



PHASING OUT THE USE OF LEAD
SHOT FOR HUNTING IN WETLANDS:

EXPERIENCES MADE AND LESSONS
LEARNED BY AEWA RANGE STATES

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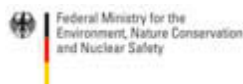
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LEAD POISONING IN WATERBIRDS

Lead poisoning in waterbirds through the ingestion of spent lead shot is a classical example of unwise use of natural resources. Each cartridge for hunting waterfowl contains around 30 grams of lead. Only a few of all fired pellets actually hit the bird, the rest fall to the ground or into the water. Waterbirds can pick the pellets from the bottom and ingest them, mistaking them for food items or grit which is retained in the gizzard to facilitate the grinding of food. The acidic stomach fluids, combined with the grinding of the gizzard, cause the pellets to dissolve. This is how lead enters the blood stream. Lead is a highly poisonous metal, causing severe anaemia and affecting the nervous and circulatory systems, liver and kidneys. Depending on the amount of pellets swallowed, birds could die within a few days or weeks. If a bird swallows only one pellet, it usually survives, although its immune system and fertility are likely to be affected. Even low concentrations of lead have a negative impact on energy storage, which affects the ability to prepare for migration.

Conservation and hunting organisations therefore agree that the use of lead shot for hunting in wetlands should be phased out.



Gizzard of a waterbird containing lead shot © Milton Friend/ U.S. Geological Survey

COMMITMENT TO PHASE OUT LEAD SHOT FOR HUNTING IN WETLANDS IN THE AEWA AREA

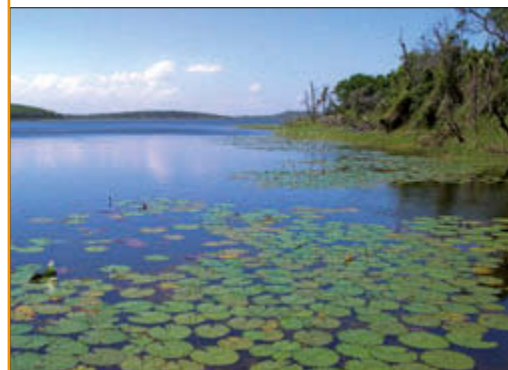
According to Paragraph 4.1.4 of the Action Plan, which is annexed to the **African-Eurasian Migratory Waterbird Agreement (AEWA)** and therefore legally binding “*any Party to AEWA shall endeavour to phase out the use of lead shot for hunting in wetlands¹ as soon as possible and in accordance with self-imposed and published timetables.*”

In its latest Resolution 4.1 on “Phasing out lead shot for hunting in wetlands” (September 2008, Antananarivo, Madagascar)² the Meeting of the Parties to AEWA called upon Contracting Parties

- **to phase out the use of lead shot in wetlands as soon as possible**, namely to promote communication between, and awareness within, authorities and the hunting community; to put emphasis on the education of hunters, especially new hunters, in order to provide them with sufficient information about non-toxic shot through hunting associations and conservation NGOs; and to stimulate and facilitate the replacement of lead shot by non-toxic shot;
- **to continue reporting to each ordinary session of the Meeting of the Parties on progress made on phasing out the use of lead shot in wetlands** in accordance with self-imposed and published timetables, and to specify how they plan to overcome any problems encountered;
- **to publish self-imposed timetables for completing the phase out as soon as possible** and to inform the Secretariat accordingly by 30 September 2009 or, in case the use of lead shot for hunting in wetlands has already been banned, to share their experiences and information material with the international hunting community, the Secretariat, and other Range States;
- **to establish enforcement procedures** to assure national compliance with an introduced ban and to **establish monitoring procedures** to assess its effectiveness;
- **to allocate financial support** for carrying out the above activities leading to the development and implementation of national legislation concerning the use of non-toxic shot instead of lead shot.

¹ Wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres (definition of the Ramsar Convention).

² <http://www.unep-aewa.org/meetings>



Lead pellets deposited in wetlands constitute a serious threat to waterbirds © Sergey Dereliev



The 4th session of the Meeting of the Parties to AEWA adopted Resolution 4.1 on “Phasing out lead shot for hunting in wetlands” in Antananarivo, Madagascar, 15-19 September 2008 © IISD Markus Staas

National and international hunting associations and other relevant bodies and institutions were invited through Resolution 4.1 to further develop and implement awareness raising and training activities for hunters related to phasing out the use of lead shot for hunting in wetlands.

The **International Council for Game and Wildlife Conservation (CIC)** and the **Federation of Associations for Hunting and Conservation of the EU (FACE)** contribute significantly to the process of phasing out lead shot for hunting in wetlands by raising awareness on the issue and convincing the hunting community of the need to replace lead by non-toxic products. Both organisations have formally committed themselves to phasing out the use of lead shot for hunting in wetlands respectively before 2010 (CIC) and 2009 (FACE).

The close cooperation, which has been established between the AEWA Secretariat and the international hunting organisations during the course of many years of joint efforts towards lead-free wetlands, includes the realisation of regional workshops on sustainable hunting. Both organisations play an active role in the AEWA Technical Committee and regularly provide technical advice and contribute to the exchange of relevant information.



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PROGRESS MADE IN THE AEWA AREA

An international review on the use of lead shot for hunting in wetlands, undertaken in 2007 by the AEWA Secretariat, has shown that the problem is still far from solved in the majority of the AEWA Range States. However, very good progress has been made in individual countries having introduced a legal ban on the use of lead shot for hunting in wetlands:

Country	Ban on use in important wetlands (e.g. Ramsar sites)	Ban on use in all wetlands (as laid down in AEWA AP)	Ban on use for waterbirds	Ban on any use	Ban on possession and trade
Belgium		X ³		X ⁴	
Canada		X	X		
Cyprus		X			
Czech Republic (as of 2010)			X		
Denmark				X	X
Finland			X		
France		X			
Germany		X			
Hungary	X				
Latvia	X				
The Netherlands				X	X
Norway				X	X
Slovakia (as of 2015)		X	X		
Spain	X				X ⁵
Sweden		X			
Switzerland		X			
United Kingdom	X ⁶	X ⁷	X ⁸		

Table 1: Type of ban in countries having phased out the use of lead shot.

Legislation is in preparation in several additional countries such as Italy, Luxembourg and Portugal. Voluntary approaches to phasing out the use of lead shot for hunting in wetlands have been reported from Benin, Guinea-Bissau, South Africa, Sudan and parts of Germany and of the UK, which are not yet covered by statutory measures.

