The Måseskär dump site – concentrations of chemical warfare agents, and possible management options

Lindgren JF[1*], Dahllöf I[2], Paka V[3], Niemikoski H[4], Kotwicki L[5], Tengberg A[1], Vanninen P[4], Hassellöv I-M[1]

[1] Mechanics and maritime sciences, Chalmers University of Technology, Sweden
[2] Biological and Environmental Sciences, University of Gothenburg, Sweden
[3] Shirshov Institute of Oceanology, Russian Academy of Sciences, Russia
[4] VERIFIN, Department of Chemistry, University of Helsinki, Finland
[5] Institute of Oceanology, Polish Academy of Sciences, Poland

*f.lindgren@chalmers.se

Bremerhaven meeting 4-7 February 2019

Outline

- CWA dumping
  - History
  - Examples
- Måseskär area
  - Historical investigations
  - Sediment sampling
- Management options

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Chemical warfare agent (CWA) dumping

- Post WWII – large stocks of munitions in former Nazi Germany
  - Conventional munitions
  - Chemical warfare agents
    - Mustard gas
    - Clark I, Clark II
    - Adamsite
- Decision to perform dumping operations in the ocean
- Allied 1946-1947
- Convoys with worn-out/damaged ships

CHEMSEA, 2013

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CWA dumping, cont.
History

- 21 May 1946 – Repacking Toxic Artillery Shells. German civilian laborers at the Grafenwohr Depot loading Russian 75mm mustard gas filled artillery shells into boxes from **open field stacks**, for shipment to Bremerhaven, to be dumped in the North Sea.

Arison, 2013

CWA dumping, cont.

History

- St. Georgen chemical depot
- 1945-1946
- Burning operation
  - 4138 m^3 mustard
  - 745 m^3 Clark I and II

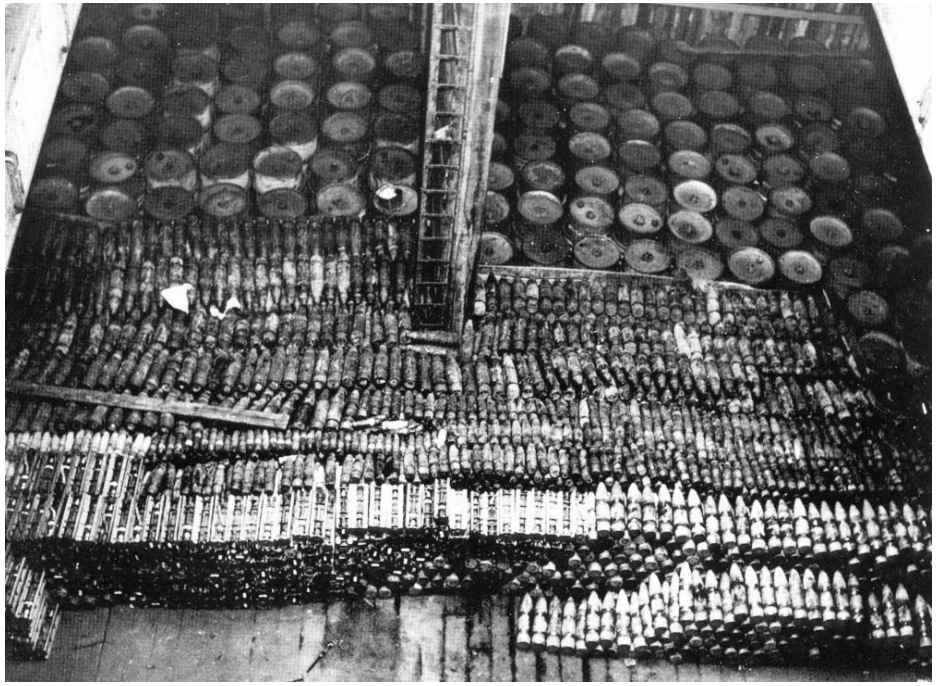
Arison, 2013

CWA dumping, cont.

