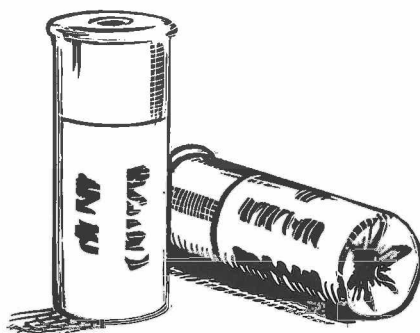


## Transition towards use of non-toxic shot in the United Kingdom

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Despite a UK government ban on lead fishing weights in 1987 to prevent further lead poisoning of Mute Swans *Cygnus olor*, extension of that ban to include lead shot discharged into wetlands has yet to occur, but may be imminent. The incidence of lead toxicosis and the mortality it causes in British waterfowl have been well established (Mudge 1983, Pain 1992), reflecting the accumulation of lead in wetlands from centuries of shooting. Replacement of toxic lead by non-toxic substitutes is the pragmatic way to resolve this problem, and lead-free ammunition has been available in the UK for at least four years. Non-toxic shot is now required, legally, for waterfowling throughout Denmark, The Netherlands, Norway and the USA and is required regionally in Australia and Canada (Thomas & Pokras, 1993).

Concerns about the ballistic efficiency and safety of non-toxic shot have delayed the transition towards its use over wetlands. The Lead Poisoning in Waterfowl Working Group, comprising representatives from all interests involved with the problem, continues to advise the UK government on non-toxic substitutes and their use (Owen 1992). In 1993 a consortium of the UK sporting arms industry, university researchers and the British Association of Shooting and Conservation (BASC) initiated a large research programme (funded by the UK Department of the Environment) on the performance and development of non-toxic ammunition.

The Department of the Environment is about to encourage the use of lead shot in waterfowling and shooting near wetlands. A voluntary transition to the use of non-toxic ammunition has been

required to start in 1995. Logically, a legal ban would follow in 1997 if an acceptable transition to lead-free shot had not occurred. Certainly it is the intention of the UK government to eliminate the use of lead over wetlands as soon as is practically possible. This intent is consistent with the recommendation of the Royal Commission on Environmental Pollution that the government should legislate the adoption and use of substitutes for lead shot as soon as they become available (RCEP 1983). There is international support for the 1995 regulation on lead shot use in the UK. The Organization of Economic Cooperation and Development is developing an action programme to reduce lead in the environment of all its member nations, including the phase-out of lead shot used in waterfowling (OECD 1993). The UK regulation is entirely consistent with the 1992 Rio de Janeiro Declaration on Environment and Development, which has been endorsed by the UK government. Principle 15 of this Declaration iterates the precautionary approach to environmental protection, stating that "lack of full scientific certainty shall not be used as a reason for postponing a cost-effective measure...". Principle 16 states that the polluter (e.g. one discharging lead shot in wetlands) should, in principle, bear the costs of pollution.

The BASC accepts that lead toxicosis occurs in waterfowl in the UK and is now working with its membership and government to remedy the problem. However, BASC has stated that a legal requirement for non-toxic shot should proceed only after substitutes have met three criteria: effectiveness, safety, and cheapness. These criteria are easy to

state, but have not been defined, and are difficult to ensure in practice.

The effectiveness of a given type of shot is determined largely by the shooting skill of individuals and their discipline in taking birds within the accepted range limit for both the cartridge and the gun. This requires the ability to assess ranges accurately and the avoidance of long-distance (>45 yds) shots which lead to substantial wounding of waterfowl. Shooting is a sport which is fraught inherently with safety problems determined by the judgement of individuals rather than the composition of their ammunition. Steel shot can deflect more from hard surfaces and water than lead shot, and this is used by some to caution against the compulsory introduction of non-toxic shot. However, millions of American, Danish, Dutch and Norwegian shooters have been using steel shot (and bismuth shot) since 1991 without compromising human safety, and reports of shot-related accidents do not exist.

The purchase price of non-toxic cartridges is a contentious issue. Steel and bismuth cartridges sold in the UK cost approximately twice the price of lead cartridges. Should more waterfowlers adopt lead-free shot, prices could decline as the volume of trade increases, especially for steel shot. Steel shot ammunition is produced by at least 12 companies in Europe and North America, this ensuring price competition. Waterfowling is an entirely recreational pursuit and the costs of ammunition (lead or lead-free) are very small in relation to the other costs incurred by waterfowlers. Thus BASC's position on this criterion is inconsistent with the nature of this sport in the UK. Moreover, the prices of lead and other non-toxic metals vary independently of one another on world markets, and a higher price of one type of non-toxic cartridge could reflect a spuriously low price of lead.

