Chemical Munitions Search and Assessment (CHEMSEA)

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After World War II

~40 vessels (150,000 t of chemical warfare) at the depth 200-700 m

2 vessels with 69,000 tabun grenades at the depth 30 m (retrieved)

32,000 t at the depth of 70-105 m

2000 t at depth of 70-120 m

(Duursma, 1999; Glasby, 1997; HELCOM CHEMU, 1994; Tørnes et al., 2002)
Dredge sites
CWA Dumps
Offshore wind farms (planned)
Bottom trawling intensity
Legend:
- CWA Dumps
- Dredge sites
- Offshore wind farms (planned)
- Bottom trawling intensity
- Pipelines and Cables

Part-financed by the European Union (European Regional Development Fund)
Project Team

- Finland: SYKE; VERIFIN
- Sweden: FOI; SMA; CBRNE
- Germany: AWI; vTi FOE
- Lithuania: EPA
- Poland: IOPAS; MUT; PNA
Associated

- HELCOM MUNI
- MA Gdynia
- Sea Fisheries Institute
- Swedish Coastguard
- Ministries of Environment: Finland, Sweden
- GIOS
- SIPRI
- IDUM
- Nature Research Centre, Institute of Ecology
- Shirshov Inst. Of Oceanology
- Pomorskie Voivodship
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**2011**
- Submission
- Workshop in Helsinki
- Kick-off (Sopot)

**2012**
- ... implementation
- 3rd Meeting (Umeå?)
- 4th Meeting (Helsinki)

**2013**
- 5th Meeting (Germany)
- Final Meeting (Poland)

**2014**
- Project closure
Project fleet

Aranda (SYKE)

Oceania (IO PAS)

Baltica (SMA)

Vėjūnas (LEPA)

Walther Herwig III (vTI FOE)
Chemical munitions investigations (Lithuanian experience)

- October, 2002 (scanning of the dumpsite bottom)
- June, 2003 (CW dumpsite)
- August, 2004 (national monitoring stations)

Scientific research vessel “Vėjas”

Totally 39 objects: 13 bombs, 2 barrels
Chemical munitions investigations (Lithuanian experience)

Sampling stations in the Lithuanian economic zone (prefix ChG mark stations from the mission in June, 2003)

Part-financed by the European Union (European Regional Development Fund)
As concentrations in the surface sediments in the Southeastern Baltic

As range from 1.1 to 19.0 mg/kg
- 9.7 mg/kg at dumpsite
- 2.1 mg/kg in other samples

Chemical munitions investigations (Lithuanian experience)
Chemical munitions investigations (Lithuanian experience)

Conclusions

- Water depth, north direction bottom water currents, bottom currents velocities and bottom relief prevent chemical munitions from reaching the Lithuanian coast
- Studied parameters did not show any changes of the environment at the chemical munitions dumpsite
- Higher As concentrations were found at the chemical munitions dumpsite, compared to other sites. However As concentrations were low relative to other investigations
- Chemical munitions - subject for future investigations
Lithuanian partner for CHEMSEA:

- Experience

- New research vessel (Vėjūnas)

- New equipment

ADCP  ROV  Side scan sonar
Workpackages

- WP0 Preparation
- WP1 Management
- WP2 Information
- WP3. Invention of detection methods of CWA’s and their degradation products METHODS
- WP4. Detection and characterization of dumpsites DETECTION
- WP5 Ecological consequences of CWA & Risk Assessment ECO-RISK
- WP6 Guidelines and contingency plans GUIDELINES
WP3. METHODS

• Review of analytical methods for CWA and their degradation products - done
• Transnational inter-calibration in progress
• Analysis of environmental samples for CWAs & their degradation products - September
• Merging of analytical data of environmental samples with hydrographical data - 2013
### Target chemicals (30)

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Structure</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Sulphur mustard</td>
<td><img src="image1" alt="Structure" /></td>
<td>Dumped CW agent</td>
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<tr>
<td>Adamsite</td>
<td><img src="image2" alt="Structure" /></td>
<td>Dumped CW agent</td>
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<tr>
<td>Clark I and II</td>
<td><img src="image3" alt="Structure" /></td>
<td>Dumped CW agent. Also component in dumped arsine oil (Clark I)</td>
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<td>Diphenylarsinic acid</td>
<td><img src="image4" alt="Structure" /></td>
<td>Oxidation product of Clark I and II and all of their degradation products</td>
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<tr>
<td>Triphenylarsine</td>
<td><img src="image5" alt="Structure" /></td>
<td>Component in dumped arsine oil</td>
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<td>α-Chloroacetophenone</td>
<td><img src="image6" alt="Structure" /></td>
<td>Dumped CW agent</td>
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<td>Lewisite I and II</td>
<td><img src="image7" alt="Structure" /></td>
<td>Dumped CW agent</td>
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Official CWA dumping sites:
Area A:
140 km²
Area B:
1450 km²
Area C:
1756 km²

Unofficial dumping along the route to C

Not on the picture: unofficial dumping site Gdansk Deep 340 km²
WP4. Detection

- Side Scan Sonar
- Magnetometers
- ROV
WP4. GOALS Detection and characterization of dumpsites

- Inventory of available data
- Characterisation of dumping sites
- Detection of CWA objects in the official & unofficial dumping site and along the transport routes to dumping sites.
- Review of detection methods
- GIS maps
Status

- 2 cruises by SMA
- 1 cruise by vTi
- 2 cruises by IOPAS
- 46% of GotDeep Surveyed
- 100% Gdansk Deep
- 10% Transport routes
Cruise by IO PAS (Oceania)
WP5. ECO-risk

• Environmental effects & fate of contaminants
  • Exposure experiments
  • Biomarker analyses
  • Bioindicator based ecosystem state

• Ecological risk assessment and development of a leakage model
WP6. Guidelines

• Transnational Meetings
• Guidelines on Chemical Munitions in the Baltic Sea
  • Fished munitions
  • Waste management (sediments)
  • Contaminated areas
• CWA Contingency plan
• CWA Advisory body
Outputs

• Recommendations on Operating Procedures for analysis of environmental samples
• Complete characterisation of Baltic CWA sites
• Recommendations on Operating Procedures for detection of underwater CWA objects and sampling in contaminated areas
• Predictive tool of ammunition detection
• Stationary leakage model
• Calculation of costs of different leakage events
Outputs – cont.

- Guidelines and procedures for fished munitions
- Guidelines for safe disposal of CWA contaminated sediments
- Designation and guidelines for CWA contaminated areas
- Permanent, transnational Baltic CWA-advisory body
- Contingency plan
HELCOM MUNI

- Verification of dumping areas
- Risk assessment on case-by-case basis
- Recovery options
- Guidelines for affected groups
- Improved models
CHEMSEA is an applied-research project aimed at linking science with administration and policy. This is reflected by the partnership composition: on one hand the team includes civilian, military and oceanographic research institutes whose expertise is hazardous substances, such as chemical warfare agents dumped in the Baltic Sea. On the other hand, CHEMSEA also brings in marine, military, environmental and other authorities in charge of taking decisions related handling of these chemical warfare agents.

Keeping in mind the challenges that exist in the transfer of knowledge between the research community and the different administrations, the CHEMSEA partnership was designed as a cooperation between at least one research institute and one relevant administration in each of the participating countries. In addition to the partners, several associated organisations have declared their commitment and willingness to take an active role in the project.
THANK YOU FOR YOUR ATTENTION

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