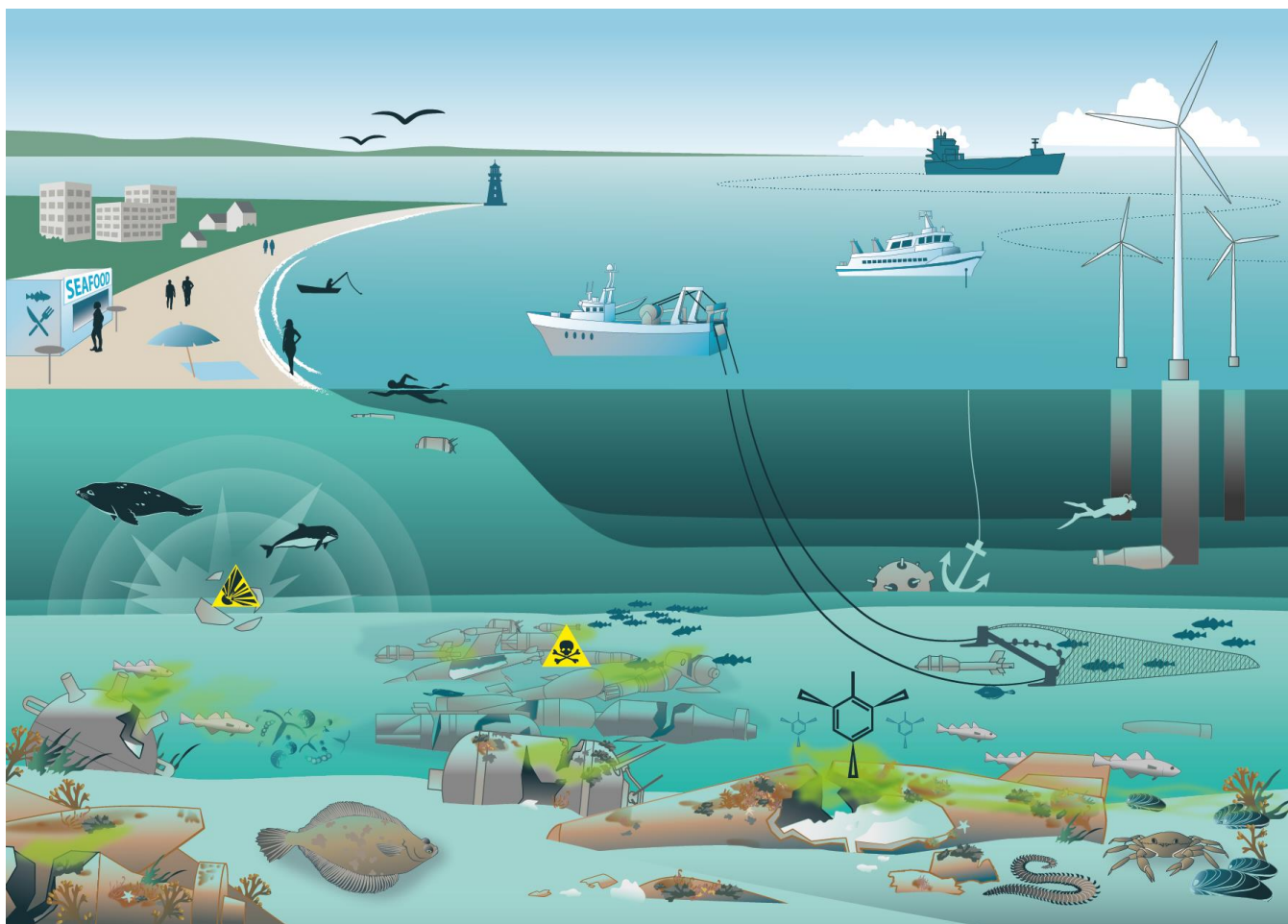


THE PROBLEM

After the Second World War, around 1.6 million tons of unused munitions were dumped in German coastal waters. Of these, about 300,000 tons were dumped in the Baltic Sea and 1.3 million tons in the North Sea. The majority is conventional munitions (explosives). The proportion of chemical munitions dumped in German waters was comparatively small. In addition to the risk of explosion in the event of contact with the munitions, for example through fishing activities, it was in particular the need to recover munitions during the installation of offshore wind farms that made the hitherto ignored problem of munitions in the sea topical again. From 2010 onwards, the first scientific studies were carried out to examine the environmental impact of munitions in the Baltic Sea. After more than 70 years lying on the seabed, many munitions casings rust through and pollutants are released into the environment. Various components of the explosives, such as trinitrotoluene (TNT) and its derivatives 2- and 4-ADNT, are carcinogenic and mutagenic substances. These can affect marine fauna and ultimately humans as fish consumers. For this reason, the German government has made 100 million Euros available to launch an immediate program for the recovery and disposal of munitions waste. The scientific expertise from CONMAR is also involved in the close cooperation between all the stakeholders involved - the federal government, the states, industry, civil society and environmental associations - that is necessary for this.

What we know:



Infographic: www.thiele.illustration.de

Since 2010, members of the CONMAR consortium have been working intensively on research into munitions in the sea. This is done through the BMBF funded project UDEMM and the *Interreg* projects DIAMON I & II and North Sea Wrecks. Through UBA, LLUR, MELUND and BMWK, projects for the development of technologies or even workflows for the handling and recovery of munitions are and were funded (BASTA and ExPlOTect, ProBaNNt, TATTOO, PILOTLUEBU and AMMOTRACe). During a series of field trips, scientists were able to investigate munitions dumping areas in the German

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Baltic Sea. In this way, they were able to expand the knowledge of exact occurrences of munitions dumps, their contamination of water, sediment and biota. The following was discovered:

- TNT is taken up by marine organisms according to environmental concentrations, e.g., by mussels and fish
- TNT is converted to TNT metabolites in biota and can be excreted
- Munition is also found in large quantities outside the dumping areas
- In all water samples tested for explosive-type compounds these could be detected (detection limit at 0.1 ng/L)
- Technical innovations allow rapid and high-resolution mapping of ammunition waste and chemical contamination in the water











CONMAR GOALS

Based on previous work, CONMAR is addressing two major research questions: "How severe and dangerous is the impact of marine munitions on the environment and humans, now and in the future?" and "What remediation actions and strategies need to be developed and implemented now?" In detail we plan to

- integrate** existing and new **data for the evaluation of marine munitions**,
- pool the expertise** of German marine research, government agencies, and industry,
- increase scientific understanding** of the effects of marine munitions,
- develop and implement solutions for monitoring and large-scale remediation** of marine munitions **with stakeholders**.

THE PARTNERS

With the partners in CONMAR, almost all centers and institutes dealing with the topic of munitions in the sea in Germany have joined forces in one project. Each partner brings to the project its individual competencies and diverse connections to the munitions clearance industry, the navy, the authorities, the explosive ordnance disposal services of the federal states and other stakeholders.

 ALFRED-WEGENER-INSTITUT HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG	Biological effects	 THÜNEN	Fishes
 GCF Global Climate Forum	Stakeholder dialogue	 UNIVERSITÄTSKLINIKUM Schleswig-Holstein Institut für Toxikologie und Pharmakologie für Naturwissenschaftler	Toxicology
 GEOMAR	Coordination, Mapping, Chemical analysis, Stakeholder dialogue, Data management.	 Umwelt Bundesamt	Environmental parameters
 LEIBNIZ-INSTITUT FÜR OSTSEEFORSCHUNG WARNEMÜNDE IOW	Oceanographic modelling	Universität Rostock  Traditio et Innovatio	Sediment and munition transport
 SENCKENBERG world of biodiversity	Benthos- und Habitatkartierung	 north.io	Softwareentwicklung

DAM Research Mission „Protection and sustainable use of the Oceans “

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Research Kiel