



Factsheet #1 Marine Dumped Munitions – Problems and Solutions

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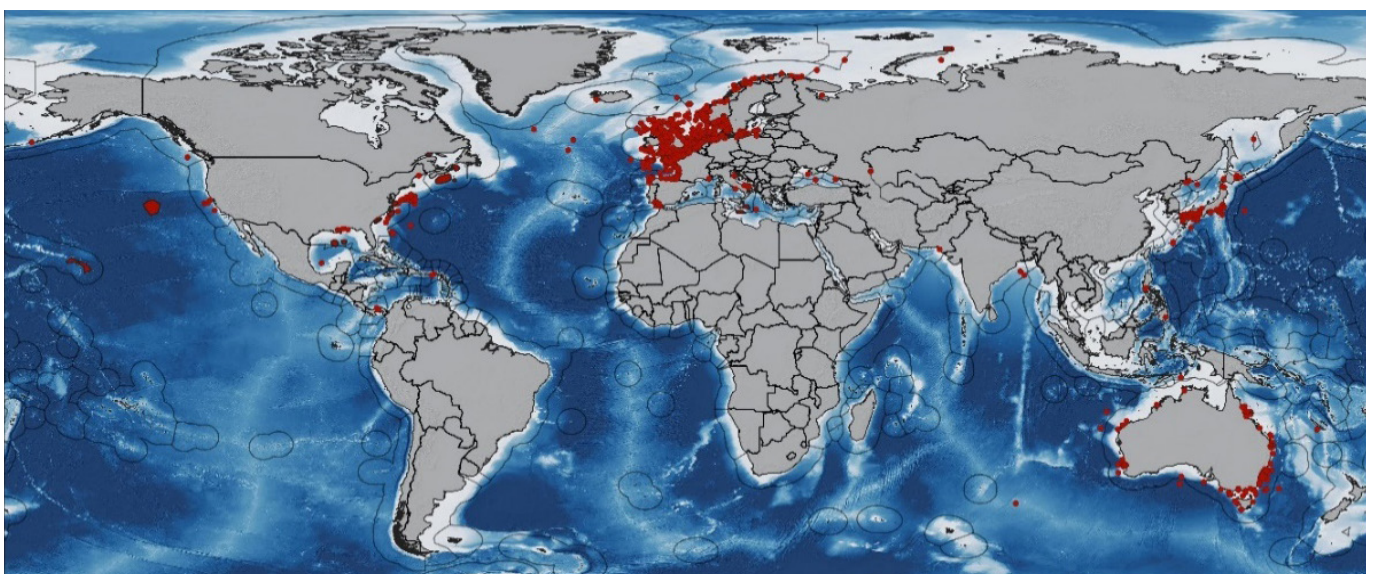
Introduction

Dumped marine munitions, also referred to as unexploded ordnance (UXO), poses multiple risks: it endangers shipping, bottom trawling, and offshore infrastructure projects such as cable routes, pipelines or wind farms. It also presents a threat to the public when munition remnants are washed ashore, and it remains a serious security concern.

