Agenda Item 3.5

Review of New Information on Threats to Small Cetaceans

Underwater Unexploded Ordnance

Document 3.5

Environmental Nongovernmental Organizations' Perspective on Underwater Munitions

Action Requested

- Take note
- Comment

Submitted by

Secretariat

NOTE:
DELEGATES ARE KINDLY REMINDED TO BRING THEIR OWN COPIES OF DOCUMENTS TO THE MEETING

Secretariat's Note

The enclosed paper was kindly provided to the Secretariat by German NGO Naturschutzbund Deutschland (NABU), in order to assist the Advisory Committee with its new Work Plan Activity No. 5, "*Review knowledge about and potential adverse effects of underwater unexploded ordnance as well as methods for its environmentally-friendly removal and make appropriate recommendations to Parties and other relevant authorities*".

The Advisory Committee may wish to note, as an additional extensive information resource on the issue, the pages of an international conference on the subject which was held in November 2010. All presentations, workshop reports and a summary of results of the conference MIREMAR: Minimizing Risks for the Environment in Marine Ammunition Removal in the Baltic and North Sea can be accessed online.

COMMENTARY

Environmental Nongovernmental Organizations' Perspective on Underwater Munitions

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European waters, like others worldwide (e.g., Plunkett, 2003; Bearden, 2007), are crammed with various types of unexploded ordnance (UXO) and sea-dumped discarded military munitions (DMM) (HELCOM, 1995; OSPAR Commission, 2005; Amato et al., 2006; Böttcher et al., 2011). Underwater munitions pose serious risks to the marine environment and human health alike. As much as 1.6 million tons of conventional ammunition and chemical warfare (CW) material were dumped into the German waters of the North Sea and the Baltic Sea after World War II (WWII) in order to demilitarize existing arsenals of the German and allied armies (Böttcher et al., 2011). These contain up to 500,000 tons of carcinogenic explosives and other highly toxic agents (Nehring, 2011). In the period before WWII, munitions were also dumped, but there are no official estimates of quantities (Nehring, 2009).

Also, some types of rocket propellants, solid or liquid, are carcinogenic or mutagenic. In other seas, even radiologic and nuclear weapons or waste from their production have been dumped.

The most pressing challenges are to develop a scientific basis to better understand the potential impacts of all kinds of underwater munitions. This requires that we immediately explore and map dump sites and assess the risks they pose on a case-by-case basis. There are still knowledge gaps, but time is too short to twiddle one's thumbs. Old underwater munitions are ticking ecologic bombs, and an immediate strategic and international approach is needed to address this forgotten and mostly invisible threat.

Environmental Risks

UXO and DMM can adversely impact marine life in different ways:

(1) When dissolved or particulate chemical substances are spread in the water body from corroded munitions, these substances or their degradation products can have toxic effects to various organisms.

(2) During removal using blow-in-place operations or from spontaneous detonations, shock waves can seriously injure marine animals or result in acoustic trauma (Koschinski, 2011).

The long-term environmental effects of chemical substances (munitions constituents and their degradation products) are extremely variable and not adequately investigated. The explosive compounds, such as trinitrotoluene (TNT) and royal demolition explosive (RDX, hexogen), and their degradation products are highly toxic and can even be carcinogenic, mutagenic, or teratogenic (toxic for reproduction) (e.g., Won et al., 1976).

Furthermore, heavy metals such as mercury (in its organic form) and lead, used in fuses and detonators, have an extremely high bioaccumulation potential, resulting in highest concentrations in marine top predators (e.g., Atwell et al., 1998), adversely affecting their endocrine systems (e.g., Kakuschke et al., 2005). To illustrate this risk: the WW II munitions in German marine waters contain about 500 tons of mercury (Nehring, 2011).

Given the numerous exposure paths to various substances, it is often impossible to link adverse ecological effects to certain substances. This should not give rise to the assumption that there is no problem if no direct effects can be attested. The fact that handling of substances of concern requires extensive safety measures in order to avoid serious adverse health impacts in humans shows that they

should not be considered harmless in biological systems.

Detonations are the loudest point source of underwater noise with pressure peaks of up to 300 dB (re 1 µPa 1 m) and can cause dramatic consequences for all marine life (on an individual level and likely on an ecological level) and marine vertebrates, in particular. The adverse effects range from acoustic trauma damaging the cochlear structure in the inner ear to deadly injury resulting from shock waves (Koschinski, 2011). The full spectrum of adverse effects on all marine life is poorly understood, in particular with respect to population level effects in different species (e.g., the critically endangered harbor porpoise in the Baltic Sea). As a consequence, the precautionary approach has to be applied to comply with international environmental law. This approach states that if a risk of causing harm to the environment is suspected but scientific consensus is missing, the burden of proof falls on those taking an action (such as detonating a mine or bomb in the sea).

Underwater explosions can also cause toxic effects. The detonation of munitions does not necessarily result in the complete combustion of all munitions constituents. Especially low-order detonations with incomplete combustion cause contamination with dissolved (Pfeiffer, 2008) or particulate toxic munitions constituents such as TNT (ESTCP, 2002; Pfeiffer, 2009). By contrast, heavy metals contained in munitions are always released into the environment by detonations because they cannot be degraded or burnt.

