

Is TNT leaking into the North Sea?

Monteyne Els, Frederic Francken, Gijs Coulier and Koen Parmentier

Royal Belgian Institute for Natural Sciences, Operational Directorate Natural Environment, 3de en 23ste Linierregimentsplein, 8400 Oostende, Belgium

E-mail: emonteyne@naturalsciences.be

After World War I, an estimated 35,000 tons of ammunition was dumped in the North Sea offshore Knokke-Heist, on a shallow sandbank called 'Paardenmarkt'. It is estimated that apart from conventional artillery shells, roughly 12,000 tons consisted of chemical warfare. These shells contain toxic chemical agents such as CLARK (I and II) and Yperite (mustard gas). But not only the chemical warfare itself is toxic. One should also take into account the explosive compounds (mainly TNT), which can be equally toxic. While it is estimated that 1,200 tons of chemical compounds are dumped, the total amount of explosives on the Paardenmarkt is estimated to be at least 2,500 tons.

The Paardenmarkt ammunition dumpsite extends over 3 km² and is indicated on hydrographic maps with a pentagon, where neither fishing nor anchoring is allowed. Extension of the Zeebrugge harbor, increased beach nourishment works and nearby dumping sites for dredging activities in the Zeebrugge harbor and access channels to these harbor have led to increased siltation of the area, covering the ammunition with fine-grained sediments, rendering them anoxic. At present, there are no indications for acute danger and the best option therefore seems to leave the dumpsite untouched - under the precondition of regular monitoring. Since the mid nineties, seabed monitoring is done on a regular basis to map the erosion/accumulation processes, whereas chemical monitoring is done to screen for specific ammunition related compounds.

Additional research is required to assess the risk of possible leakage. A diffusion model of the toxicants leaking from the shells has been made in previous studies (Francken & Hafez, 2009). In order to validate and refine these models, actual measurements of TNT have to be performed. TNT has been suggested to bind strongly to sediments (Shen *et al.*, 1998). Passive sampling is a method to assess the labile fraction of TNT in sediments. For this purpose new methods have to be developed, using for example ceramic passive samplers or polydimethylsiloxane passive samplers. The analytical methods require to be very specific and with a high sensitivity to measure trace levels of TNT.

References

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