- Ships scuttled
- Single objects pushed overboard

Arison, 2013

Shipwrecks ready for scuttling



Arison, 2013

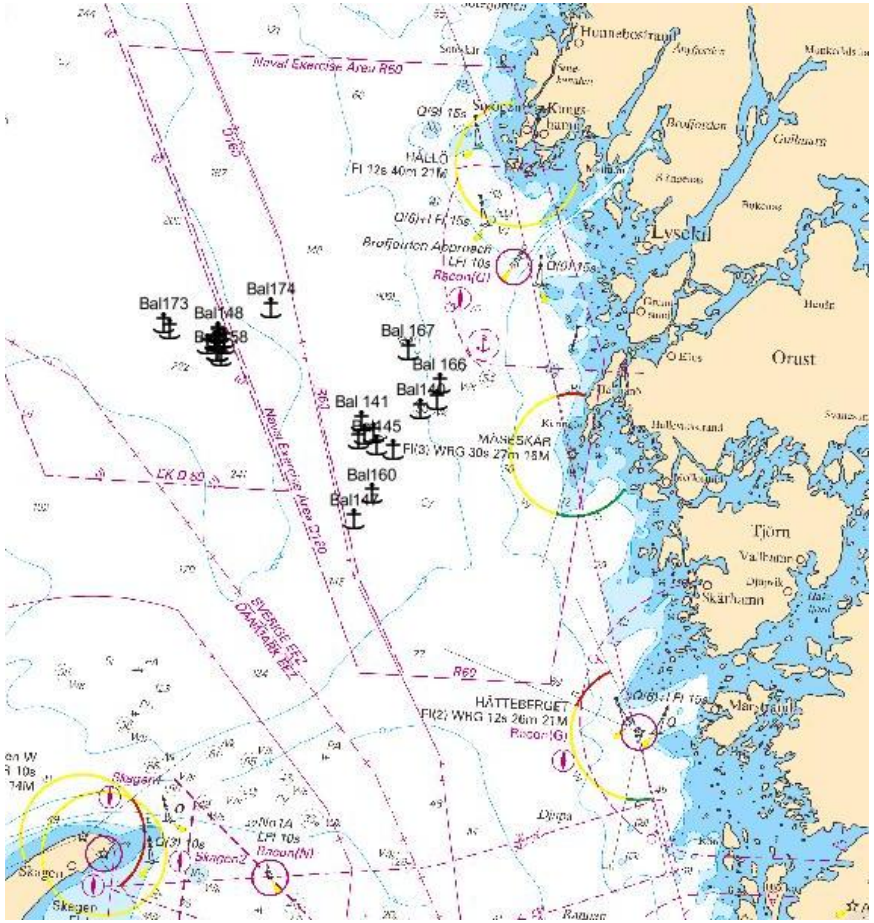
- Examples of cargo-holds

Skagerrak dumpsite

Måseskär

- West of the Island Måseskär
- 19nm (7-22)
- Depth: 190-220m

- Area known as the Gas ships



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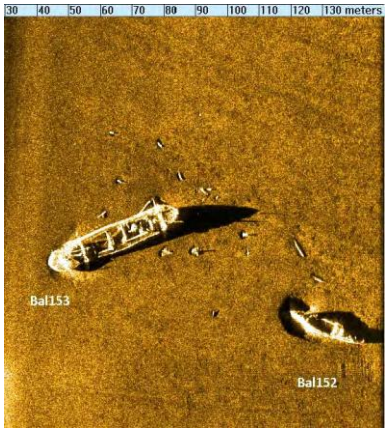
Historical investigations
Survey wreck area

- Swedish Maritime Administration
- 2015
- Hydrographic survey
  - Sidescan
  - Multibeam
- 28 wrecks identified
- ROV investigation 13

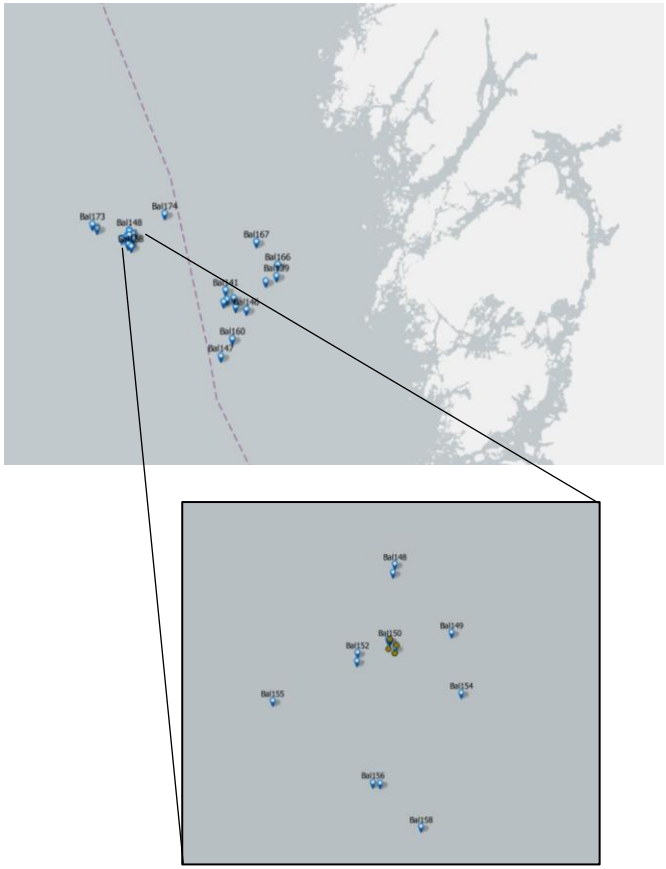


Hassellöv et al., 2015

Historical investigations, cont.

