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5.18.14

Chemical Weapon Munitions Dumped at Sea: An Interactive Map

CNS has located 127 CW disposal and human exposure sites. CNS created a Google Earth map and presentation in hopes of garnering further interest.

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Posted: **August 6, 2009**

Overview

In the decades following World War I, and even more so after World War II, at least three major powers disposed of massive quantities of captured, damaged, and obsolete chemical warfare (CW) material by dumping them in the oceans. According to U.S. Department of Defense reports, the U.S military alone dumped CW agents in waters worldwide on at least 74 occasions between 1918 and 1970.[1,2] The jettisoned material consisted either of munitions containing chemicals (such as artillery and mortar shells or bombs) or chemicals encased in some manner in, for example, bulk containers made out of metals or cement. Shells and bombs sometimes were jettisoned unfettered, but more often were loaded as cargo into ships that were sunk by opening sea cocks or holed by artillery fire or torpedoes. Sunken ships tended to settle on the ocean floor largely intact, with the result that the CW material they contained remained within a small area. Unfettered material could settle within a small area, but also might become widely dispersed by currents, tides, and other forces. As can be realized, not much consideration was given at the time to the safety and environmental implications of employing ocean-dumping disposal techniques.

Some dumping operations were carefully undertaken, including the keeping of records of where the dumping occurred, a listing of the material that was dumped, and the quantities of dumped material. Other dumping was done haphazardly with no or minimal records being written and kept. In particular, the USSR (and now Russia) has provided hardly any records to the international community of its sizeable chemical dumping activities. The potentially enormous problem posed by Soviet ocean-dumped chemical material is demonstrated by Russia having admitted that "at least 160,000 tons of chemical weapons may be buried in Russian seas, posing a grave threat to ecology and the health of man."[3] For these reasons, the total quantity of CW material discarded at sea will never be known precisely, but most likely is on the order of several hundreds of thousands of tons.[4] To demonstrate the quantities involved, after World War II 302,857 tons of CW ammunitions were left over in just Germany and the United Kingdom, most of which were eventually dumped in the oceans.[5]

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As public environmental concerns rose in the 1960s, national and international environmental protection legislation emerged causing the disposal of CW agents at sea to become increasingly rare. A major development in this regard occurred in 1969, when the U.S. National Academy of Science recommended that ocean dumping be discontinued as a method of chemical agent and munition disposal.[6] However, legal CW ocean dumping did not end until after the "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972", a multilateral treaty concluded in 1972, banned the practice of ocean-dumping of CW materials.[7]

CW agents present three types of threats to the world. First, many contain energetic material for explosive dispersion that can self-detonate without warning. Second, by design chemical weapons can cause human casualties, thus some human activities, such as fishing, dredging, and pipe-laying in areas laden with dumped CW agents, may result in humans being exposed to chemicals whose powers to burn skin, injure the naso-pharyngeal and gastrointestinal tracts, and close down the nervous system are very high (see below). Third, CW agents and their degradation products can cause direct and indirect damage to the environment. There is little data on how and to what extent CW agents may cause environmental harm, though it appears likely that CW agents would be able to maim and kill marine organisms in a similar fashion to terrestrial beings. If so, the damage to primary producers in the marine environment, as well as the food webs of which they are members, could be very high.

CW agent disposal sites have created a latent public health hazard with unknown but potentially serious environmental consequences. In areas of substantial dumping, such as off the coast of Japan and in the Baltic and Adriatic Seas, a large number of injuries have resulted from exposures to accidentally recovered CW agents. In most cases, CW materials are ensnared in fishing nets or accidentally disturbed during dredging operations. For example, Italian scientists have documented 232 instances of mustard-related injuries, including five deaths, suffered by Italian fishermen in the waters off Molfetta (near Bari) between 1946 and 1997.[8] Bioaccumulation of hazardous levels of arsenical chemicals in the local fish population, likely derived from the World War I-era blister agent Lewisite, has also been observed as recently as 2005.[9]