Further references:

AEWA Update report on the use of non-toxic shot for hunting in wetlands:
<http://www.unep-aewa.org/publications>

³ Walloon region.

⁴ A total ban has been in force in the Flemish region since 1 July 2008.

⁵ The possession of lead shot is prohibited in wetlands in which its use is banned.

⁶ England and Wales.

⁷ Scotland.

⁸ England and Wales.

EXPERIENCES MADE AND LESSONS LEARNED BY AEWA RANGE STATES

In order to be able to benefit from the experiences made in a number of countries and to enable other AEWA Parties and Range States to learn from the countries, which have already gone through the process of phasing out the use of lead shot for hunting in wetlands, the AEWA Secretariat, on request of the Parties⁹, distributed a series of questionnaires on this issue among governmental focal points and hunting organisations. The findings of this survey have been summarized on the following pages, which are meant to guide governments through the process of implementing Paragraph 4.1.4 of the AEWA Action Plan by providing a roadmap built on experiences made and lessons learned by other countries.

STEP 1: PREPARING THE PROCESS

ANALYSE THE SITUATION IN THE COUNTRY

In order to be able to decide on steps to be taken towards meeting their commitments under AEWA and phasing out the use of lead shot for hunting in wetlands, governmental policy and decision-makers will need

- a) to collate existing scientific and technical data on the issue of lead poisoning, possibly including those collected in their own countries, through relevant research, (case) studies or surveys;
- b) to collate all relevant facts resulting from the legal, social, cultural and economic context, in particular to investigate the degree of relevant stakeholders' awareness of the issue.

⁹ Compare AEWA Resolution 2.2, Paragraph 9 at <http://www.unep-aewa.org/meetings>

Such comprehensive analysis should provide a clear picture about:

- the relevance and extent of the problem in the country or, if unknown, the steps needed to be able to make such assessment, e.g. the need to undertake further studies or surveys; to establish a working group of experts or to undertake a national review on the issue;
- existing national legislation or gaps in legislation with regard to the use of lead shot;
- the views of different interest groups and potential opponents regarding a change towards non-toxic ammunition;
- potential difficulties in the country;
- possible solutions to the problem of lead poisoning.



X-ray of gizzard with lead shot © Niels Kanstrup



The X-ray shows that lead pellets have been accumulated in the guts of the bird
© David Hebert/ U.S. Geological Survey

IDENTIFY APPROPRIATE ACTIONS TO PHASE OUT THE USE OF LEAD SHOT

Based on this initial analysis, policy makers will have to decide on how to proceed in order to solve the problem of lead poisoning. Different approaches have been taken by countries in the past and could be translated into the following four options (*examples of countries having successfully gone through the process of the respective option are given in brackets*):

Option 1:

Immediate introduction of a legal ban on lead shot

This option would be recommendable for countries in which the use of lead shot for hunting in wetlands is quite limited, opposition of hunters is low, alternative shot is widely available and a good enforcement system is in place (*examples: The Netherlands, Switzerland*).

Option 2:

Introduction of a legal ban on lead shot after a transition period in which all stakeholders involved are given time to adapt to the change towards non-toxic ammunition

This option would be recommendable for countries in which the use of lead shot for hunting in wetlands is quite common, hunters are reluctant to accept the change towards non-toxic shot and/ or the market still needs to be adapted to the new situation (*examples: Czech Republic, Slovakia*).

Option 3:

Take measures in order to solve the problem on a voluntary basis, and eventually introduce a legal ban in case the voluntary approach is not considered as being sufficient

This option would be recommendable for countries in which the use of lead shot for hunting in wetlands is quite limited, hunters do not oppose and alternative shot is widely available (*examples: Germany, Norway*).

Option 4:

Establish a working group, ideally representing all stakeholders and interest groups concerned, or produce a review, which would express recommendations on how to proceed

This option would be recommendable for countries in which opposition by hunters and/ or manufacturers and traders is strong or the situation and/ or best solution to the problem is not clear enough (*examples: Canada, Denmark, Finland, France, and the United Kingdom*).

DIFFICULTIES REPORTED FROM FINLAND:

“Finland has never faced major problems with regard to waterfowl hunting, which is why the working group on lead shot, in 1992, recommended a voluntary system to phase out the use of lead shot. However, the Hunting Act, issued in 1993, was stricter and ordered the total ban on the use of lead shot from 1995 on. The ban refers to “waterfowl hunting” and not to “hunting in wetlands”, which is the same in practice but makes it more simple for hunters to apply. The hunters know that the ban includes the hunting of geese, dabbling ducks, diving ducks, coots and woodcocks, but not pheasants and black grouses. However, this leads to the following difficulty: when different game birds are to be found at the same time in one and the same dryland area (e.g. waterfowl, pheasants and black grouses) then the hunters are obliged to change from lead shot to lead-free shot, often very spontaneously.”

Vikberg Pentti, Director for Game Management, Hunters' Central Organisation
(source: AEWA questionnaire, 2007)



Bean Goose (*Anser fabalis*) at snowfall, Finland © J. Peltomaeki / Still Pictures

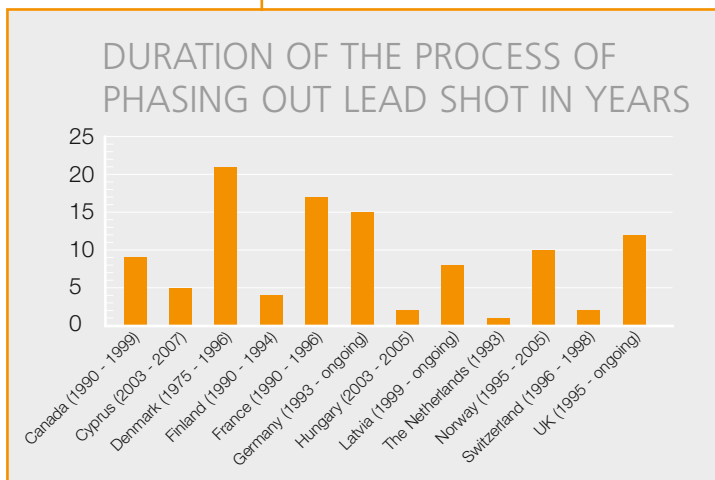
SET A REALISTIC TIME-FRAME

Lesson learned:

The process of phasing out lead shot for hunting in wetlands takes around 9 years on average; however individual countries reported a duration ranging from only a few months to 21 years.

