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Lead Shot Ingestion in Waterfowl in Washington State, 1978-1979

Abstract

A total of 762 waterfowl gizzards was collected from Washington State during the 1978-79 hunting season. Lead shot were present in 33 (4.3 percent) of the gizzards of 10 species of waterfowl represented. Only gizzards of Pintails (*Anas acuta*) and Mallards (*Anas platyrhynchos*) contained lead pellets. The incidence of lead shot ingestion in Mallards was 4.6 percent statewide. Mallards collected from western Washington had lead shot present in 4.1 percent of gizzards as compared to 0.5 percent in gizzards of Mallards from eastern Washington.

Introduction

Ingestion of spent lead shot has been recognized as an important cause of waterfowl mortality since 1874 (Phillips and Lincoln 1930). More than 6000 tons of lead shot are expended into waterfowl feeding areas by hunters every year (Montague and Montague 1973). Consequently, ducks and geese ingesting lead shot in all four major flyways across the United States have been affected by lead poisoning (Grinnell 1901, Wetmore 1919, Mohler 1954, and Trainer and Hunt 1965). Bellrose (1959) estimated that plumbism accounted for the mortality of 2 to 3 percent of the total fall population of waterfowl in North America. Incidence of lead poisoning along the Pacific Flyway has been estimated to be 4.9 percent, or about twice the national average (Bellrose 1959).

Nearshore bottom sediments of waterfowl feeding areas in Washington State may contain up to a reported 34,000 lead pellets per hectare (34/sq. meter) in the state's lakes and marshes (Adkins 1975). Waterfowl appear to be at risk of ingestion of spent lead shot in Washington State. However, recent studies by the Washington State Department of Game suggest a decline in statewide lead shot ingestion by waterfowl. Ingestion rates dropped from 5.3 percent for the 1973-74 hunting season to 4.5 percent in 1976-77. In the 1977-78 season, the incidence of lead shot in waterfowl gizzards was 2.6 percent (Henry 1979). Because lead poisoning in waterfowl has occurred in hunting areas, steel shot regulations for waterfowl have been adopted. The present study was undertaken to assess the occurrence of lead and steel shot in gizzards of waterfowl in the State of Washington during the 1978-79 hunting season.

Methods

Gizzards of hunter-killed waterfowl were collected at public hunting areas broken down on a county basis in the State of Washington during the 1978-79 hunting season. In

addition, Gray's Marsh, a private hunting reserve in Clallam County, contributed 108 Mallard gizzards to the study.

Specimens were received by Washington State Department of Game field personnel and frozen in plastic bags until examined in our laboratory. Gizzards were opened and contents examined for lead pellets by the hydraulic method developed by Brewer (1981). Shot were identified as lead, steel, or copper. Penetrated gizzards were identified, and any shot present was examined for erosion under a dissecting microscope. If erosion of the pellet was apparent, it was assumed to have been ingested.

Results

A total of 762 waterfowl gizzards was collected from 11 counties in Washington State during the 1978-79 hunting season. Lead shot were present in 33 (4.3 percent) of the gizzards (Table 1). One copper shot was found in a Mallard (*Anas platyrhynchos*) from

TABLE 1. Incidence of lead and copper shot in gizzards of waterfowl from Washington State, 1978-1979.

Species	No. of Gizzards	% of Waterfowl Collected	No. of Gizzards with Lead Shot	% of Species with Lead Shot Present in Gizzard	% of Total Sample with Lead Shot
Mallard (<i>Anas platyrhynchos</i>)	565	74.3	26	4.6	3.4
Pintail (<i>Anas acuta</i>)	70	9.2	4	5.7	0.5
Gadwall (<i>Anas strepera</i>)	2	0.3	0	—	—
American Widgeon (<i>Mareca americana</i>)	29	3.8	0	—	—
G. W. Teal (<i>Anas carolinensis</i>)	14	1.8	0	—	—
Redhead (<i>Aythya americana</i>)	2	0.3	0	—	—
Canvasback (<i>Aythya valisineria</i>)	6	0.8	0	—	—
Scap (<i>Aythya affinis</i>)	3	0.4	0	—	—
Total Duck	698	91.6	30	10.3	3.9
Canada Goose (<i>Branta canadensis</i>)	74	9.7	2	2.6	0.3
Brant (<i>Branta nigricans</i>)	4	0.5	1	25.0	0.1
Total Goose	85	11.2	3	3.5	0.4
Total Waterfowl	762		33		4.3

the Corfu Reserve in Grant County (Table 2). No steel shot was present in any of the gizzards. Of those waterfowl gizzards that contained lead shot, 70 percent had 1 pellet (Table 3). Only gizzards from Mallards contained more than 2 lead shot per gizzard, except for 2 Pintails (*Anas acuta*) that had 4 and 8 shots in their gizzard (Table 3).

Of the eight species of ducks collected, only gizzards from Mallards and Pintails contained lead pellets. The incidence of lead shot ingestion in Mallards for the 1978-79 season was 4.6 percent statewide (Table 1). Eastern Washington Mallards showed low ingestion rates (0.5 percent) compared to Mallards from western counties (4.1 percent) (Table 4). The incidence of ingested lead shot in Pintails was 5.7 percent (Table 1). All Pintails that had ingested lead shot were collected from the Willapa Refuge in Pacific County (Table 4).