The Italian experiences in the Adriatic demonstrate that a better understanding of the locations of the dumpsites, as well as the status of the materials within them, is needed to gauge the risk posed by undersea CW munitions. Due to decades of advances in ocean science and technology, human oceanic activity is increasing and expanding to deeper waters. Consequently, CW dumpsites once thought impossibly remote are becoming increasingly accessible and dangerous to unaware explorers and workers. The issue has drawn considerable attention, and concern, by both the public and its elected representatives, resulting in the commissioning of research activities and the publication of official reports documenting the extent of dumping activities undertaken in the 20th century and their potential for causing harm. For example, in 2006 the U.S. Congress enacted legislation requiring the Secretary of Defense to review historical records and report annually on "the number, size, and probable sites where the Armed Forces disposed of military munitions in coastal waters."[10]

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Always keeping in mind that information about most ocean dump sites is incomplete and that many dump sites, especially Russian ones, there is information about an unknown percentage of them; we estimate between 40 and 50%. The sites that are best known, and mapped, are those located in the Baltic Sea and North Atlantic, mostly because those who undertook the dumping did record their actions and, more recently, these areas have been surveyed for such reasons as natural products exploitation and the laying of cables and pipelines. Chemical dump sites in the rest of the oceans, particularly the Pacific Ocean, are hardly known at all, so we think of this project as one that will continue with new information being continually unearthed and periodically used to update the global map.

Chemical Arms Control and Disposal

Major powers, including the US, UK, USSR, Germany, and France, manufactured massive quantities of CW agents throughout much of the 20th century. Their widespread use in World War I resulted in hundreds of thousands of casualties. The horrors of CW use during the war stimulated diplomats to negotiate the 1925 Geneva Protocol, a multilateral treaty banning the use of CW agents in armed conflict. However, the Geneva Protocol has since its inception been considered a weak arms control treaty since it has no provisions for verification or levying sanctions. Further, it makes no mention whatever of eliminating chemical weapons.

In the 1980s, countries began to draft a stronger chemical arms control convention, which was realized in 1993 as the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction, more generally known as the Chemical Weapons Convention (CWC), which entered into force in 1997. One of its main provisions requires its State Parties (currently 188 with an additional 2 signatories) to destroy all existing CW stockpiles and renounce any future development, production, stockpiling, or use of chemical weapons.[11] Notably, the CWC is silent with respect to the remediation of CW agents and munitions dumped at sea prior to 1972.

With few exceptions, nations that in the past possessed a CW program now belong to the CWC and thus are faced with the problem of disposing the remnants of their programs. As this is written, only one CW-possessing country, Albania, has declared complete disposal of its chemical weapons. The major possessors, Russia and the United States, are not likely to be in Albania's position until the early 2020s. All chemical weapons and related facilities in current and former possessor countries are located on terrestrial sites, hence are relatively easy to access. (Japanese chemical weapons buried in China are the major exception to this statement.)

The situation regarding marine dump sites is completely different. These sites are dealt with in CWC's Article III, which gives State Parties the option of declaring and/or destroying chemical weapons "dumped at sea" before January 1, 1985. Further, State Parties are obligated to declare chemical weapons "dumped at sea" on or after January 1, 1985. John Hart notes that as of January 2000, "no formal declaration of dumping of CW in the high seas or in territorial waters have been submitted to the OPCW [Organization for

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the Prohibition of Chemical Weapon].[12] As far as we know, no such declaration has been made as of January 2008.

Nevertheless, the countries that in the past chose to take the "easy" way out by disposing their CW material by ocean dumping are now realizing the unpleasant fact that this material, although out of sight, is not out of mind because it presents threats to public health and the environment as discussed above. Therefore, countries responsible for past disposals of CW material in the oceans must now consider how they might act to undo the damaging actions authorized by past leaders that from hindsight appear foolish. By publishing the maps [13] containing information about chemical dump sites in the ocean, we hope to alert the world community about the large scope and seriousness of the problem and make clear that it is indeed global. While it is beyond the scope of our consideration, we note that options for approaches for addressing the problem of CW materials resting on ocean floor has been discussed by Hart.[12]