The duration of the process of phasing out lead shot for hunting in wetlands differs greatly between individual countries. In the case of countries having started the process in the early 1990s or even earlier¹⁰, the process was obviously a lengthy one; this was due to the fact that the issue was still fairly unknown at the time, studies required to understand the problem were still lacking, and alternative products were far from being established on the market. However, experience shows that the duration also depends on various other factors such as:

- the political system and legal procedures of a country (e.g. the process will potentially take more time in countries with federal systems than with centralized governments);
- the type of ban (ban on the use in wetlands only/ ban on any use/ ban on any use, possession and trade; is the ban to be introduced in one procedure or in different steps, e.g. first in certain wetlands, later in all wetlands, eventually also in other ecosystems/ countrywide?);
- the duration of the transition period chosen by a government until a legal ban takes effect, again depending on:
 - the level of opposition/ problems faced by affected interest groups (hunters/ sport shooters, industry)
 - the time needed to “phase in” substitute shots (are the industrial sector and market ready to adapt to the change towards non-toxic shot?).



¹⁰ For example, Denmark was the first country to start such a process in Europe in the mid-1970s, with first restrictions on the use of lead shot already entering into force in 1981.

STEP 2: STARTING THE PROCESS

INVOLVE INFLUENTIAL INTEREST GROUPS IN THE PROCESS

Lesson learned:

Ideally all important stakeholders and opponents should be involved in the process from the beginning, in order to find common solutions and to facilitate the implementation.

The political process is often started with the establishment of a working group consisting of representatives of the government, hunting/ sport shooting organisations, conservation organisations, gun and ammunition manufacturers, land-owning, farming, research institutions and any other stakeholders, which might need to be involved. The object of such a working group would be to develop recommendations for the government on how to proceed in order to phase out the use of lead shot, providing policy-makers with relevant information on all aspects needed to bring the process forward. Even if a country does not choose to establish a working group, then different interest groups should be involved in the development of legislation or through the establishment of bilateral agreements.

The participation of all parties is the key to approaching the problem in a constructive, realistic and solution-oriented way. Successful implementation and enforcement of relevant legislation can only be achieved if an integrated approach is adopted from the very beginning and maintained throughout the process.

FURTHER REFERENCES:

REPORTS FROM COUNTRIES HAVING STARTED THE POLITICAL PROCESS

France:

Baron, P. 2001. Suppression de l'utilisation de la grenaille de plomb de chasse dans les zones humides exposant les oiseaux d'eau au saturnisme. Rapport présenté au nom du groupe de travail. Inspection Générale de l'Environnement, Ministère de l'Aménagement du territoire et de l'Environnement, France:
<http://www.ecologie.gouv.fr/IMG/pdf/0405-saturnisme-rapport.pdf>

Canada:

Scheuhammer, A.M., Norris, S.L. 1995. A review of the environmental impacts of lead shotshell ammunition and lead fishing weights in Canada. Occasional Paper Number 88. Canadian Wildlife Service (aussi disponible en français): <http://dsp-psd.pwgsc.gc.ca/Collection/CW69-1-88E.pdf>



RAISE AWARENESS

Lesson learned:

Raising awareness amongst all concerned stakeholders is a prerequisite for phasing out the use of lead shot.

The process of phasing out lead shot is usually (and should always be) accompanied by a strong awareness-raising campaign. This campaign should address all stakeholders and interest groups:

- **All policy and decision-makers** involved need to be sufficiently informed about the scientific and technical as well as social, cultural, legal and economic aspects of the problem, namely
 - the problem of lead poisoning and its effects on waterbirds;
 - the relevance and extent of the problem in the country;
 - relevant national legislation;
 - the view of different interest groups/ potential opponents regarding a change towards non-toxic ammunition;
 - potential difficulties in the country;
 - possible solutions to the problem of lead poisoning.
- **Hunting/ sport shooting organisations** and their individual members need to be convinced that
 - lead shot contributes unnecessarily and unsustainably to waterbird losses;
 - substitutes to lead shot are necessary, effective and affordable.
- **Ammunition and gun manufacturers and traders** need to
 - be fully informed about the legal requirements and time schedule of the planned change towards non-toxic shot; in order to
 - adapt their product development, production and product line to the expected demand.
- **The general public** needs to be informed about
 - the problem of lead poisoning, its effects on waterbirds and potential risks for consumers;
 - how the government is going to address this problem;
 - any introduction of legislation and its consequences for the public (e.g. landowners).



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Governments should, if possible, initiate their own awareness-raising campaigns, but also encourage hunting organizations, conservation NGOs and manufacturers and traders to raise awareness on the need to change towards non-toxic ammunition amongst individual members/ clients/ purchasers, through newsletters, websites, publications, printed information on products etc. Information material could also be handed out when hunters purchase their permits.

Awareness-raising campaigns generally include:

- the distribution of print publications: information brochures, posters, codes of good practice, guidelines, articles in hunting/ sport shooting magazines and general press, press releases etc,
- awareness-raising events: information evenings, working groups, conferences or symposiums, practical demonstrations etc,
- information and exchange platforms on relevant websites,
- TV or radio spots, DVDs.



POSITIVE EXPERIENCE REPORTED FROM THE UK (ENGLAND):

"The Association of Chief Police Officers' Wildlife and Environmental Crime Advisor reported that in the first year the Regulations were in force, only a very small number of potential offences were reported to the police and all of these were dealt with by advice with no court action taken. The police welcomed the work undertaken by responsible shooting organisations to raise awareness of the Regulations, foster sensible interpretation and advice on compliance."

Kate Fouracre, Policy Officer, Department for Environment, Food and Rural Affairs - DEFRA (source: AEWa questionnaire, 2007)

ENCOURAGE TRAINING OF HUNTERS AND PROVIDE THEM WITH SUBSTITUTES TO LEAD SHOT

Lesson learned:

The process of phasing out lead shot should foresee the education of hunters in the theory and practice surrounding existing substitutes to lead shot and how to use them.

It is not sufficient to convince hunters about the necessity of changing towards non-toxic shot; users of gun shot also need to learn how to use ammunition other than lead, both in theory and in practice. Experiences show that users, once they have adapted their own shooting style to the new ammunition, generally accept the ban on lead shot. Training could be provided on a large scale by national hunting organizations and hunting clubs; this should focus on newcomers, especially the younger generation. Hunters should also be encouraged to try lead substitutes on clay targets before using them in the field and be provided with the facilities to do this. A ban on the use of lead shot for clay pigeon shooting could be way of forcing hunters to gain experience with non-toxic shot.

POSITIVE EXPERIENCE REPORTED FROM



UK (Scotland):

"The main positive experience was the fact that so many hunters adapted their own shooting style to make full use of the ballistics associated with steel shot. Because of this change and widespread adherence to what is seen as sensible legislation there have been no reported infringements or prosecutions over two years."

