A Comparison of Two Methods to Establish the Prevalence of Lead Shot Ingestion in Mallards (Anas platyrhynchos) from The Netherlands

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Source: Journal of Wildlife Diseases, 25(2) : 297-299

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-25.2.297

Journal of Wildlife Diseases, 25(2), 1989, pp. 297–299

A Comparison of Two Methods to Establish the Prevalence of Lead Shot Ingestion in Mallards (*Anas platyrhynchos*) from The Netherlands

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ABSTRACT: Two collection methods for screening the mallard (*Anas platyrhynchos*) population in the Netherlands for the ingestion of spent lead shot were compared. One method consisted of examination of gizzards from mallards shot by hunters (n = 2,859) and the other method consisted of examination of gizzards from mallards caught in duck traps (n = 865). The 95% confidence interval of lead shot ingestion in the mallard population estimated by the first method was 1.7 to 2.9% and by the second method 1.1 to 3.1%. These values were not significantly different. From the numbers of lead pellets embedded in the gizzard wall in hunter-killed and trapped mallards it was estimated that at least 22 to 68% of the trapped ducks had been hit by lead shot previously, but survived. Furthermore, this study shows that it is reasonable to assume that a substantial part of the pellets which are identified (in this study and other studies) as ingested, may well have been shot into the gizzard lumen at some time before the birds were actually killed. To avoid lead poisoning in mallards and in raptors depredating waterfowl hit by lead shot, a change to steel shot is advocated.

Key words: Mallard, *Anas platyrhynchos*, lead poisoning, hunting, trapping, Netherlands, "eendenkooi."

Lead poisoning in waterfowl due to ingestion and retention of shotgun pellets dispersed by hunters has been well documented (Bellrose, 1959; United States Fish and Wildlife Service, 1986). During feeding, spent lead shot is retrieved by waterfowl from hunted areas. Examination of gizzards from shot mallards (*Anas platyrhynchos*) for ingested lead pellets has been widely used as a method to establish the prevalence of lead shot ingestion (Bellrose, 1959; United States Fish and Wildlife Service, 1986).

In a previous study (Lumeij et al., 1989) the 95% confidence interval (95% C.I.) of lead shot ingestion in wild mallards in the Netherlands was established to be 1.7 to 2.9%. In this study, gizzards from mallards shot by hunters were selected radiographically and examined visually for ingested lead shot. Since it has been suggested that lead-poisoned ducks may have a greater chance to get shot than healthy ducks (Bellrose, 1959), the collection method used might have yielded a higher prevalence of lead shot ingestion than actually occurred in the population. Furthermore, mallards that visit feeding ponds which are specifically constructed to attract ducks for hunting purposes, and where large numbers of lead pellets can be found in close proximity to the corn fed to these birds, might have a greater chance of being shot than other birds.

In the Netherlands, an alternative method of catching wild mallards has been known for centuries. Wild mallards are caught in a specially constructed device called "eendenkooi" (duck trap). The wild ducks are attracted to a pond that is connected to the trap by means of tame decoy ducks ("de kooi") and then lured into the trap with the help of a special breed of dog ("kooikerhondje"). Hunting with shotguns is not allowed within a distance of 1,500 m from an officially registered duck trap (Antonisse, 1974). This unique way of catching ducks in the Netherlands offers ideal circumstances for a comparative study such as the one described herein. Thus, the purpose of the present study was to compare the prevalence of lead shot ingestion by two methods of collecting gizzards from the mallard population in the Netherlands.

During the 1987–1988 trapping season, 865 gizzards from mallards caught in duck traps were supplied by Dutch poulterers. All gizzards were screened for radiopaque

material and selected gizzards were further examined for ingested pellets using the same methods and criteria reported previously (Lumeij et al., 1989). When lead pellets were found in the gizzard wall, histological examination of the area around the lead pellet was performed.

Results from the present study were compared with those from a previous study performed in the 1986–1987 hunting season on 2,859 gizzards from mallards shot in the Netherlands (Lumeij et al., 1989). Percentages reported are expressed as the 95% C.I. (Bulpitt, 1987).

Eighteen of 865 gizzards from trapped ducks contained ingested lead shot pellets (95% C.I.: $1.1\% < P < 3.1\%$), while 21 gizzards (95% C.I.: $1.4\% < P < 3.4\%$) contained one or more lead pellets in the gizzard wall. None of the lead shot pellets found in the lumen were identified as shot into the lumen. Histological examination revealed that embedded pellets in the gizzard wall were surrounded by connective tissue, indicating that the pellets had been shot into the gizzard well before the ducks were trapped.