Conclusion

Most of the information present in the open literature regarding the location of CW agent dumpsites in the oceans is specific to a unitary actor (e.g. the U.S. military) or a particular geographic region.[14] No comprehensive database encompassing all available marine disposal information has been compiled. Data on casualties due to accidental exposure to chemicals populating these dumpsites is even more fragmentary and data on environmental damage is almost entirely lacking. In view of this lack of information, the James Martin Center for Nonproliferation Studies is attempting here to make available all-inclusive information regarding the locations of undersea CW dumpsites and the contents they hold in order to facilitate the analysis of public health risks and environmental hazards posed by such sites, including the determination of susceptible human populations, coastal industries, and marine ecosystems. Further, a readily accessible database hopefully will serve to call public attention to a poorly understood yet significant issue, and also highlight knowledge gaps (such as incomplete or inaccurate geographic coordinate data) that require further study. Because the CWC is virtually silent with respect to the issue of undersea CW dumpsites, the opportunity exists for the initiation of a new multilateral effort to address the problem outside the treaty. This project thus seeks to provide a unified, nonpartisan data source to stimulate and support the efforts of national and international endeavors to address the serious threats posed to public health and the environment by CW material resting on the ocean floor in locations throughout the world.

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Explore the CWMDS Interactive Map

Runs the beta edition of the CWMDS.

Take a Video Tour

[7 MIN, YOUTUBE]

A video outlining significant locations and describing the CWMDS.

Through this tour, we hope to highlight the global nature of this problem by showing you example disposal sites located around the globe; in locations ranging from the Bay of Bengal to areas west of San Francisco.

Download the Latest Version of the CWMDS Map Data

[KML FORMAT]

This keyhole markup file is coded for use with Google Earth.

The file tracks known incidents of chemical weapons disposed at sea.

Related Resources

Chemical and Biological Weapon topics

NukeTube.TV: Nonproliferation Videos and Multimedia

More Feature Stories

Notes

[1] Program Executive Officer-Program Manager for Chemical Demilitarization, *Chemical Stockpile Disposal Program: Chemical Agent and Munition Disposal. Summary of the U.S. Army's Experience*, SAPEO-CDE-IS-87005, (Aberdeen Proving Ground, Maryland, September 21, 1987).
[2] U.S. Army Research, Development, and Engineering Command, *Off-Shore Disposal of Chemical Agents and Weapons Conducted by the United States* (Aberdeen Proving Ground, MD, 2001).
[3] Interfax, "Ministry: 'Tonnes' of chemical weapons 'buried' at sea," Moscow, December 7, 1995.
[4] David M. Bearden, *U.S. Disposal of Chemical Weapons in the Ocean: Background and Issues for Congress* (Washington, D.C.: Congressional Research Service, May 24, 2006).
[5] Fredrick Laurin, "Scandinavia's underwater time bomb," *Bulletin of the Atomic Scientists*, Vol. 47(2), p. 11.
[6] National Academy of Sciences, *Disposal Hazards of Certain Chemical Warfare Agents and Munitions* (Washington, D.C.: National Academy Press, 1969).
[7] International Maritime Organization, "London Convention 1972" available at <www.imo.org>.
[8] G. Assennato, D. Sivo and F. Lobuono, "Health Effects of Sulfur Mustard Exposure among Apulian Fisherman," Noblis Inc. (1995), <www.noblis.org>.
[9] E. Amato, L. Alcaro, I. Corsi, C. Della Torre, C. Farchi, S. Focardi, G. Marino, and A. Tursi, "An

Integrated Ecotoxicological Approach to Assess the Effects of Pollutants Released by Unexploded Chemical Ordnance Dumped in the Southern Adriatic (Mediterranean Sea)," *Marine Biology*, Vol. 149 (2006), pp. 17-23.

[10] 109th US Congress, "John Warner National Defense Authorization Act for Fiscal Year 2007," Public Law 109-364, Section 314, October 17, 2006.

[11] The text of the CWC may be read at: <www.opcw.org>.

[12] John Hart, "A review of sea-dumped chemical weapons," paper presented at the "The Environment and the Common Fisheries Policy, Threats to and Constraints on Sustainability" forum, 27 January 2000, The Royal Society, London, Great Britain.

[13] The mapping relies on a Keyhole Markup Language (KML) file, which utilizes features and programs created by Google™.

[14] J. Beddington and A.J. Kinloch, *Munitions Dumped at Sea: A Literature Review,*(London: Imperial College Consultants, June 2005).

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