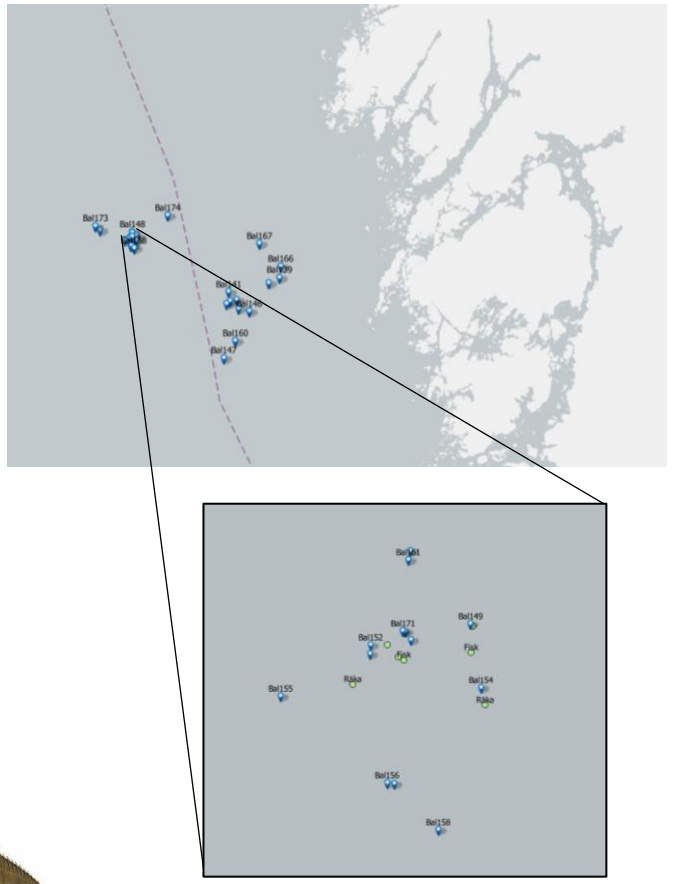
Sediment analysis

- Swedish Maritime Administration
  - Mustard gas - low conc.
  - 1992
- Russia
  - As, Pb
  - 1998



Historical investigations, cont.
Exploratory fishing

- Swedish Agency for Marine and Water Management
- 2016, 2017
- 12% of the samples
- Norway lobster (*Nephorps norvegicus*)
- Northern shrimp (*Pandalus borealis*)
- Witch (*Glyptocephalus cynoglossus)*
- Clark I and Clark II



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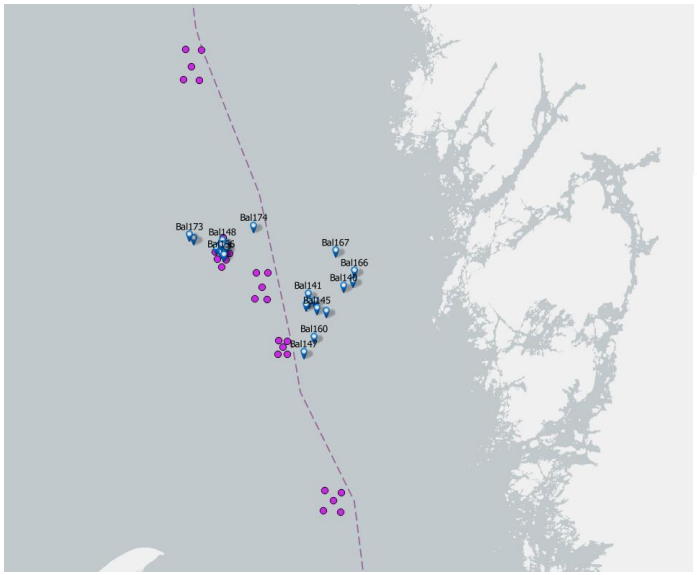
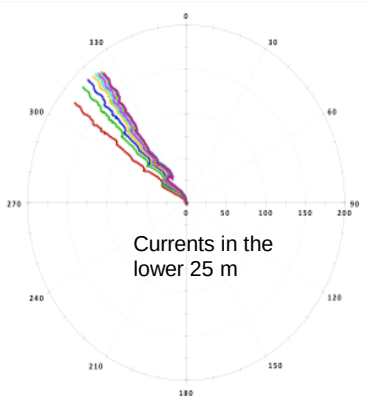
DAIMON - Sediment sampling

