The corrosion rate of munitions dumped in the Baltic Sea

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Introduction:

Within the framework of the project "DAIMON" tests of rate and type of corrosion of metallic construction materials of chemical (conventional) munitions, and containers in which CWA dumped in the marine environment were stored, was carried out using coupon corrosimetry method.

Material used in experiments

No.	Material type / origin	Material markings (symbols)	Type of experiment
1.	Materials from the barrel of German production from 1942 year	B	In-situ Ex-situ
2.	Materials from a 75mm artillery projectile of German production	75	In-situ
3.	Steel St3S	ST	In-situ Ex-situ
4.	Steel S355J2	S3	In-situ Ex-situ
5.	Stal Steel S235J	S2	In-situ Ex-situ
6.	Stal Steel S 235 JRG+N II	S2N	In-situ Ex-situ
7.	Aluminum alloy AlMg	PA11	In-situ
8.	Aluminum alloy AlMg	PA43	In-situ

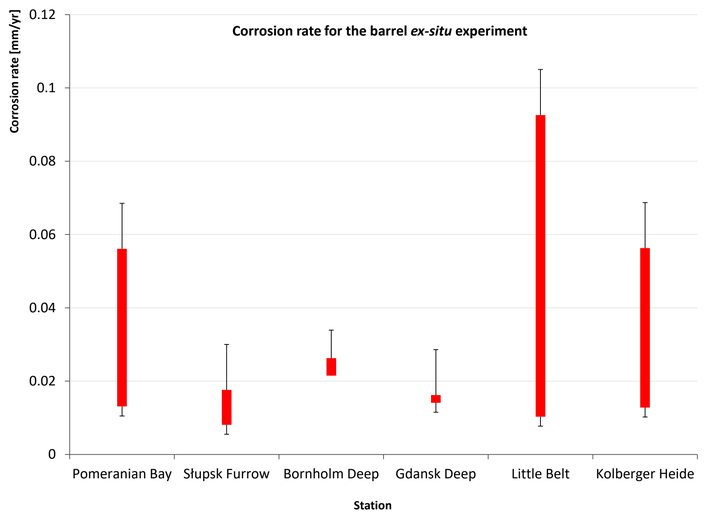
Coupons cleaned after exposition to corrosive factors

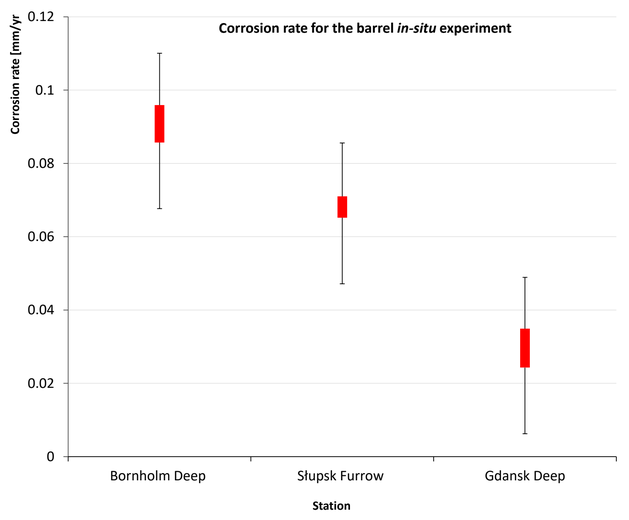
Materials:

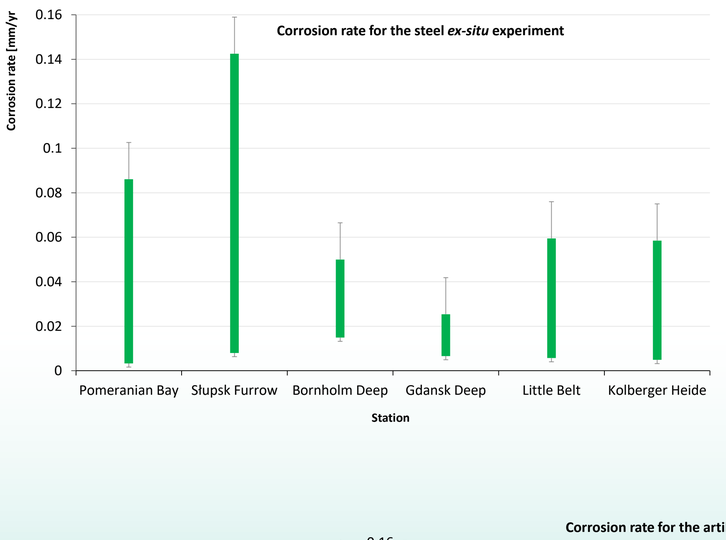
Materials examined in the form of coupons, were obtained from two original elements from the WWII (projectile artillery shell and barrel cover), but also from materials currently manufactured (steel sheets), however with a composition similar to the chemical composition corresponding to the construction materials of ammunition produced before and during WW II.
The research on the rate of corrosive dissolution was carried out in two parallel experiments: ex-situ and in-situ.

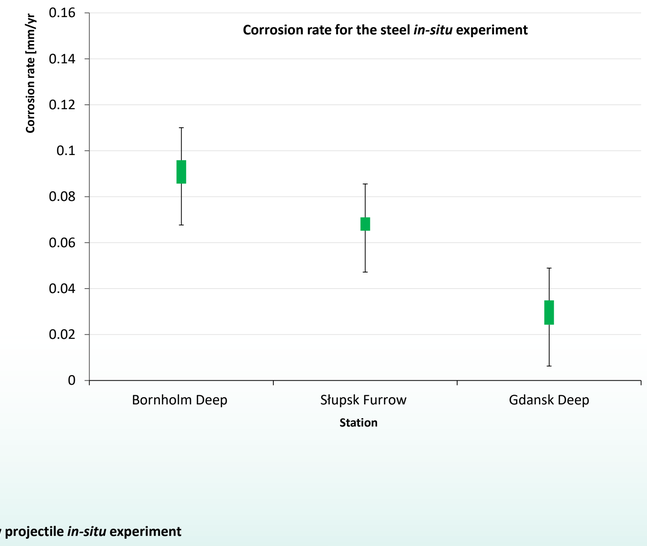
EXPERIMENT *EX-SITU*
PNA laboratory

EXPERIMENT *IN-SITU*
Racks with coupons









Conclusions:

EX-SITU EXPERIMENT

- after 70 years of the deposition thickness of barrels covered with sediment decreased by 0.6 mm to 4 mm,
- barrels are completely destroyed and unsealed, and the CWA have already been released into the environment
- aerial bombs covered with sediment the thickness of their bodies decreased by 0.1 mm to 6 mm
- bombs may already be destroyed or heavily corroded, in case of their recovery, they may break

IN-SITU EXPERIMENT

- after 70 years of deposition of the munitions in the marine environment, the thickness of barrels has decreased by approx 1.7 mm to 6 mm
- CWA from the barrels have already been released into the marine environment
- thickness of the artillery prtojectiles shell has decreased by 5.7 mm to 8.5 mm, therefore it can be assumed that they are corroded, but they can still be tight
- thickness of aerial bombs decreased by 1.3 to 7.5 mm, and CWA probably have been released into the environment