"LEAD SHOT POISONING IN WATERFOWL AND STEEL SHOT ALTERNATIVES"

A submission To The W.A. Fisheries and Wildlife Department.

By The

WEST AUSTRALIAN FIELD & GAME ASSOCIATION (Inc.)

AUGUST 1977

CONTENTS:

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INTRODUCTION:

Following the receipt of correspondence from the Conservator of Wildlife, Department of Fisheries and Wildlife, Western Australia, which points out that Department's concern of Lead Shot Poisoning of Waterfowl and the practicalities of employing steel shot instead of lead, The W.A. Field and Game Association has undertaken research on the subject:-

Results of these investigations follow:

Summary:

The concensus of research available from New South Wales, Victoria and Queensland has indicated quite clearly that the incidence of ingestion of lead shot by waterfowl in those states is generally very low (by Northern Hemisphere standards) and that scientific appraisal leads to conclusions that lead poisoning is not a potential mortality factor of Australian Waterfowl. These conclusions are based on:-

Not true for Qld. incidence is comparable!

(a) Sampling statistics of waterfowl gizzards for lead shot content.

(b) The relatively small amount of shooting pressure compared with that practised in Northern America, the latter being concentrated into the "flyway" areas which compounds the potential for lead accumulation in that country. (To put "guesstimates" and fact into perspective, the only factual evidence to date shows that a 2% mortality of the waterfowl population could result from lead poisoning in America.)

(c) The concentration co-incidence of birds and lead shot in North America does not compare with the Australian situation where bird dispersal is governed by prevailing water regimes which cause bird populations to be largely nomadic rather than greatly influenced by traditional or predictable routes as occurs in the Northern Hemisphere i.e. waterfowl and shooters do not come together in the quantity or intensity to provide the elements necessary to produce a lead shot accumulation threat.

(d) *The inherent physiographic differences in lake and swamp characteristics (hard base in North America, soft mud in Australia) which present obvious physical difficulities to waterfowl in accidently ingesting lead shot under normal feeding methods.*
With respect to the introduction of steel shot, it has been statistically proven that the substitution of steel for lead shot results only in a substantially greater number of crippled birds, the latter factor causing a proportion of eventual mortalities in itself over and above the numbers that would normally be taken or "pricked" using lead shot.

NORTH AMERICAN SYNOPSIS:

A substantial amount of wild fowling in North America is carried out on migratory birds moving south from Canadian lakes and Tundra regions. The flight pattern follows major waterways and coastal areas of North America. One such migratory flyway which is very popular with hunters is the Atlantic flyway - much of the populatity being due to the fact that the flyway is near some very large population centres;
consequently heavy shooting pressures occur along some portions. Since the U.S.A. and Canadian waterfowl are in a migratory state when using the flyways, they do not remain at feeding and rest points for any length of time, therefore it is improbable that the numbers of birds poisoned (unofficially assessed at "millions") do actually perish. This fact is borne out quite strongly since the U.S. Department of the Interior has been unable to demonstrate positively the numbers and particular incidence of waterfowl actually being poisoned by the ingestion of lead shot, viz;
"The degree or amount of (waterfowl) losses on a nationwide or continent wide scale simply is not known. Such data are so scattered and unobtainable that the information we have is sporadic at best and quantitatively inconclusive." [1].

Certain environmental bodies in the U.S.A. have effectively lobbied the U.S. Fish and Wildlife Service to place a ban on the use of lead shot in cartridges in certain areas of the Atlantic flyway, due to the type of shooting pressures these areas sustain and the fact that those bodies consider that the accumulation of fallen lead represents a potential threat to waterfowl. The ban has been placed only in specially designated areas which suffer the heaviest shooting pressure, despite the fact that much of the evidence is unsubstantiated i.e. "Assessment of actual lead poisoning mortality is difficult because of the many areas where waterfowl are hunted and because poisoned ducks seek cover for seclusion. Consequently, estimates of lead poisoning have been made using sub-lethal incidence of lead poisoning rather than actual mortality due to lead poisoning." [1].

The ban has received strong opposition from national sporting and game management bodies who are just as concerned in conserving the waterfowl resource as the official Government bodies.