Kate Fouracre, Policy Officer, Department for Environment, Food and Rural Affairs - DEFRA
(source: AEWA questionnaire, 2007)



Denmark:

"The use of other ammunition than lead can be "learned by doing" and got used to. Actually, shot efficiency is 80 % related to the shooter and only 20 % to the gun/ ammunition. Efficiency of ammunition is related to cartridge quality more than shot material."

Niels Kanstrup, President of the CIC Migratory Birds Commission
(source: presentation at regional workshop on sustainable hunting, Jordan, 2007)



The Netherlands:

"The change towards lead-free ammunition was made within a very short period. No difficulties occurred and the ban was generally accepted. The compliance by hunters is estimated to be 100 %."

Jan van Spaandonk, Policy Officer, Department of Nature, Ministry of Agriculture, Nature and Food Quality (source: AEWA questionnaire, 2007)

STEP 3: IMPLEMENTING THE PHASE OUT OF LEAD SHOT

CONSIDER IF THERE IS NEED FOR A VOLUNTARY TRANSITION PERIOD BEFORE INTRODUCING A BAN

Lesson learned:

To start the actual change towards non-toxic shot with a voluntary transition period helps facilitate the adaptation of opponents to this process and ensure the supply with substitute shots.

Some countries choose to start the implementation phase with a voluntary transition time in which hunters, as well as the industrial sector are given time to adapt to the change towards non-toxic shot. Such transition periods have proven to be useful in order to allow hunting organizations to educate and put in place a system to train their members in the use of alternative shot. Time may also be required to ensure the availability of substitutes to lead shot in a country, either by local production or via import.

A voluntary phase may also be considered to be a “test phase” in which users are given the possibility to change towards non-toxic ammunition on a voluntary basis avoiding the introduction of a legal ban. However, so far, there is no country case in which a voluntary phase has avoided the later introduction of statutory measures.



Flying Barnacle Geese (*Branta leucopsis*)
© Biosphoto / Varesvuo Markus / Still Pictures

EXAMPLES:



In **Germany** the problem has first been approached on a voluntary basis with a bilateral agreement between the responsible Ministry¹¹ and the national hunting association¹² in 1993. Based on this, regional associations have recommended the use of lead-free shot for hunting in wetlands. A statutory ban is meanwhile in place in 10 of 16 federal states and further plans to introduce legislation exist in all remaining federal states except for the city states Hamburg and Bremen.



In **Norway** an Agreement was signed with hunting associations with regard to phasing out the use of lead shot in 1995. After a voluntary shift period of 10 years, a total statutory ban on the use of lead shot was introduced.



In the **UK** a voluntary phase-out of the use of lead shot in wetlands was announced in 1995 for a two-year period, which was extended for another two years. Meanwhile a statutory ban on hunting with lead shot in wetlands is in place in England, Scotland, Wales and, since September 2009, also in Northern Ireland.

Difficulties faced in the UK during the process:

"The main difficulty was firstly convincing hunters that their lead shot was contributing to waterfowl losses and then convincing them that the substitutes to lead shot were necessary, effective and affordable. These difficulties were tackled by giving the hunting community time to adapt during the voluntary ban. This also allowed the hunting organizations e.g. the British Association for Shooting and Conservation (BASC) time to educate their members on the benefits of using non lead shot and to put in place systems to train their members in the use of alternative types of shot."

Kate Fouracre, Policy Officer, Department for Environment, Food and Rural Affairs - DEFRA
(source: AEWA questionnaire, 2007)

¹¹ Federal Ministry of Food, Agriculture and Consumer Protection.

¹² Deutscher Jagdschutz-Verband e.V.

FACILITATE THE DEVELOPMENT AND AVAILABILITY OF HIGH-QUALITY NON-TOXIC SHOT

Lesson learned:

Most initial concerns of shooters about non-toxic shot can be tackled by providing them with sufficient knowledge on the characteristics of the different ammunition types and how to adapt their techniques to the new shot. However, the higher price of certain non-toxic shots remains a major concern as well as the lack of availability of substitutes in certain countries.

A number of substitutes to lead have been developed using different materials and are meanwhile being used by hunters in certain countries within the AEWA region, which have already banned the use of lead shot for hunting in wetlands.

Cartridges mostly used by hunters (ranked from mostly used to less used):

	1	2	3
Wetlands	Steel	Bismuth	Tungsten
Other ecosystems	Lead	Steel/Bismuth	Tungsten
Clay target shooting	Lead	Steel	

Facts on different ammunitions provided by Mr. Niels Kanstrup (Denmark), President of the CIC Migratory Birds Commission & Member of the AEWA Technical Committee

	Lead	Steel	Bismuth	Tungsten	Tin	Zinc	Alloy Tungsten/nickel/iron
Toxic to waterbirds	yes	no	no	no	no	yes	no
Specific gravity (g/m ³)	11,4	7,8	9,6	10,5	7,3	7,3	12
Hardness	soft	hard	soft	soft	soft	hard	hard
Stability	stable	stable	fragments	stable	stable	stable	stable





Examples of non-toxic shots © Florian Keil

Experience shows that hunters and other interest groups have a number of concerns with respect to the change towards non-toxic shot. The following advantages and disadvantages of substitute products have been communicated to the AEWA Secretariat by representatives of national hunting organizations within the AEWA area:

Steel:

- at least 30 % restriction on shooting distance;
- problems with respect to older guns;
- serious problems related to duck and geese shooting from a distance of more than 30 metres (e.g. crippling losses);
- ricochets on water and hard surfaces, trees and wet branches;
- dental problems after consumption of game containing pellets;
- problems with machines in food production;
- lack of availability.

Bismuth:

- at least 25 % restriction on shooting distance;
- higher prices compared to lead;
- lack of availability.

Tungsten (soft or hard):

- very effective and even extended shooting distance by 10-15 %;
- no reports about ricochets, crippling of birds or dental problems;
- higher prices compared to lead;
- problems with respect to older guns in the case of the hard version;
- lack of availability.

Tin:

- inefficient;
- lack of availability.

Zinc:

- toxic;
- lack of availability.