The 1995 recommendation of the Department of the Environment is that lead-free shot be used when shooting over, or within 300 m of a wetland if there is a danger that the shot would be deposited in it. This has created the problem of defining wetlands in legal terms. By contrast, the USA federal gov-

ernment required steel shot to be used in the pursuit of waterfowl wherever they occurred, and extended this requirement to apply to all game hunting conducted within the limit of federally-regulated preserves. Thus the USA has avoided this problem by regulating the activity in terms of hunting wildfowl species rather than in terms of wetland habitats.

The Department of the Environment has not stated what level of transition towards use of non-toxic shot is adequate in the 1995-96 and 1996-97 seasons to avoid the necessity for a 1997 ban on the use of lead shot over wetlands. This avoids the invidious problem of deciding whether to ban, or not to ban, lead shot based on possible small differences between expected and realized transition figures. However, this approach does not provide a quantitative basis for the government's expectations, nor does it provide a guidance for waterfowlers. The Department of the Environment requires that broad-scale testing be done to assess the transition to lead-free shot. Sales of non-toxic cartridges are broadly indicative of a trend but do not reflect the behavioural change of individual waterfowlers or those who shoot other species near wetlands. The 1995 regulation applies only to 12 bore cartridges, allowing waterfowlers to continue using lead shot in guns of larger and smaller bore. These factors will produce a large statistical error about any transition estimates. Other methods of monitoring proposed include surveys of lead ingestion by waterfowl, but these are unlikely to provide accurate estimates in the short term.

In the USA, compliance with regulations as determined by the detection of steel and lead shot from carcasses collected from hunters (who had no warning of the trial) is very high, varying from 90-99% in different studies (Havera *et al.* 1994). However, the evidence of compliance where no legal enforcement is possible is not encouraging. In the USA, a voluntary programme of phasing out of shot in Illinois resulted in only 15% of the hunters using steel shot (Havera *et al.* 1994). In Britain, the phasing out of lead weights and sinkers for angling on a voluntary basis was not

successful; sale, import and manufacture were regulated under the Control of Pollution Act (1974) and the use of lead controlled by water authorities and policed by fisheries managers.

We suggest that the adoption of non-toxic shot by waterfowlers would be facilitated by the Department of the Environment issuing guidelines before the 1995-96 season in which the desired levels of transition were indicated. If we take as the desired aim the elimination of lead from use over wetlands before the 1997-98 shooting season, we suggest that levels of compliance of 40% in 1995-96 and 80% in 1996-97 should be considered a minimum.

It is interesting to note the persuasion of the UK approach as opposed to the outright bans for all gauges of cartridge inherent in the American, Danish and Dutch regulations. Also, the use of bismuth shot for waterfowling in the USA will be allowed only if and when the product passes all the non-toxicity trials and a test exists which can reliably and quickly identify bismuth under field conditions by enforcement officers. The intent here is not to regulate the use of a product unless the basis for enforcement (and thus compliance) is assured.

It will be difficult in the UK to monitor compliance effectively unless some statutory backing is given to the measure. Unless there is such backing, there can be no compulsion about shooters providing samples for checking or samples of their cartridges. As always, those who are compliant will cooperate and those who are not will not.

The arms industry of Europe and North America has developed a large array of non-toxic cartridges in a short time, and further developments are ongoing. For several years UK cartridge manufacturers have been making steel and bismuth shot products for domestic use and international export. British made bismuth cartridges have been tested independently and shown to be

effective replacements for lead shot in waterfowling (Anon 1993b, 1994). Recent field tests have endorsed the use of steel shot for clay target shooting and helped to dispel fears of barrel damage to shotguns (Anon 1995).

Fears that the use of steel shot in waterfowling would increase the wounding rates more than it would reduce the prevalence of lead poisoning have not been validated, either in Europe or North America. It has been suggested that the positive experiences of Denmark and The Netherlands with lead-free shot may catalyze the transition towards a greater acceptance and use of non-toxic cartridges in the UK (Anon 1993a).

If adoption of steel shot by waterfowlers leads to greater emphasis on skills in attracting waterfowl and shooting at shorter ranges at which the likelihood of wounding is much less, this should be viewed positively. The birds sought by waterfowlers are not uniquely theirs to enjoy. An ever-growing number of naturalists have a vested interest in waterfowl and the quality of their habitats and constitute an important political voice. By embracing lead-free shot, waterfowlers would be perceived to be making their sport more sustainable while inflicting no unintentional damage on wildfowl. There are some encouraging signs that this message is getting through, with the first BASC-affiliated wildfowling club committing itself to the phase-out by 1997. We hope that lead-free regulations will find their way into club rulebooks and that others involved in shooting over wetlands will follow the example of the wildfowling clubs.

The goal of lead reduction must be extended to the entire flyway of migratory waterfowl if they are to receive the full protection from this toxic risk. The 1995 initiative of the Department of Environment should be seen as the UK contribution to this larger goal.

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