AUSTRALIAN SYNOPSIS:

There are major differences in the situation and type of shooting in Western Australia (and Australia) and North America:-

Firstly there are no specific flyways which are frequented by birds and shooters (to compare with frequency intensity in North America) nor are there many wetlands where waterfowl accumulate in large numbers that are not restricted or closed to shooters. In this State, the largest congregations of birds will generally be found along coastal wetlands and other isolated refuges where shooting is illegal and thus the problem of lead shot accumulation, if it exists in the exception, is absolutely minimal on a regional scale.
The following extract applies.....
"Examination of gizzards from waterfowl collected in South-Eastern Australia showed an extremely low intake of shotgum pellets compared with that in Northern Hemisphere species. (c.f. Reid 1948; Bellrose 1951, 1959; Hoffmann 1960; Olney 1960; Hovette 1972.) Lavery (1971) presented the only comparable data from Australia and concluded that lead poisoning was of no consequence for waterfowl in Northern Queensland. [3]. *This low incidence of ingested pellets may reflect a low level of shooting intensity; but more probably the extreme variations in water levels cause a wider distribution of pellets and thus reduce the density of shot in waterfowl feeding areas which may, in any case, be dry and vegetated in succeeding seasons. The formation of huge wetland areas in times of flood would further reduce ingestion of pellets since many of these areas are inaccessible to hunters."* [2].

There is negligible shooting pressure on waterfowl in W.A. when compared to the U.S. flyways, especially in view of the restricted seasons available in the past decade. Greatly differing environmental topographical and climatic features also exist between U.S.A. and W..A. with Australian wildfowl being basically nomadic in nature due to the

irregular supply and distribution of water compared to the migratory regular patterned nature of many Northern Hemisphere waterfowl.

From information available, North American swamps and wetlands basically have hard bases on which the spent shot rests rather than sinking into a soft mud base which is a feature of most Australian wetlands. In soft mud lead shot generally becomes irretrievable by feeding birds; consequently, accidental ingestion is virtually minimal.
It is also considered that the amount of lead shot per given area of wetland in W.A. - even in well frequented areas is exceedingly small when compared with the flyway areas of America. By logistics, the resticted flyway areas and high shooter population in the eastern part of U.S.A. would support these findings.

In Victoria, (average of 30,000 licences issued annually over smaller area) the shooting pressure on the wetlands readily available to the public is substantially greater than W.A. and despite these facts the Victorian and N.S.W. Fisheries and Wildlife Departments and C.S.I.R.O. have not found any positive evidence to suggest lead poisoning of waterbirds by accidental ingestion of lead shot around and through lakes.

A further reference can be applied:-
"No pellets were found in gizzards of black duck (468 examined) black swan (100), blue-winged shoveller (31), chestnut teal (163), freckled duck (11), hardhead (32), mountain duck (99) and pink-eared duck (92): only one wood duck (70) and two grey teal (993) gizzards contained pellets". [2.]

This lead shot occurrence in three gizzards thus represents 0.015% of the total of 1989 birds examined.
Evidence from the C.S.I.R.O. Wildlife Research Centre, Black Mountain, Canberra A.C.T. (Dr. Braithwaite) on work done in the last five years in N.S.W. (Barren Box in particular) indicates no signs of lead concentrations in waterfowl examined.

Information from the N.S.W. National Parks and Wildlife Service (Mr. W. Steel) states that no effects of lead concentrations in duck populations sampled has been encountered by Officers in the Service.

The possibility of the problem occurring in W.A. is even more remote in view of the much lower shooting pressures and the dispersed nature of the areas where duck shooting is practised.

Australian waterfowl generally are surface feeders and are not in the habit of filtering heavily into thick mud in their foraging habits. Coarse washed sand is often used by the birds to assist digestion of food materials and in many instances these sands are situated near the high water levels of lakes. The majority of shooting is directed towards the centres of lakes which are deeper and are not generally used as feeding areas by waterfowl. By the time centre portions of lakes become readily accessible to birds for feeding, most lakes would have dried up to such as extent that the remaining water becomes excessively saline or foul and unlikely to sustain aquatic food material which might be attractive to waterfowl. A classic example of this occurrence is Lake Wannamal , which by late summer is often practically dry and supports a negligible number of birds.

THE DISADVANTAGES OF STEEL SHOT:

If a lead shot poisoning problem could be identified in this country and there was to be considered a change to steel shot that might be appropiate as a safeguard, the rationale underlying a judgement in this decision is the trade off of lead poisoning for the crippling effects of steel shot.

Ballistically steel shot is greatly inferior to lead. The essential difference is that the crippling effect of steel shot, by comparison would be severe. So much so, in fact, that in Australia, the adoption of steel would certainly produce bird losses far exceeding those attributed to lead shot poisoning if the latter could even be substantiated (No evidence to date suggesting that this could be achieved.) Steel shot also represents a hazard to the safety of the gun and the shooter.

The N.R.A. in America has substantial evidence to show that steel shot has a "peening" effect on shotgun chokes due to the greater hardness of the shot. The constant use of steel shot has also been implicated in barrel bursts resulting in shooter injury.