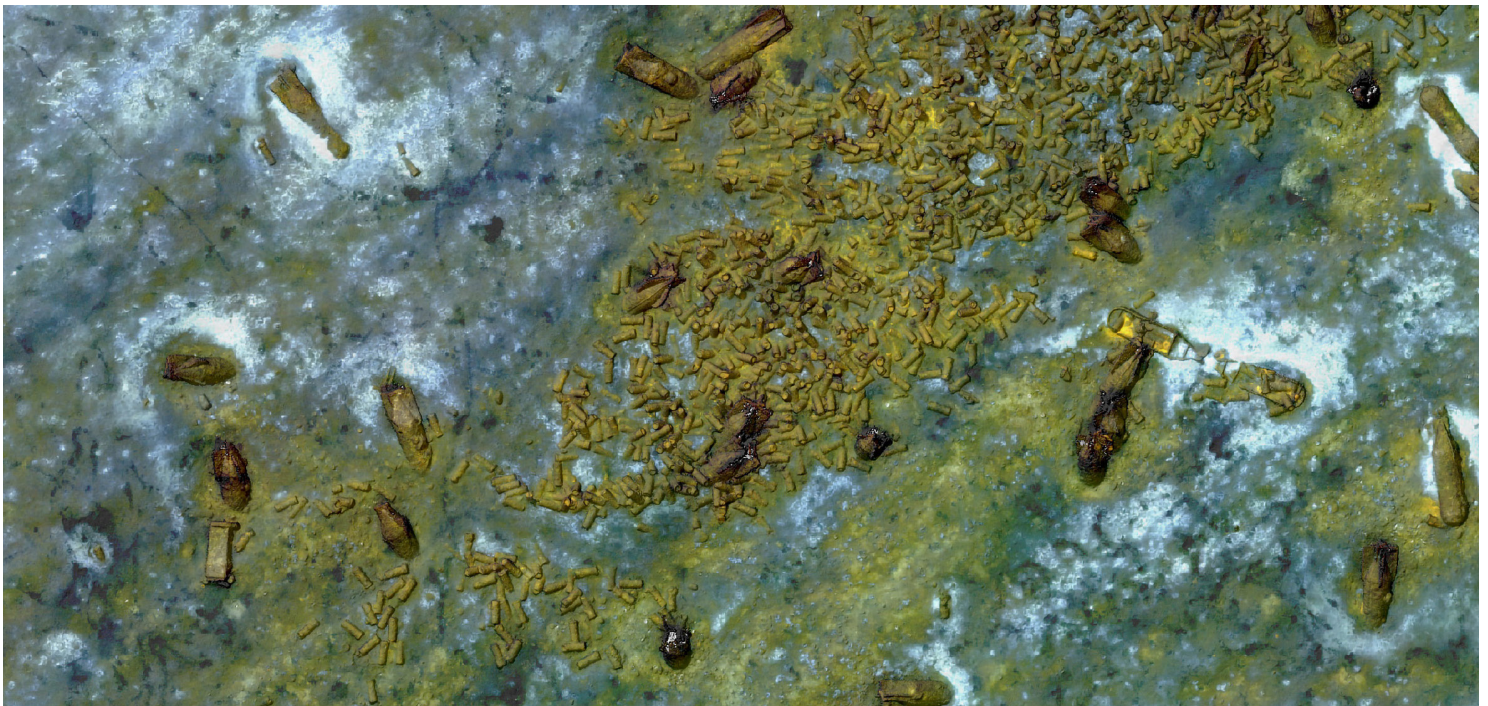
Explosive devices include both conventional munitions and those loaded with chemical warfare agents. While chemical weapons have long been recognized as toxic and dangerous, conventional munitions have only been acknowledged as environmental pollutants within the last 20 years. Scientists have since shown that toxic substances, such as TNT – which is carcino-

genic and mutagenic – can be absorbed by marine organisms, with harmful effects on ecosystems. The extent and nature of this impact have only recently come into sharper focus.

This growing awareness, combined with more open public discussion and improved understanding of the scale and distribution of dumped munitions – often close to shore – has led to increased research at national and international levels. Areas where dumping occurred on a large-scale face particularly significant ecological and economic consequences. The threat is compounded by the fact that both explosive and chemical munitions can remain functional even after more than 80 years underwater.



Global overview of marine dumped munitions. (Data compiled from EMODnet, HELCOM and AMUCAD; Illustration: GEOMAR)



The photomosaic shows a munitions pile at a depth of 20 metres in the Baltic Sea. It is composed of cluster bomb casings and more than 5,000 bomblets. (Photo: GEOMAR)

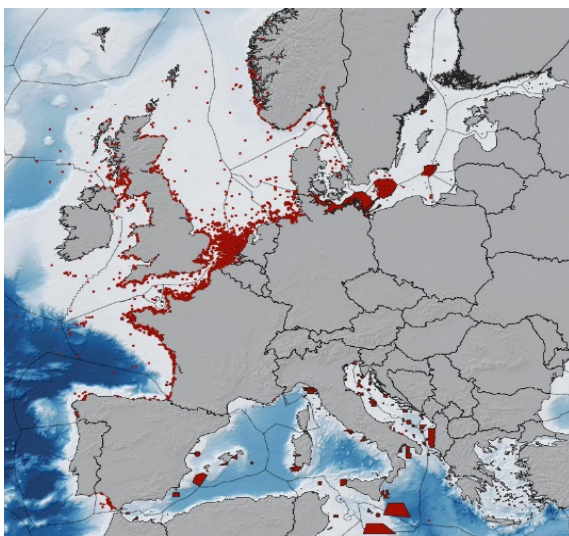


Large quantities of surplus ammunition were dumped at sea during the demilitarisation efforts following the war. This resulted in large piles of munition on the seafloor. (Photo: Imperial War Museums)

Why Is There Dumped Munition in the Ocean?