Human Health Risks

DMM and UXO can be found in many offshore and most coastal waters. People accidentally come into contact with munitions or substances released from broken or corroded shells (in solution or as particles of various sizes). A number of accidents with old ammunition in Germany are reported by Nehring (2007, 2008).

Fishermen and workers in offshore businesses (e.g., diving, oil and gas, offshore wind farming, cable and pipe-laying, dredging) run a specific risk of encountering conventional munitions or CW agents (HELCOM, 1995; Böttcher et al., 2011). Consequently, it is conceivable that fish or other seafood from contaminated hauls will find their way into the market. This has been officially documented in Germany in a number of cases (Nehring, 2011). Because old munitions fills or munitions fragments being washed up cannot be easily identified as being extremely hazardous, beachgoers and bathers are also at risk.

Bioaccumulation of toxic substances in fish and other seafood is a reason for human health concerns. Extended exposure to seawater and corrosion is resulting in the release of substantial amounts of toxic compounds from ammunition into the sea floor and surrounding waters over a considerable time. There are substantial quantities of toxic compounds in the ammunition and a concern is whether the rate of release will remain steady or will change significantly. This requires monitoring at specific sites in order to frequently reassess risks.

Measurable quantities of explosive residues were detected in various biota including fish from the vicinity of UXO at Vieques Island, Puerto Rico (Barton & Porter, 2004). Typical substances originating from old munitions were also found in marine organisms from the Baltic Sea (e.g., 4-amino-2,6-dinitrotoluene in blue mussels; Maser, 2011). The exposition path to toxic compounds and their movement through the marine food web is not well investigated, but it is conceivable that persistent substances could find their way into seafood products. Seafood is not monitored for munitions constituents.

The Legal Framework

There are different legal instruments that potentially regulate international approaches to addressing the problem of underwater UXO and DMM, although munitions are not explicitly mentioned. The existing legal instruments suffer from incomplete data or unclear wording and rarely keep pace with continuously increasing scientific knowledge. The most relevant legislation relating to European waters is presented here.

The United Nations Convention on the Law of the Sea (UNCLOS) defines rights and responsibilities of nations in their use of the world's oceans. It establishes guidelines for business, the environment, and the management of marine natural resources. Article 192 generally obliges signatories to "protect and preserve the marine environment." In addition, Article 194 calls on states to take all appropriate measures necessary to ensure that activities in areas under their jurisdiction do not damage the environment. These measures shall "prevent, reduce, and control pollution" in order to "minimize to the fullest possible extent" potential adverse effects and shall "deal with all sources of pollution of the marine environment." Marine pollution is defined in Article 1 as the introduction of substances or energy "which results or is likely to result in such deleterious

effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities." Consequently, contaminants and noise resulting from munitions are covered by this and other legal instruments. UNCLOS defines the framework for most relevant European environmental laws, such as the Habitats Directive or the Marine Strategy Framework Directive (MSFD) and also for strategic approaches of regional conventions such as Oslo-Paris Convention (OSPAR) and Helsinki Convention (HELCOM).

The Habitats Directive (92/43/EEC) forms the cornerstone of Europe's nature conservation policy (http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm). It protects more than 1,000 animal and plant species and 220 habitat types. For habitats and species listed in Annexes I and II, Special Areas of Conservation have to be designated. The main aim is to maintain biodiversity. Article 6(2) obliges Member States "to take appropriate steps to avoid, in the special areas of conservation, the deterioration of natural habitats and the habitats of species as well as disturbance of the species for which the areas have been designated." In light of the detrimental effects of underwater munitions on the marine environment, this commitment must include an obligation to protect biodiversity from dumped munitions.

The MSFD (2008/56/EC) is the environmental pillar of the integrated Marine Policy of the European Union (EU). The Directive requires Member States to prepare national strategies to manage their seas to achieve or maintain Good Environmental Status (GES) by 2020. It has a strong focus on regional cooperation using existing conventions where appropriate. Article 9(3) of the MSFD contains a number of criteria and associated indicators for assessing GES in relation to the 11 qualitative descriptors laid down in Annex I characterizing all elements of marine ecosystems (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0056:EN:NOT). Three of the descriptors should be highlighted. Descriptor 8 "Concentrations of contaminants are at levels not given rise to pollution effects" and the related indicator 3, which defines toxic substances to be considered as "contaminants and their total releases (including losses, discharges or emissions) may entail significant risks to the marine environment from past and present pollution," clearly cover the effects of ammunition, even if they occurred or were caused in the past. In addition, descriptor 9 addresses contaminants in fish and other seafood for human consumption that are not allowed to "exceed levels established by EU legislation or other relevant standards." The MSFD is the first legal instrument also covering the introduction of energy, including underwater noise. The aim that by 2020 EU noise levels "do not adversely affect the marine environment" can only be achieved by an extensive reduction of underwater detonations. If detonations cannot be replaced completely due to imminent danger or other safety reasons, all technical mitigation measures have to be applied to minimize adverse environmental effects.

The Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and Their Destruction (CWC) may be relevant when dealing with dumped CW. Although the CWC does not require declaration of CW dumped in sea areas prior to 1 January 1985, recovery of munitions containing CW agents could be interpreted as falling under the jurisdiction of the CWC.

Regional Conventions

The OSPAR Commission has adopted a framework for the development of national guidelines on how to deal with underwater munitions in order to reduce the risk to fishermen and coastal users. OSPAR activities include a program to investigate the extent of dumped munitions and to monitor the frequency of encounters. In 2009, OSPAR published an Assessment on the Environmental Impacts of Dumped Conventional and Chemical Munitions, and the 2010 Quality Status Report summarized OSPAR activities and further needs (http://qsr2010.ospar.org).

HELCOM works to protect the marine environment of the Baltic Sea from all sources of pollution through intergovernmental cooperation between the Baltic coastal states and the EU. In 1995, the ad hoc working group of national experts on CW (HELCOM CHEMU) presented their report on the knowledge on dumping sites as well as quantity and condition of the chemical munitions in the Baltic Sea at that point of time (HELCOM, 1995). Since then, HELCOM has continued to collect information submitted by countries and reports on this annually. In 2010, a corresponding expert group (HELCOM MUNI) was established. So far, HELCOM's approach is limited to CW. However, the quantity of conventional munitions and the number of sites in the convention area are much larger than the quantity of CW. Since each is subject

to corrosion and thus represents a point source of pollution, conventional munitions need to be addressed immediately as the risks may be even higher than those posed by chemical munitions.

The German Approach

In Germany, authorities are beginning to realize that it is time to act. Federal and state authorities recently addressed the legacy of underwater munitions, including the publication of the current knowledge on dumpsites, state of corrosion, and contaminants and the known effects in the marine environment (Böttcher et al., 2011). Extensive information is published on the web (www.munition-im-meer.de). This is the first time Germany has presented that information on munitions in such a transparent and comprehensive way. This approach is a valuable example for other nations and regional efforts.

However, the involvement of various federal and state authorities, driven by different motivations or hampered by internal restrictions, obviously resulted in a complicated coordination and adjustment process and the temptation to trivialize the problem. The general conclusions in Böttcher et al. (2011) seem to be based on the lowest common denominator of authorities involved rather than reliable scientific evidence. For example, the report neglects the possibility that currents potentially wash up munitions on beaches although this happens regularly in various places along German coasts. Furthermore, the authors rule out the potential danger of contaminated commercial fish products due to a lack of concrete scientific evidence (although exactly this has been documented in a number of cases; Nehring, 2011). Bearing in mind that generally no related analysis of fish and seafood is taking place and that at least TNT is known to be dermally absorbed by humans (Letzel et al., 2003), this conclusion seems to be insufficiently substantiated and must be reviewed.

The report fell short of suggesting a detailed risk assessment, which has to be made on a case-by-case basis as a precondition for a strategic approach to addressing the disregarded problem of underwater munitions. Since the report is meant as a "living" document, the next step should be to consult independent experts in order to replace those conclusions in the report with much more detailed recommendations. These recommendations must be scientifically based while adequately taking the precautionary approach into account to address uncertainties.

Removal in Place of Blasting

A very common method used for the disposal of underwater munitions is the intentional detonation initiated by placing a small donor charge on the munitions in order to initiate an explosion of the main charge. This procedure is referred to as "Blow-in-Place" and creates serious risks to the marine environment (Koschinski, 2011). A paradigm shift acknowledging the need for nature conservation is urgently needed to replace detonations by new and innovative technical alternatives, such as underwater robotics, water abrasive suspension cutting or mobile detonation chambers (Koschinski & Kock, 2009, www.miremar.de). The International Dialogues on Underwater Munitions and the MIREMAR conference (Minimizing Risks for the Environment in Marine Ammunition Removal in the Baltic and North Sea) demonstrated that there are hardly any technological constraints to conducting remediation activities in a more environmentally protective fashion. These are often used as mock reasons by decision makers in order to hide a lack of political willingness.

What Do Environmental NGOs Call For?

Despite the fact that more research is needed, the existing knowledge about the potential adverse impacts of underwater munitions calls for immediate action. Leaving things as they are is not an option at all. Countries with affected waters need a strategic approach to exploring and detecting munitions dump sites and to preparing detailed maps as a basis for a responsible risk assessment. National authorities, with the involvement of stakeholders, must identify which explosives have to be removed first and which technology is feasible. Blasting these relicts has to be replaced by alternative removal methods. A number of different technical solutions have been presented at the International Dialogues on Underwater Munitions and the MIREMAR conference. Environmental aspects, human health, and the safety of technical staff have to be considered equally. Additionally, the existing legislation has to be improved by more precise wording and by taking into account the latest scientific knowledge.

For the Baltic region, it is time that HELCOM deals with risks of conventional ammunition, reflecting that all munitions are point sources of pollution.

Underwater munitions are a worldwide concern and will require a global

response by all relevant bodies. Therefore, regionally and globally we need to continue to cooperate and to support the efforts of the International Dialogues on Underwater Munitions. We cannot afford to ignore the past or the future.

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