In the previous study (Lumeij et al., 1989) 67 hunter-killed ducks contained ingested lead shot pellets (95% C.I.: $1.7\% < P < 2.9\%$), while 158 gizzards (95% C.I.: $4.9\% < P < 6.4\%$) contained one or more lead pellets in the gizzard wall and 99 gizzards (95% C.I.: $2.8\% < P < 4.1\%$) contained one or more lead pellets which were identified as being shot into the lumen. There was no significant difference between the methods used for collecting gizzards with respect to the percentage of ingested lead pellets.

The findings that gizzards from shot mallards had a significantly higher percentage of pellets embedded in the wall than gizzards from trapped mallards, and that no pellets were found in gizzards from trapped mallards which were identified as being shot into the lumen (versus 2.8 to 4.1% in mallards that were hunter-killed) confirm that the latter were obtained from mallards which had been trapped and that we had not been fooled by the poulterers which supplied the gizzards. Furthermore, pellets found in the gizzard wall of trapped ducks were surrounded by connective tissue, indicating that these birds had been hit by lead shot well before they were trapped.

This study shows that there is no difference in lead shot ingestion between hunter-killed and trapped ducks. This is an important finding since it is often thought that lead-exposed ducks are more susceptible to shooting because they are weaker fliers (Bellrose, 1959).

The fact that 1.4 to 3.4% of mallards caught in duck traps had lead pellets in the gizzard wall indicates that a substantial part of these ducks had been hit by lead shot previously, but survived. From the prevalence of lead pellets in hunter-killed mallards (95% C.I.: $4.9\% < P < 6.4\%$) it can be calculated that one of every 16 to 20 hunter-killed mallards contains lead pellets in the gizzard wall. From this value and the incidence of lead pellets embedded in the gizzard wall of trapped mallards, it can be estimated that at least 22 to 68% (16×1.4 to 20×3.4) of trapped ducks have been hit by lead shot previously, but were not killed.

Previous studies in mallards from North America have revealed a prevalence of embedded lead shot in mallards ranging from 13 to 27% (Murdy, 1952; United States Fish and Wildlife Service, 1986). Further studies, involving total body radiography of trapped mallards, will furnish more exact data for the situation in the Netherlands.

It cannot be discounted that at least a part of the number of lead pellets found in the gizzard contents of the trapped ducks, and which were classed as ingested, in reality had been shot into the bird, penetrated the gizzard wall and remained in the lumen. It is reasonable to assume that the chance of a lead pellet becoming embedded in the gizzard wall would not be much different from the chance of a pellet penetrating to and remaining in the

lumen, especially when the presence of grit in the lumen is considered. This would be true also for other similar studies on ingestion of lead shot.

The present study demonstrates that the usual collecting method for gizzards from hunter-killed mallards to establish the prevalence of lead shot ingestion does not yield different results from the collecting method whereby gizzards are taken from trapped mallards. However, from the prevalence of embedded pellets in the gizzard wall of trapped ducks, it seems reasonable to assume that a substantial part of the pellets which are identified (in this study and other studies) as ingested, actually may have been shot into the gizzard lumen at some time before the birds were actually killed.

Our findings do not change the fact that lead pellets dispersed by hunters are a contributing factor to mortality in the mallard population in the Netherlands. Furthermore, poisoning of birds of prey depredating ducks (or other game) which survived after being hit by lead shot is possible. Although lead poisoning does not seem to affect the spring populations of ducks or predators in the Netherlands (Bekhuis et al., 1987), it is likely that more ducks can be harvested from the population by Dutch hunters if there is a switch from lead shot to steel shot.

This study was made possible by the kind cooperation of the Royal Dutch Hunters Association (Koninklijke Nederlandse Jagers Vereniging), the Dutch Kooikers Association (Kooikersvereniging) and financial support from the Dutch Hunting Fund (Jachtfonds). Radiographs were made with the kind cooperation of the Utrecht University Department of Veterinary Radiology. Histological studies were performed by M. H. VanderHage, Utrecht University Faculty of Veterinary Medicine, Department of Pathology. Technical assistance was given by Jack Achterbosch.

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Received for publication 25 July 1988.