Three of 85 (3.5 percent) goose gizzards contained lead pellets (Table 1). Two

TABLE 2. Sample distribution and incidence of lead shot in waterfowl gizzards collected from 12 Washington counties, 1978-1979.

County	No. of Gizzards	% of Waterfowl Collected	No. of with Lead Shot Gizzards	% of All Waterfowl Collected from Each County with Lead Shot in Gizzard	% of Total
Adams	146	19.2	3	2.1	0.4
Franklin	11	1.4	0	—	—
Grant	235	30.8	2*	0.9	0.3
Lincoln	63	8.3	0	—	—
Yakima	2	0.3	0	—	—
Columbia	2	0.3	0	—	—
East	459	60.3	5	—	—
Whatcom	101	13.3	1	1.0	0.1
Skagit	5	0.7	1	20.0	0.1
King	2	0.3	0	—	—
Clallum	108	14.2	20	18.5	2.6
Pacific	87	11.4	7	8.1	0.9
West	303	39.9	29	—	3.7
Total	762	100	34	—	4.4

*Includes one copper shot.

TABLE 3. Frequency distribution of numbers of ingested shot per gizzard for waterfowl collected in Washington State during the 1978-1979 hunting season.

Species	No. of Gizzards with Lead Shot	No. of Gizzards with				
		1	2	3	4	8
Mallard	26	18	3	4	1	0
Pintail	4	2	0	0	1	1
Canada Goose	2	2	0	0	0	0
Brant	1	1	0	0	0	0
Total	33	23	3	4	2	1
Percent	(100)	(69.7)	(9.1)	(12.1)	(6.1)	(3.0)

TABLE 4. Lead shot incidence in waterfowl from hunting areas where lead shot were ingested.

Species	County (Refuge)	No. of Gizzards (%)	No. of Gizzards with Lead Shot Present (%)
Mallard		565	
	Grant (Wanapum)*	200 (35.4)	1 (0.5)
	Adams (Othello)*	88 (15.6)	2 (2.3)
	Whatcom (Hampton Lake)+	83 (14.7)	1 (1.2)
	Clallum (Grays March)+	108 (19.1)	20 (18.5)
	Pacific (Willapa)+	13 (2.3)	2 (15.4)
Pintail		70	
	Pacific (Willapa)	34 (48.6)	4 (11.8)
Canada Goose		74	
	Adams (Othello)	32 (43.2)	1 (3.1)
	Pacific (Willapa)	14 (18.4)	1 (7.1)
Brant		4	
	Skagit	4 (0.5)	1 (25.0)

*Eastern counties in the State of Washington had 3 Mallard gizzards with lead shot present; 0.5 percent of total Mallard gizzards.

+Western counties in the State of Washington had 23 Mallard gizzards with lead shot present; 4.1 percent of total Mallard gizzards.

of the positive gizzards were collected in western Washington, although most samples were taken from the eastern counties.

Discussion

Previous studies have suggested a decline in lead shot ingestion by waterfowl collected from Washington State since the 1973-74 hunting season. Dropping from 5.3 percent in 1973-74, the statewide lead shot ingestion rate was 2.6 percent in waterfowl during the 1977-78 season (Henry 1979). In the present study, the lead shot incidence in waterfowl was found to be 4.3 percent (Table 1), with 60 percent of the gizzards coming from the eastern portion of the state (Table 2). Although the 4.3 percent ingestion rate tended to be higher than the 2.6 percent rate reported for the previous hunting season (Henry 1979), it compares closely with the mean (4.4 percent) ingestion rate over three seasons (Henry 1979). Bellrose (1959) reported that the incidence of lead shot ingestion in waterfowl in the Pacific Flyway was 4.9 percent.

As in previous seasons, the incidence of lead shot ingestion tended to be higher in the western portion of the state (3.7 percent) than in the eastern counties (0.7 percent) (Table 2). It should be noted that Clark County, the county having the highest statewide incidence of ingested lead and steel shot in waterfowl in 1977-78, was not sampled during the 1978-79 season. In eastern Washington, only two gizzards were from Yakima County, whereas over 200 were from this county in 1976-77 and in 1977-78. Therefore, conclusions from these data should be limited, although there appears to be a higher incidence of lead shot ingestion in waterfowl collected from the western part of the State of Washington.

The percentage of gizzards with lead shot that contained only one pellet was 69.7 percent. Bellrose (1959) earlier reported a similar figure of 65.5 percent from the Pacific Flyway. In 1973-74, the percentage of gizzards with lead shot that contained a single pellet was 92.8 percent declining to 64.6 percent in 1977-78 (Henry 1979). Bellrose (1959) described an inverse relationship between pellets per gizzard and ingestion rates for waterfowl species. Therefore, in Washington waterfowl, Henry (1979) suggested that the increase in the number of shot per gizzard from 1973 to 1977 reflects an upward trend in total ingestion rates. Since our data do not reflect a continued drop in the percentage of gizzards containing a single lead pellet, the total ingestion rate has possibly stabilized.

Acknowledgments

Waterfowl gizzards were provided by the Washington State Department of Game. Appreciation is extended to Mr. Larry Brewer for providing a hydraulic separation device for gizzard analyses.

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Received May 21, 1982

Accepted for publication August 13, 1982