Munitions were introduced into the ocean during wartime activities – for example, through coastal artillery, aerial bombing, naval mines, and shipwrecks. In addition to munitions lost in combat or accidents, large quantities were dumped after the end of wars during demilitarisation efforts and the disposal of surplus or captured arms.

Dumped marine munitions include a wide range of ordnance – from small-calibre ammunition and grenades of all sizes to large aerial bombs, sea mines, and chemical weapons. These materials were often jettisoned from ships and barges at designated sites, but sometimes also dumped en route due to navigational errors or the lack of accurate positioning systems in the post-war years. As a result, munitions can be found outside officially marked dumping grounds – especially in coastal waters.



Where Is Dumped Munition Found?

Dump sites were designated shortly after the wars, usually near ports with good transport infrastructure. Offshore sites in deeper waters were chosen particularly for chemical munitions, but practical considerations often led to the dumping of conventional munitions within just 12 nautical miles off the coast.

For instance, chemical weapons were dumped in the Bornholm and Gotland Basins in the Baltic Sea, and entire ships were scuttled in the Skagerrak at depths of around 600 metres. In the Bay of Biscay, munitions were dumped at a depth of almost 5,000 metres. Although many dumping sites are known, detailed information on their actual size and contents is lacking. This information must be gathered to enable proper risk assessments and mitigation planning.

Map showing munition dumping grounds and known finds in European waters (Data: EMODnet, HELCOM, AMUCAD, Illustration: GEOMAR).



Military 'Blast-in-Place' operation in shallow waters. Detonations like this eliminate immediate risks but pose serious risks to marine mammals due to intense shockwaves (Photo: Uwe Wichert).

What Are the Options for Remediation?

Various approaches exist for dealing with munition. The method used depends on the urgency and reason for removal.

In-place disposal: When immediate threats to human safety or infrastructure exists, munitions can be neutralized where they lie. This can be done via:

- **Low-order detonation (LOD): The casing is breached without triggering a full explosion.**
- **High-order detonation (HOD): The explosive charge is intentionally detonated.**

LOD can spread explosives over a wide area, while HOD creates powerful shockwaves that can harm marine life – especially mammals. To mitigate these effects, bubble curtains are often deployed to reduce pressure waves, and acoustic deterrents are used to scare animals away.

In general, if no immediate safety threat exists, munition is often left in place. However, long-term environmental monitoring is necessary to assess the release of toxic substances and their accumulation in marine ecosystems.

Who is Responsible?

Responsibility for dealing with marine munition usually lies with the coastal state where it is found. In most countries, the military is responsible for dealing with marine munition in case of immediate threats or planned removal. In the context of offshore constructions, private companies are contracted to detect and remove munitions, particularly in connection with the growing offshore wind sector. This has led to increased expertise within the commercial sector for handling individual UXO.

However, there is still little clarity around who is responsible for large-scale clearance of entire dumping sites, both from a technical and legal standpoint. National regulations vary, and different agencies may be in charge of safety and environmental assessments.

In Germany, for instance, the Federal Ministry for the Environment has recently launched a pilot project to clear munitions piles in the German Baltic Sea. Meanwhile, international discussions are under way to explore how joint efforts can be coordinated to prevent further environmental damage and address this legacy.

What Is the European Science Community Doing?

For more than a decade, researchers have been investigating the ecological impact of marine munitions, both in designated sites and around wrecks. Studies focus on the presence of toxic substances from explosives and chemical weapons, and evaluate the environmental consequences of disposal techniques such as LOD and HOD.

Scientists are also actively engaging in dialogue with stakeholders and developing tools to support decision-making – often using methods from the social sciences. Numerous national and international research projects have been established, particularly in the North and Baltic Seas, often in collaboration with intergovernmental organisations like HELCOM and CBSS.

Where Can I Find More Information?

Several national and international research projects have generated substantial knowledge, which is published in scientific journals and public reports. Project websites are a good starting point for information on goals and findings.

A key resource is the “Munitions in the Sea” action under JPI Oceans:
<https://www.jpi-oceans.eu/en/munition-sea>