FURTHER REFERENCES: EXPERIENCES MADE WITH LEAD-FREE AMMUNITION

- Kanstrup, N. 2006. Non-toxic shot - Danish experiences. In: Waterbirds around the world. Eds. G.C. Boere, C.A. Galbraith & D.A. Stroud. The Stationery Office, Edinburgh, UK. pp. 861.
- Mondain-Monval, J.-Y. & Lamarque, F. 2004. Saturnisme des Anatidés: une bonne raison pour passer aux munitions sans plomb? Faune Sauvage n° 261. pp. 59-68.
- Mondain-Monval, J.Y., Didier, S., Malagutti, A., Noble P., Sonier, J.P. 2006. Dossier. Munitions alternatives: trouver ses marques. La Sauvagine, octobre 2006. pp.18-25.
- Olivier, G.-N. 2006. Considerations on the use of lead shot over wetlands. In: Waterbirds around the world. Eds. G.C. Boere, C.A. Galbraith & D.A. Stroud. The Stationery Office, Edinburgh, UK. pp. 866-867.
- Olivier, G.-N. 2006. Témoignage d'un sauvaginer passionné. La Sauvagine, février 2006, pp. 26-28.
- Thomas, V.G. & Guitart, R. 2003. Evaluating non-toxic substitutes for lead shot and fishing weights. Criteria and regulations. Environmental Policy and Law 33. pp. 150-154.

PERMANENT INTERNATIONAL COMMISSION FOR FIREARMS TESTING (C.I.P.)

The uniform testing of firearms and ammunition to safeguard that firearms and ammunition sold to consumers are safe for users is assured by the C.I.P., an international organization, which was established in 1914. C.I.P. decisions have to be implemented into national legislation by its member states. Any cartridge intended to be sold in C.I.P. member states needs to be tested and approved at the respective C.I.P. accredited Proof House, obligatorily established in each member state.

Members of C.I.P.:

Austria, Belgium, Chile, Czech Republic, Finland, France, Germany, Hungary, Italy, Russian Federation, Slovakia, Spain, United Kingdom.

<http://www.cip-bp.org/>

POSITIVE EXPERIENCE REPORTED FROM



France:

"France is one of the leading countries in Europe regarding the development and production of alternative ammunition. If the ban is successfully enforced, this will lead to a growing demand of non-toxic shot and to an adaptation of the production by manufacturers. In the long term, it is expected that prices for alternative ammunition will therefore fall, which will favor all European countries served by French manufacturers."

François Lamarque and Jean-Yves Mondain-Monval, Office national de la chasse et de la faune sauvage - ONCFS (source: AEWA questionnaire, 2007)



UK:

"Substitutes to lead shot are widely available to shooters. Initially there were concerns from hunters about steel shot damaging shotgun barrels, not effectively killing birds, and about the cost of other substitutes. While cost is still a concern, there are now very few concerns (if any) about barrel damage. Many hunters have adapted to steel shot and use it effectively. However, there are continuing concerns, particularly from shooting and land-owning interests, that there is a need to be able to consider substitutes to lead shot, some of which may be over 1% lead (and are therefore currently prohibited by the Regulations), but which have been demonstrated to be non-toxic."

Kate Fouracre, Policy Officer, Department for Environment, Food and Rural Affairs - DEFRA (source: AEWA questionnaire, 2007)



Hungary:

"The product line on the market was promptly adapted to the new situation and the trade of lead-free cartridges is growing since the ban has been introduced."

Zoltan Czirak, Councilor, Ministry of Environment and Water (source: AEWA questionnaire, 2007)



Canada:

"Initial concerns that substitutes to lead shot would not be sufficiently available to hunters proved to be unjustified. Manufacturers and distributors did a good job at making alternative products available. No problems are linked to the use of these substitutes. The opposition to the lead ban died down relatively quickly."

Kathryn Dickson, Senior Waterfowl Biologist, Canadian Wildlife Service (source: AEWA questionnaire, 2007)

"Although the alternative products can be considerably more expensive than either lead or steel shot, ammunition purchases represent a minor part (approximately 8.5 %) of the average hunter's yearly expenditure, thus the affordability of waterfowl hunting should not be negatively affected by nontoxic shot regulations."

(source: Stevenson, A.L., Scheuhammer, A.M., Chan, H.M. 2005. Effects of Nontoxic Shot Regulations on Lead Accumulation in Ducks and American Woodcock in Canada. Environmental Contamination and Toxicology, 48 (3). pp. 405-413 (412)).

STEP 4: ENFORCEMENT & MONITORING OF THE EFFECT OF THE BAN AND THE COMPLIANCE OF HUNTERS

MONITOR THE EFFECTIVENESS OF THE BAN AND THE COMPLIANCE OF HUNTERS

Lesson learned:

The ban on the use of lead shot makes a difference!

A legal ban on the use of lead shot for hunting in wetlands will potentially lead to law violation and therefore needs to be accompanied and followed up by strong enforcement measures that ensure the effectiveness of the legal prohibition in place. The level of enforcement measures required will especially depend on factors like the availability and cost of substitute materials, but also on the level of awareness and acceptance of the problem among hunters, thus on the quality of information and education campaigns and communication processes with different stakeholders going along with the change.

The effectiveness of established legal bans on the use of lead shot has been studied in a few countries, setting positive examples for the successful phasing out of lead shot in wetlands:

In the **USA**¹⁹, studies on the impact of the lead shot ban on different duck species have revealed a major reduction in waterfowl lead toxicosis in a short period of time following the ban on lead shot use.

FURTHER REFERENCES:

- Anderson, W.L., Havera, S.P., Zercher, B.W. 2000. Ingestion of lead and nontoxic shotgun pellets by ducks in the Mississippi flyway. *Journal of Wildlife Management*, 64. pp. 848-857.
- Samuel, M.D. & Bowers, F. 2000. Lead exposure in American black ducks after implementation of non-toxic shot. *Journal of Wildlife Management*, 64. pp. 947-953.

¹⁹ The USA are not a Range State to AEWA; however relevant studies have been taken into account for the compilation of this publication.

A study undertaken in **Canada** compared the accumulation of lead in waterbirds in different parts of the country prior to and after the establishment of a national regulation prohibiting the use of lead shot for waterfowl hunting. Moreover, hunters were surveyed (anonymously) in order to determine reported levels of compliance with the non-toxic shot regulation. The study showed that average lead concentrations had decreased significantly since the legal ban, and – consistent with these results – the survey indicated a high level of compliance with the legal regulation.

FURTHER REFERENCE:

Stevenson, A.L., Scheuhammer, A.M., Chan, H.M. 2005. Effects of Nontoxic Shot Regulations on Lead Accumulation in Ducks and American Woodcock in Canada. *Environmental Contamination and Toxicology*, 48 (3). pp. 405-413.

Moreover, during a search of spent cartridges at waterfowl hunting sites, all cartridges found were for steel shot and no evidence of lead shot use was found. Conversely, results for an important upland game species (American Woodcock *Scolopax minor*, for which the use of lead shot was still allowed) showed that lead concentrations in the species' bones remained unchanged as well as the habit of most hunters to use lead shot for hunting this upland species.

