

ID: W2800278667

TITLE: Spread, Behavior, and Ecosystem Consequences of Conventional Munitions Compounds in Coastal Marine Waters

AUTHOR: ['Aaron J. Beck', 'Martha Gledhill', 'Christian Schlösser', 'Beate Stamer', 'Claus Böttcher', 'Jens Sternheim', 'Jens Greinert', 'Eric P. Achterberg']

ABSTRACT:

Coastal marine environments are contaminated globally with a vast quantity of unexploded ordnance and munitions from intentional disposal. These munitions contain organic explosive compounds as well as a variety of metals, and represent point sources of chemical pollution to marine waters. Most underwater munitions originate from World Wars at the beginning of the 20th century, and metal munitions housings have been impacted by extensive corrosion over the course of the following decades. As a result, the risk of munitions-related contaminant release to the water column is increasing. The behavior of munitions compounds is well-characterized in terrestrial systems and groundwater, but is only poorly understood in marine systems. Organic explosive compounds, primarily nitroaromatics and nitramines, can be degraded or transformed by a variety of biotic and abiotic mechanisms. These reaction products exhibit a range in biogeochemical characteristics such as sorption by particles and sediments, and variable environmental behavior as a result. The reaction products often exhibit increased toxicity to biological receptors and geochemical controls like sorption can limit this exposure. Environmental samples typically show low concentrations of munitions compounds in water and sediments (on the order of ng/L and µg/kg, respectively), and ecological risk appears generally low. Nonetheless, recent work demonstrates the possibility of sub-lethal genetic and metabolic effects. This review evaluates the state of knowledge on the occurrence, fate, and effect of munition-related chemical contaminants in the marine environment. There remain a number of knowledge gaps that limit our understanding of munitions-related contaminant spread and effect, and the need for additional work is made all the more urgent by increasing risk of release to the environment.

SOURCE: Frontiers in marine science

PDF URL: <https://www.frontiersin.org/articles/10.3389/fmars.2018.00141/pdf>

CITED BY COUNT: 61

PUBLICATION YEAR: 2018

TYPE: article

CONCEPTS: ['Environmental science', 'Unexploded ordnance', 'Marine ecosystem', 'Environmental chemistry', 'Biogeochemical cycle', 'Ecosystem', 'Contamination', 'Abiotic component', 'Pollution', 'Explosive material', 'Ecology', 'Chemistry', 'Geology', 'Biology', 'Remote sensing', 'Organic chemistry']