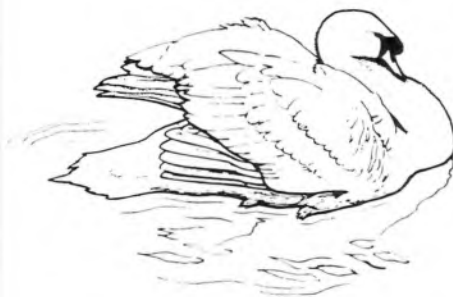


## A review of lead poisoning among the River Thames Mute Swan *Cygnus olor* population

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Lead poisoning of Mute Swans *Cygnus olor* in lowland Britain has been well documented since the late 1970s (Simpson *et al.* 1979, Birkhead 1982, 1983, Sears 1988). The main problem is caused by lead split-shot and leger weights used in coarse angling which are ingested by swans with their food and grit. In 1981 the Nature Conservancy Council's Working Group published their report on the problem. They encouraged the development of non-toxic weights and recommended that lead weights should be phased out of use once acceptable alternatives were available. The first alternative weights were marketed in 1984 and a wide range of products became available to anglers during 1985. A voluntary ban on the use of lead was introduced in 1985 but this was found to be relatively ineffective and it was decided that legislation was required to alleviate the problem. From 1 January 1987 it has been illegal to sell or import lead weights for fishing of over 0.06 g (no. 8 split-shot) up to and including 28.36 g (1 oz leger weights) under the Control of Pollution (Anglers' Lead Weights) Regulations 1986 made under the Control of Pollution Act 1974. Further to this, the use of lead weights of the same size range has been banned by the ten English and Welsh Water Authorities since the summer of 1987, under the Fisheries Byelaw amendment to the 1978 Fisheries Byelaw (made under the Salmon and Freshwater Fisheries Act 1975).

Lead poisoning in the population of Mute Swans in the Thames valley, southern England, has been monitored since 1980. During the current study, from 1983 onwards, the following methods have been used; post-mortem analyses of swans found dead, veterinary diagnoses of rescued swans and blood-sampling of live swans for lead analysis. The methods are described in Sears (1988) and Sears *et al.* (in press).

Since the introduction of controls over

the use of lead weights there have been substantial reductions in the incidence of lead poisoning in the swans of the Thames. Each year from 1983 onwards between 200–240 swans found dead or rescued have been examined for poisoning. In both 1983 and 1984 over 110 swans were diagnosed as lead poisoned, accounting for 50–60% of the total number examined. The number of cases dropped slightly to 70–80 per year (36–40% of the total) in 1985 and 1986 after the introduction of the voluntary ban on the use of lead. Since legislation was brought in, there have been rapid reductions in both the number of lead poisoned swans and the percentage of the total number found dead or rescued every year. Lead poisoning accounted for 24% of the 213 swans examined in 1987 and 16% of the 241 swans in 1988. Overall the number of cases of lead poisoning has been reduced by 70%, from 125 in 1983 down to 38 in 1988.

Blood-sampling has enabled a larger proportion to be monitored for lead. Swans sampled include pre-fledged cygnets of 15–20 weeks old, breeding adults caught during August and September, and non-breeding juveniles caught throughout the year. Blood lead levels above 40  $\mu\text{g}/100\text{ ml}$  are considered to be abnormally elevated (Sears 1988).

The highest blood lead levels have been recorded in immature swans of one to three years old living in non-breeding flocks in urban areas of the Thames. From 1983 to 1986 a total of 181 individual swans living in the flock at Windsor was blood-sampled. Every year between 84–89% of the swans tested had abnormally elevated blood lead levels. Since the introduction of legislation in 1987 there has been a dramatic reduction in the percentage of swans with abnormally high levels down to 44% of the 108 swans sampled in 1987 and 24% of the 119 sampled in 1988. The average blood lead levels recorded each year have also dropped

rapidly from a median of over 100 µg/100 ml in 1983 and 1984 down to 22–25 µg/100 ml in 1987 and 1988.

A slightly different pattern has been recorded for cygnets and breeding adults living on the Thames between Goring and West London. There was no substantial reduction in their blood lead levels until 1988. Every year from 1983 to 1987 over 50% of the cygnets and adults sampled had abnormally elevated lead levels but the percentage dropped substantially in 1988 down to 9% of the 76 cygnets and 5% of the 22 adults sampled. It is not known why the reduction in lead levels occurred one year later in the families compared with the urban flock birds. The reason does not appear to be related to the different habitats of the two groups since families living in urban areas followed the same pattern as those in rural areas.

Prior to 1987 a distinct seasonal pattern of lead poisoning was recorded every year (Sears 1988). The peak in mid-summer and trough during the spring appeared to be related to the fishing season. Large numbers of lead weights which had accumulated on the banks and in the sediment were still available to swans during the coarse angling close-season from mid-March to mid-June, and yet the incidence of lead poisoning dropped during this period every year. The

rapid increase in lead poisoning as soon as fishing commenced suggested that current use of lead weights caused the greatest problem. It was possible that swans were ingesting mainly recently used weights from the surface of the sediment, or those that were still attached to line. It was predicted that once lead weights were no longer in use, conditions should be similar to those during the close-season, and there should be a rapid decrease in the incidence of lead poisoning (Sears 1988).

As predicted, in the two years since the ban on the use of lead weights, the incidence of lead poisoning has dropped to levels similar to those previously recorded during the close-seasons. There is no longer a summer peak in either the monthly blood lead levels or the numbers of lead poisoned swans autopsied or rescued.

The legislation against the sale and use of lead weights has had a major and rapid effect in reducing the incidence of poisoning in the swans on the Thames. The problem is unlikely to disappear completely while there are lead weights accessible for swans to ingest. However, the number eaten by swans should decrease further with time as old weights gradually sink out of reach and any illegal use of lead diminishes as stocks are used up.

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