Chalmers and Shirshov Institute of Oceanology

- Sampling points
  - Widespread
  - Dispersal
    - sea floor current
    - trawling
- Concentrations
  - CWA
  - As
- Effects on biota
  - Meiofauna





Akademik Strakhov

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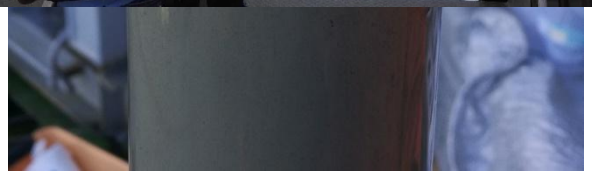

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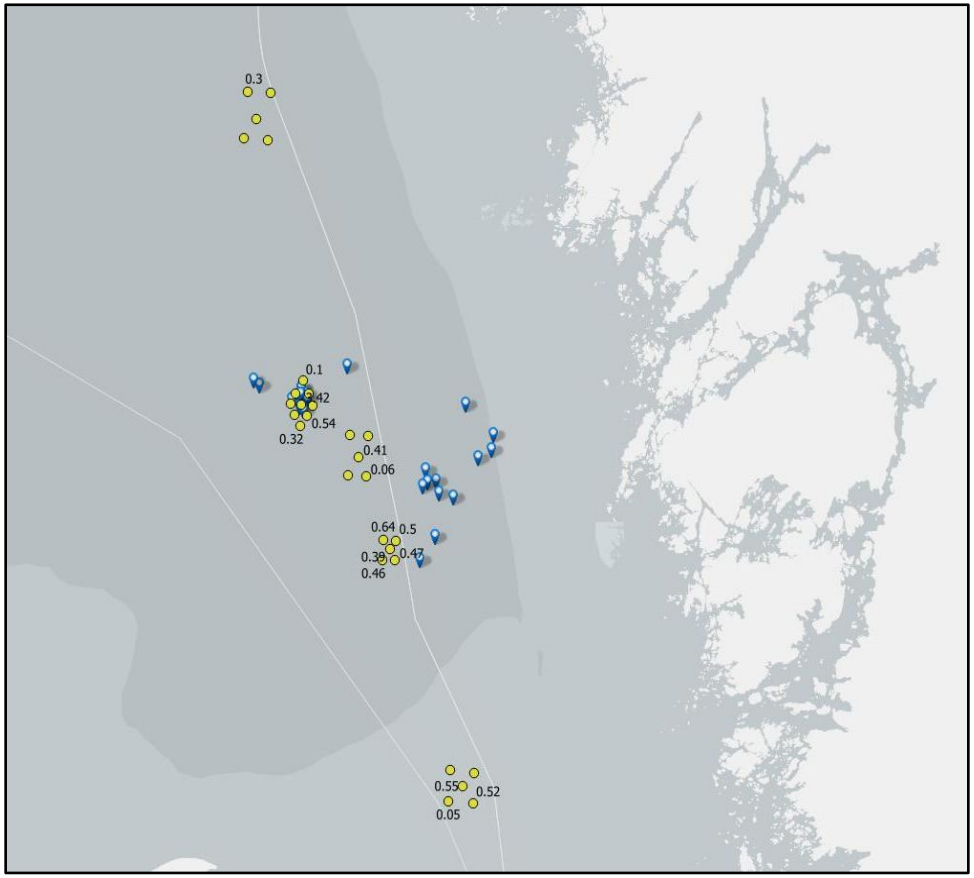
DAIMON - Sediment sampling

Results

- Mustard 52% of samples
- Control area
- Different meiofaunal communities
  - As most responsible