Handloading by shooters using steel shot will not be possible since specially designed cartridge components must be used for steel shot which will not be marketed as such by ammunition companies.
This is so because the companies involved are concerned that shooters may or will confuse or interchange steel and lead shot components with resultant injury to shooter and or damage to shotguns. Also the limited production of steel shot cartridges compared to lead will not warrant separate marketing to cater for handloading.
Since steel has a much lower specific gravity than lead, shotgun cartridges are completely redesigned for steel shot especially as the volume occupied in the cartridge by the shot is much greater with steel shot to achieve the same weight as the equivalent lead shot loaded cartridge.

The redesigning involved will result in the vast majority of guns being unsuitable for steel shot cartriges.

Additionally, effective killing ranges of shotguns using steel shot cartridges are much reduced, this being due to the intrinsically lower striking energies of the same size in steel shot. Consequently, much larger size shot is required to maintain approximately the same killing ranges as lead shot. Already this has been demonstrated in America with much higher percentages of wounded and lost birds being evident in the flyway areas where shooters are required to use steel shot cartridges. Recent studies of trends in American flyway pass-shooting have indicated that shooters have been achieving clean kills on large geese at 60-70 yeards using lead shot. Some veteran shooters using heavier hand loads of larger sizes of lead shot are taking birds at out to 80 yards.

Although greater numbers of pellets of a given size (say No.6 shot) and for a given load are used in steel shot, compared to lead, the greater numbers of pellets do not compensate for the reduction in striking energy at a given distance. U.S. Wildlife Management studies on the lethality of lead shot prove that a pellet must have a striking energy of 2.0 ft lbs or more to effect a clean kill and a bird the size of a black duck (the study was actually on mallard ducks) requires a minimum of 4 pellets striking at these energies to effect a clean kill. Comparing shot sizes in lead against their retained energies at distance the following data has been compiled.

Lead Shot Size	Retained Energy	Max. Distance at which 2.0 ft lbs energy is retained.
4	2.0 ft lbs	65 yards
5	2.0 ft lbs	55 yards
*6	2.0 ft lbs	50 yards

The denser shot pattern with #6 shot begins to complicate these results.

Data pertaining to the performance characteristics and effects of steel shot is not at this stage available in as simple a form as the above

table however, comparable data is shown in wildlife Monographs published by the U.S. Wildlife Society 1976 No. 51 of work done by Kozicky and Madson (1973) Tables 1 & 2 (see Appendix) and further work by Cockrane on steel and lead shot sizes 4 and 6. Bagging rates on Mallards become significantly higher in favour of No. 4 lead shot beyond 40 yards than with steel No. 4 shot. Correspondingly crippling rates are twice as great at 30 and 40 yards with No. 4. steel shot than with No. 4 lead shot Fig.2. (see Appendix), Table 3.)

CONCLUSIONS AND DISCUSSIONS:

(1) There is an absence of precise evidence in North America on the location and extent of lead poisoning.

(11) Sampling statistics in Eastern Australia indicate that the ingestion of lead shot is not a potential mortality factor.

(111) There has been no identification of a lead poisoning problem in Western Australia, nor, it appears, is there likely to be one in the forseeable future.

(1V) The case for introduction of steel shot in this state (and Australia) is not justified to any degree in the light of the above and when taking into account its inherent ballistic disadvantages.

A rational and logical approach is required to place into correct perspective such an issue as lead shot poisoning which, it appears, has drawn somewhat emotive responses from many areas.

Much research would be necessary over a number of years to determine if a lead poisoning problem existed in this state. With no preliminary evidence to suggest that lead shot is poisoning waterfowl, such a research programme hardly seems justified at this stage.

Nevertheless, the W.A. Field and Game Association can see value in conducting limited sampling procedures such as gizzard inspections for lead shot content during open seasons on ducks. Accordingly, such statistical work will be implemented in future seasons amongst Field and Game Members, the result of which will be made available to the Fisheries and Wildlife Department.

Compiled:

August 1977:

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REFERENCES:

1. *"WILDLIFE MONOGRAPHS No. 51" (U.S.A. WILDLIFE SOCIETY) Cochrane and Nicklaus Nov. 1976.*

2. *"THE INCIDENCE OF LEAD SHOTGUN PELLETS IN WATERFOWL EXAMINED IN SOUTH-EASTERN AUSTRALIA BETWEEN 1957 and 1973" F.I. NORMAN. Australian Wildlife Research 1976, 3, 61-71.*

3. *"LEAD POISONING AS A POSSIBLE CAUSE OF DEATH IN WATERFOWL IN NORTHERN QUEENSLAND" J.H. Lavery. Emu Feb. 1971 p138, 139.*

GENERAL:

* *Mr. R. Durell, W.A.F.G.A. District Officer, NARROGIN. Private Comm.*
* *I M I (Aust.) Ltd Private Communication.*
* *U.S.A. N.R.A. pub. "THE AMERICAN RIFLEMAN" Nov. 76.*