Thus the study indicated that the legal ban had led to substantial declines in the rates of lead shot ingestion in waterbirds. The survey among hunters, however, also showed that many hunters were of the opinion that non-toxic alternatives were not effective for waterfowl hunting and increased the crippling of waterbirds.

FURTHER REFERENCE:

Mondain-Monval, J.Y., Desnouhes, L., Taxis, J.P. 2002. Lead shot ingestion in waterbirds in the Camargue, France. *Game and Wildlife Science*, 19. pp. 237-246.

In **France**, the ingested lead shot prevalence rate was assessed in several species wintering in the Camargue region after a ban on lead shot and data were compared to historical data. A high prevalence of ingested lead pellets was still found in waterbird species. However, the method used in this case is suggested as being a useful tool for a monitoring procedure to assess the compliance of hunters with a legal ban.

DIFFICULTIES FACED IN FRANCE:



"There are no methods to identify non-toxic ammunition other than steel in guns, which makes controlling the compliance of hunters difficult."

François Lamarque and Jean-Yves Mondain-Monval, Office national de la chasse et de la faune sauvage - ONCFS (source: AEWA questionnaire, 2007)

POSSIBLE FUTURE POLICY DEVELOPMENTS WITHIN AEWA

Since AEWA Parties already committed themselves to phase out the use of lead shot for hunting in wetlands in 1999, the issue of lead poisoning has been continuously studied and examined over the last years. Two particular issues discussed in literature have recently been picked up at the 4th session of the Meeting of the Parties (September 2008, Madagascar): The AEWA Technical Committee was requested by Resolution 4.1 on phasing out lead shot for hunting in wetlands, to examine, as far as the waterbird species covered by the Agreement are concerned, any potential problems from the use of lead shot in terrestrial ecosystems as well as from the use of lead fishing weights.

The outcomes of the Technical Committee's work on these issues will be presented to the 5th session of the Meeting of the Parties in 2012.



Lead poisoning in different waterbird species has also been associated with the ingestion of lead fishing weights used by anglers
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In the autumn (before migration) Greylag Geese (*Anser anser*) also frequent agricultural land © Daniel Ullrich

CONCLUSIONS

Experiences of countries having phased out the use of lead shot for hunting in wetlands clearly show that it can take several years before a legal ban on lead shot is ready to be enforced. Before the process can begin on governmental level, various factors have to be considered, all of which have an influence on the duration of the process, including the actual level of awareness and opposition of different interest groups and the current market situation regarding the availability of high-quality substitutes to lead. All the parties involved, most importantly hunters, ammunition manufacturers and traders, must be well-prepared; this is an indispensable requirement for successful implementation of a legal ban.

The African-Eurasian Migratory Waterbird Agreement, as well as partner organisations like the CIC and FACE have been very active over the past years in promoting the phasing out of lead shot for hunting in wetlands throughout the AEWA area. The reality however is that hunting with lead shot is still practiced in the large majority of countries across the region and the governments will need to tackle the problem on various levels, thus involving political processes, awareness-raising activities and the establishment of a market for alternative products.

The purpose of this publication is to assist these countries in their efforts to implement Paragraph 4.1.4 of the AEWA Action Plan and, based on case-scenarios, provide them with approaches, which could be relevant to the situation in their country and thus pave the way for successful implementation. The AEWA Secretariat sincerely hopes that the information collated will provide the necessary impulses to facilitate and accelerate the working processes, thus helping to preserve waterbirds and their habitats for future generations with the help of all parties concerned.



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REFERENCES AND RESOURCES

1. Websites of relevant organisations:

- African-Eurasian Migratory Waterbird Agreement: <http://www.unep-aewa.org>
- Convention on Migratory Species: <http://www.cms.int>
- Convention on Biological Diversity: <http://www.cbd.int>
- Ramsar Convention: <http://www.ramsar.org>
- Bern Convention:
<http://conventions.coe.int/Treaty/Commun/QueVoulezVous.asp?NT=104&CM=8&DF=1/22/2008&CL=ENG>
- European Commission/ Nature and Biodiversity: http://ec.europa.eu/environment/nature/index_en.htm
- International Council for Game and Wildlife Conservation (CIC): <http://www.cic-wildlife.org>
- Federation of Associations for Hunting and Conservation of the EU (FACE): <http://www.face-europe.org>
- British Association for Shooting and Conservation (BASC): <http://www.basc.org.uk>

2. Key publications on lead poisoning in waterbirds (in English or French):

AEWA Secretariat:

- Update report on the use of non-toxic shot for hunting in wetlands. 2007.
- Special edition of the AEWA Newsletter: The use of non-toxic shot for hunting waterbirds in wetlands. 2002. (English, French and Russian versions available).
- Technical Series No. 3: Non-toxic shot - A path towards sustainable use of the waterbird resource (English and French versions available).
- Beintema, Nienke. Planting seeds of awareness.
- Beintema, Nienke. Steel shot – some technical and safety aspects.
- Beintema, Nienke. Non-toxic shot is gaining territory.

All publications can be downloaded at <http://www.unep-aewa.org/publications> or ordered as free hardcopy from the AEWA Secretariat at aewa@unep.de

Project on Building capacity for sustainable hunting of migratory birds in Mediterranean countries of North Africa and Middle East:

- Guidelines for Sustainable Hunting of Migratory Birds in Mediterranean Third Countries developed under the project "Building capacity for sustainable hunting of migratory birds in Mediterranean countries of North Africa and Middle East", executed by BirdLife Middle East in partnership with SPNL in Lebanon.
- Code of Practice for Responsible hunting of Migratory birds developed under the project "Building capacity for sustainable hunting of migratory birds in Mediterranean countries of North Africa and Middle East", executed by BirdLife Middle East in partnership with SPNL in Lebanon.

France:

- Baron, P. 2001. Suppression de l'utilisation de la grenaille de plomb de chasse dans les zones humides exposant les oiseaux d'eau au saturnisme. Rapport présenté au nom du groupe de travail. Inspection Générale de l'Environnement, Ministère de l'Aménagement du territoire et de l'Environnement, France: <http://www.ecologie.gouv.fr/IMG/pdf/0405-saturnisme-rapport.pdf>
- ONCFS. 2004. Les cartouches sans plombs - Guide de l'armurier: http://www.oncfs.gouv.fr/doc/cartouches/Armurier_ONCFS.pdf
- RNC. 2006. Billes d'acier: Elles ont tout pour plaire. Revue nationale de la chasse, juillet 2006. pp. 24-38.

