer, Dordrecht. DOI: https://doi.org/10.1007/978-94-024-1153-9_9

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Grabowski M., Fioravanti S., Been R., Cernich F., Malejevas V. (2018). *Suitability Study of Survey Equipment Used in the MODUM Project* In: Bełdowski J., Been R., Turmus E. (eds) Towards the Monitoring of Dumped Munitions Threat (MODUM). NATO Science for Peace and Security Series C: Environmental Security. 2018. pp. 19 – 47. Springer, Dordrecht. DOI: https://doi.org/10.1007/978-94-024-1153-9_2

Software and equipment manuals