APPENDIX

Tables 1, 2 & 3

(Refer Page 10)

PHYSICAL AND BALLISTIC PROPERTIES OF THE SHOT SHELLS IN THIS EXPERIMENT

Type of shell	Pellet Size	Shot Weight[1] (g)	Pellet Count[1]	Pellets in a 30-inch Circle[2] (%)	Specific Gravity
Super XX magnum lead	4	43	198	87	11.30
Experimental steel	4	32	214	83	7.85
Experimental copper	4	32	180	84	8.90
Experimental steel	6	32	354	74	7.85

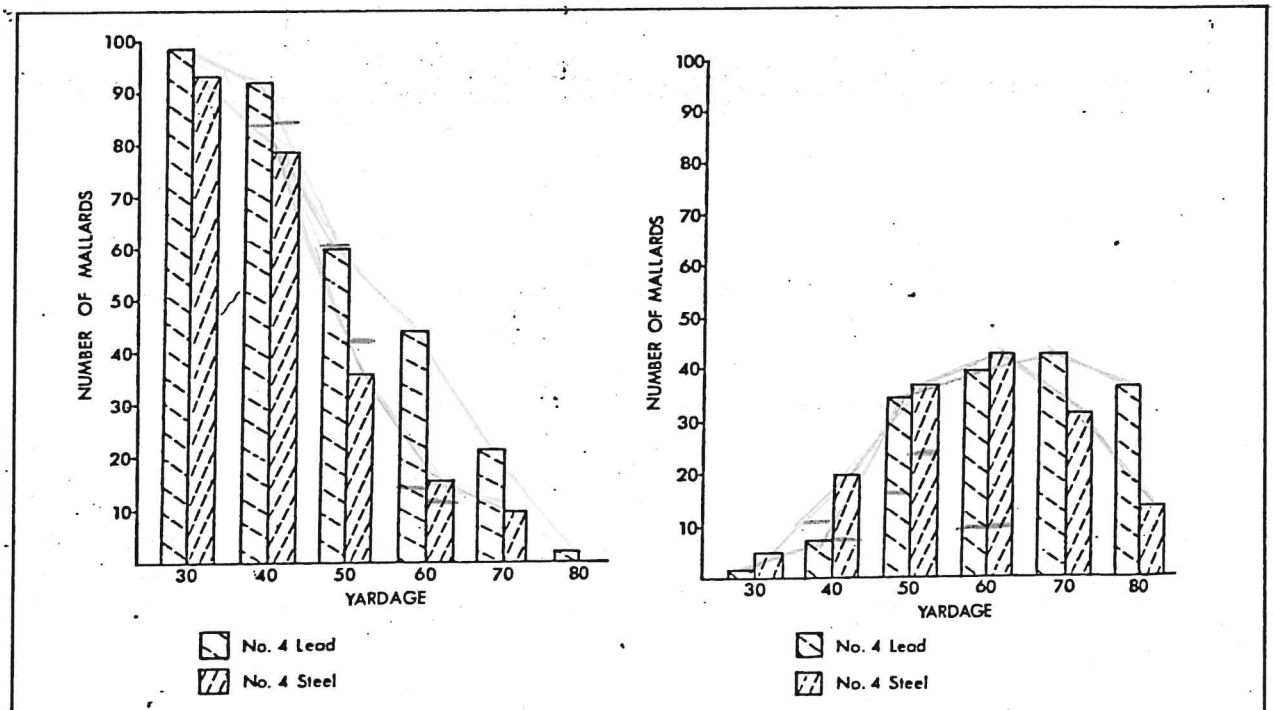
[1] Kozicky and Madson 1973.
[2] Average of 25 rounds measured at Nilo Farms (E. D. Lowry, pers. comm.).

TABLE 1

Shot Type and Category	Distance				
	30 m	40 m	50 m	60 m	Total
Nilo 4 lead					
Bagged	98	92	63	45	298
Crippled	2	8	32	33	75
Survivor	—	—	5	22	27
Nilo 4 steel					
Bagged	93	78	36	17	224
Crippled	5	21	38	36	100
Survivor	2	1	26	47	76
Patuxent 4 lead					
Bagged	20	83	61	14	178
Crippled	—	12	17	9	38
Survivor	—	5	22	27	54
Patuxent 4 steel					
Bagged	19	84	43	11	157
Crippled	1	8	26	9	44
Survivor	—	8	31	30	69
Patuxent 6 lead					
Bagged	20	85	59	19	183
Crippled	—	7	21	7	35
Survivor	—	8	20	24	52

TABLE 2

Number of ducks broken down into shot type categories.



Bagging rates per 100 mallards for No. 4 lead and No. 4 steel shot.

Crippling rates per 100 mallards of No. 4 lead and No. 4 steel shot.

TABLE 3