Portugal:

- Rodrigues, D., Figueiredo, M., Oliveira, D., Fabião, A., Vaz, M.C., Sarmiento, G., França, J., Bacelar, J. 2005. Lead Poisoning in Portuguese Waterfowl. In: K. Pohlmeier (Ed.) 27th Congress of the International Union of Game Biologists – IUGB, DSV-Verlag, Hamburg. pp. 170-171.

South Africa:

- Code of Conduct for waterfowl hunting, Southern African Wingshooters Association: <http://www.wingshooters.co.za/pdf/ethics/CodeEthics-Waterfowling.pdf>

UK :

- Protecting Waterfowl from Lead in Wetlands – A Practical Guide to the Lead Shot Regulations in Scotland, UK: http://www.unep-aewa.org/surveys/hunting_and_trade/brochure_on_lead_shot_scotland.pdf
- Code of practice on the licensed shooting of Brent geese: http://www.defra.gov.uk/corporate/regulat/forms/cons_man/WCA25.pdf
- Code of good practice in conjunction with the main shooting organisations: <http://www.basc.org.uk/en/codes-of-practice/code-of-good-shooting-practice.cfm>
- Assessment of Techniques for Monitoring Compliance with Lead Shot Regulations (England) 1999, Final Report, prepared by ADAS UK Ltd for Defra Wildlife Species Conservation Division, March 2007: http://randd.defra.gov.uk/Document.aspx?Document=WC04025_6178_FRP.pdf

USA:

- Report of the Nontoxic Shot Advisory Committee, submitted to the Minnesota Department of Natural Resources, Fish and Wildlife Division. 2006.

3. Scientific papers and articles published since 2000 (in English or French):

Lead exposure in (water)birds:

- Bana, G. 2004. Ecological effects of lead-shot on terrestrial habitats and on the accumulation of lead in wild birds other than waterfowl. Information document of the 24th meeting of the Standing Committee of the Bern Convention, Strasbourg, 29 November - 3 December 2004.
- Butler, D.A., Sage, R.B., Draycott, R.A.H., Carroll, J.P., Potts, D. 2005. Lead exposure in Ring-necked Pheasants on shooting estates in Great Britain. *Wildlife Society Bulletin* 33 (2). pp. 583-589.
- De Besombes, A. 2006. Saturnisme des anatidés et passage aux munitions non toxiques : incidence de la grenaille d'acier sur la qualité de la viande de gibier. Thèse vétérinaire, ENV Toulouse.
- Burger, J. & Gochfeld, M. 2000. Effects of lead on birds (*Laridae*): a review of laboratory and field studies. *Journal of Toxicology and Environmental Health, Part B Critical Reviews*, 3 (2). pp. 59-78.
- Clark, A.J. & Scheuhammer, A.M. 2003. Lead poisoning in upland-foraging birds of prey in Canada. *Ecotoxicology* 12. pp. 12-30.
- Falk, K., Merkel, F., Kampp, K., Jamieson, S.E. 2006. Embedded lead shot and infliction rates in common eiders *Somateria mollissima* and kind eiders *S. spectabilis* wintering in southwest Greenland. *Wildlife Biology*, 12. pp. 257-265.
- Figuerola, J., Mateo, R., Green, A.J., Mondain-Monval, J.-Y., Lefranc, H., Mentaberre, G. 2005. Grit selection in waterfowl and how it determines exposure to ingested lead shot in Mediterranean wetlands. *Environment Conservation*, 32 (3). pp. 226-234.
- Fisher, I.J., Pain, D.J., Thomas, V.G. 2006. A review of lead poisoning from ammunition sources in terrestrial birds. *Biological Conservation* 131. pp. 421-432.
- Goutner, V., Papagiannis, I., Kalfakakou, V. 2001. Lead and cadmium in eggs of colonially nesting waterbirds of different position in the food chain of Greek wetlands of international importance. *The Science of the Total Environment*, 267. pp. 169-176.
- Guillemain, M., Devineau, O., Lebreton, J.-D., Mondain-Monval, J.-Y., Johnson, A.-R., Simon, G. 2007. Lead shot and teal (*Anas crecca*) in the Camargue, Southern France: Effects of embedded and ingested pellets on survival. *Biological Conservation* 137 (2007). pp. 567-576.
- Hicklin, P.W., Barrow, W.R. 2004. The incidence of embedded shot in waterfowl in Atlantic Canada and Hudson Strait, *Waterbirds*, 27 (1). pp. 41-45.
- Madsen, J., Rigét, F. 2007. Do embedded shotgun pellets have a chronic effect on body condition of Pink-footed Geese? *Journal of Wildlife Management* 71(5). pp. 1427-1430.

- Mateo, R., Guitart, R., Green, A.J. 2000. Determinants of lead shot, rice, and grit ingestion in ducks and coots. *Journal of Wildlife Management*, 64. pp. 939-347.
- Mateo, R., Green, A.J., Jeske, C.W., Urios, V., Gerique, C. 2001. Lead poisoning in the globally threatened Marbled Teal and White-headed Duck in Spain. *Environmental Toxicology and Chemistry*, Vol. 20, No. 12. pp. 2860-2868.
- Mateo, R., Green, A.J., Lefranc, H., Baos, R., Figuerola, J. 2007. Lead poisoning in wild birds from southern Spain: A comparative study of wetland areas and species affected, and trends over time. *Ecotoxicology and Environmental Safety*, 66 (1). pp. 119-126.
- McCracken, K.G., Afton, A.D., Peters, M. 2000. Conditions bias of hunter-shot ring-necked duck exposed to lead. *Journal of Wildlife Management*, 64. pp. 585-590.
- Merkel, F.R, Falk, K., Jamieson, S.E. 2006. Effect of embedded lead shot on body condition of Common Eiders. *The Journal of Wildlife Management*, 70 (6). pp. 1644-1649.
- Mondain-Monval, J.Y., Desnouhes, L., Taris, J.P. 2002. Lead shot ingestion in waterbirds in the Camargue, France. *Game and Wildlife Science*, 19. pp. 237-246.
- Noer, H., Madsen, J., Hartmann, P. 2007. Reducing wounding of game by shotgun hunting: effects of a Danish action plan on pink-footed geese. *Journal of Applied Ecology* 44. pp. 653-662.
- Pain, D.J., Meharg, A.A., Ferrer, M., Taggart, M., Penteriani, V. 2005. Lead concentrations in bones and feathers of the globally threatened Spanish imperial eagle. *Biological Conservation*, 121. pp. 603-610.
- Perrins, C.M., Cousquer, G., Waine, J. 2003. A survey of blood lead levels in Mute Swans *Cygnus olor*. *Avian Pathology*, 32. pp. 205-212.
- Rodrigues, D.J.C., Figueiredo, M.E.M.A., Fabião, A.M.D. 2001. Mallard Lead Poisoning Risk in Central Portugal. *Wildfowl* 52: 169-174.
- Scheuhammer, A.M., Bond, D.E., Burgess, N.M., Rodrigues, J. 2003. Lead and stable lead isotope ratios in soil, earthworms, and bones of American Woodcock (*Scolopax minor*) from Eastern Canada. *Environmental Toxicology and Chemistry*, 22 (11). pp. 2585-2591.
- Strom, S.M., Patnode, K.A., Langenbert, J.A., Bodenstern, B.L., Scheuhammer, A.M. 2005. Lead contamination in American Woodcock (*Scolopax minor*) from Wisconsin. *Environmental Contamination and Toxicology*, 49 (3). pp. 396-402.
- Tavecchia, G., Pradel, R., Lebreton, J.-D., Johnson, A.R., Mondain-Monval, J.-Y. 2001. The effect of lead exposure on survival of adult mallards in the Camargue, southern France. *Journal of Applied Ecology*, 38. pp. 1197-1207.