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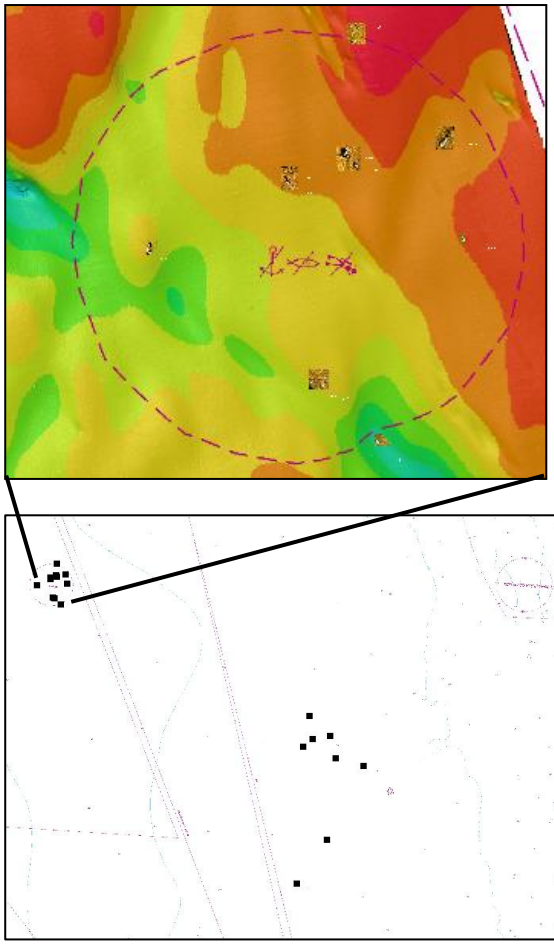
Existing management

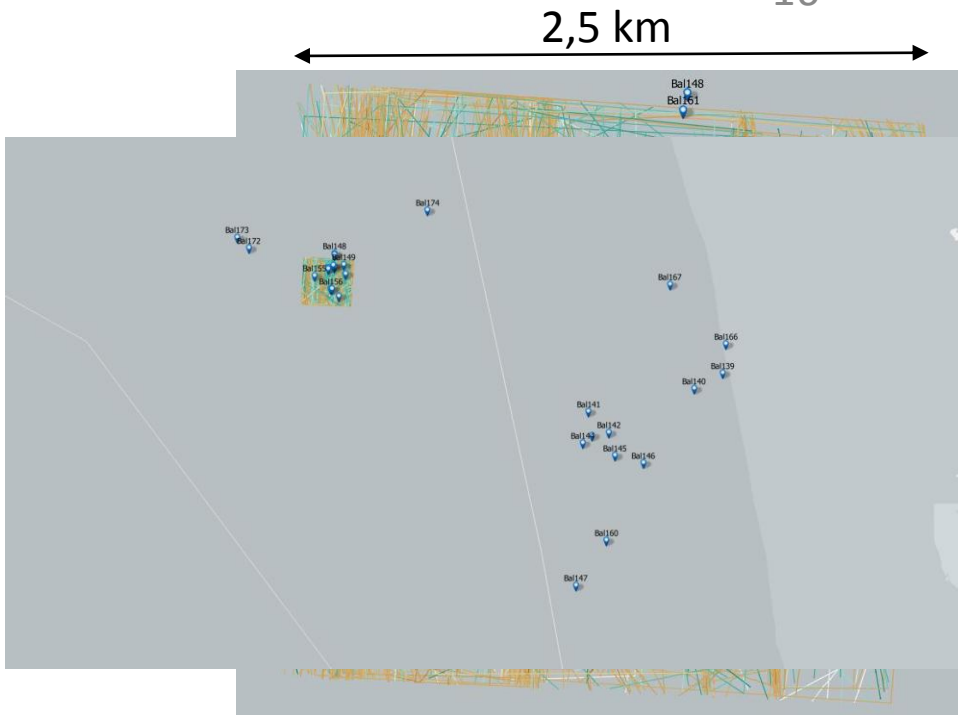
- Sea chart
- Warning for sea-floor activities
  - Anchoring
  - Fishing
  - Diving



Activities in the area

Commercial fishing

- Trawling
- >100 tracks/year
- Different nationalities
  - Fi, Se, Dk, No
  - Bilateral agreements



Management strategies

Possibilities

- Limit activities - trawling
- Monitoring – exploratory fishing
- Raising the CWA and subsequent destruction
  - Incineration
  - Hydrolysis (mustard gas)
- Containment
  - Sediment
  - Concrete
- Costs…

Reuters, 2013

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Interreg Baltic Sea Region

EUROPEAN UNION

EUROPEAN REGIONAL DEVELOPMENT FUND

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

Summary

Historical dumping areas

Måseskär site

- Investigations
- Exploratory fishing – Clark I in fish and crayfish
- Sediment sampling – Mustard 52%

Management strategies

- Close area for fishing
- Other

Fredrik Lindgren, f.lindgren@chalmers.se

Chalmers University of Technology

X-ray florescence (XRF)

- On board
  - Wet sediment, initial screening
  - High As → indication of CWA
  - Further cores in that location
- Laboratory
  - Dry sediment
  - Concentrations of As
  - Complement to the CWA analysis