Solutions to the problem (general considerations, tests of substitute materials etc.):

- Brewer, L., Fairbrother, A., Clark, J., Amick, D. 2003. Acute toxicity of lead, steel, and an iron-tungsten-nickel shot to mallard ducks (*Anas platyrhynchos*). *Journal of Wildlife Diseases*, 39(3). pp. 638-648.
- Fisher, I.J., Pain, D.J., Thomas, V.G. 2006. A review of lead poisoning from ammunition sources in terrestrial birds. *Biological Conservation*, 131. pp. 421-432.
- Kanstrup, N. 2006. Non-toxic shot – Danish experiences. In: *Waterbirds around the world*. Eds. G.C. Boere, C.A. Galbraith & D.A. Stroud. The Stationery Office, Edinburgh, UK. pp. 861.
- Kanstrup, N. & Potts, D. Lead Shot: New developments with relevance to all hunters. *CIC Newsletter* 2007/4. pp. 1, 4-5.
- Mondain-Monval, J.-Y. & Lamarque, F. 2004. Saturnisme des Anatidés: une bonne raison pour passer aux munitions sans plomb? *Faune Sauvage* n° 261. pp. 59-68.
- Mondain-Monval, J.Y., Didier, S., Malagutti, A., Noble, P., Sonier, J.P. 2006. Dossier. Munitions alternatives: trouver ses marques. *La Sauvagine*, octobre 2006. pp.18-25.
- Olivier, G.-N. 2006. Considerations on the use of lead shot over wetlands. In: *Waterbirds around the world*. Eds. G.C. Boere, C.A. Galbraith & D.A. Stroud. The Stationery Office, Edinburgh, UK. pp. 866-867.
- Olivier, G.-N. 2006. Témoignage d'un sauvaginer passionné. *La Sauvagine*, février 2006. pp. 26-28.
- Thomas, V.G. & Guitart, R. 2005. Role of international conventions in promoting avian conservation through reduced lead toxicosis: progression towards a non-toxic agenda. *Bird Conservation International*, 15 (2005-06) Nr. 2. pp. 147-160.

- Lenten, B. 2005. Response of the UNEP/AEWA Secretariat to "Role of international conventions in promoting avian conservation through reduced lead toxicosis: progression towards a non-toxic agenda." Bird Conservation International, 15 (2005-06) Nr. 2. pp. 161-163.
- Thomas, V.G. & Guitart, R. 2003. Evaluating non-toxic substitutes for lead shot and fishing weights. Criteria and regulations. Environmental Policy and Law 33. pp. 150-154.
- U.S. Fish and Wildlife Service (USFWS). 2002. National survey of fishing, hunting and wildlife-associated recreation.

Effects of lead shot on consumers:

- Guitart, R., Serratos, J., Thomas, V.G. 2002. Lead poisoned wildfowl in Spain: a significant threat for human consumers. International Journal of Environmental Health Research, 12. pp. 301-309.
- Johansen, P., Asmund, G., Riget, F. 2004. High human exposure to lead through consumption of birds hunted with lead shot. Environmental Pollution, 127. pp. 125-129.
- Johansen, P., Pederson, H.S., Asmund, G., Riget, F. 2006. Lead shot from hunting as a source of lead in human blood. Environmental Pollution, 142. pp. 93-97.
- Lévesque, B., Duchesne, J.F., Gariépy, C., Rhainds, M., Dumas, P., Scheuhammer, A.M., Proulx, F.-F., Déry, S., Muckle, G., Dallaire, F., Dewailly, É. 2003. Monitoring of umbilical cord blood lead levels and sources assessment among the Inuit. Occupational and Environmental Medicine, 60. pp. 693-695.

Effectiveness of a legal ban on the use of lead shot for hunting (in wetlands) and compliance of hunters:

- Anderson, W.L., Havera, S.P., Zercher, B.W. 2000. Ingestion of lead and nontoxic shotgun pellets by ducks in the Mississippi flyway. Journal of Wildlife Management, 64. pp. 848-857.
- Samuel, M.D. & Bowers, F. 2000. Lead exposure in American black ducks after implementation of non-toxic shot. Journal of Wildlife Management, 64. pp. 947-953.
- Stevenson, A.L., Scheuhammer, A.M., Chan, H.M. 2005. Effects of Nontoxic Shot Regulations on Lead Accumulation in Ducks and American Woodcock in Canada. Environmental Contamination and Toxicology, 48 (3). pp. 405-413.

Effects of fishing sinkers on waterbirds:

- Franson, J.C., Hansen, S.P., Creekmore, T.E., Brand, C.J., Evers, Da.C., Duerr, A.E., DeStephano, S. 2003. Lead Fishing Weights and other Fishing tackle in selected waterbirds. Waterbirds 26 (3). pp. 345-352.
- Scheuhammer, A.M., Money, S.L., Kirk, D.A., Donaldson, G. 2002. Lead fishing sinkers and jigs in Canada: a review of their use patterns and toxic impacts on wildlife, Ottawa, Canada. Occasional paper No. 108. Canadian Wildlife Service, Environment Canada.
- Thomas, V.G. 2003. Harmonizing approval of nontoxic shot and sinkers in North America. Wildlife Society Bulletin, 31. pp. 292-295.
- Thomas, V.G. & Guitart, R. 2003. Lead pollution from shooting and angling, and a common regulative approach. Environmental Policy Law, 33. pp. 143-149.

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