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Lead Shot Poisoning of a Pacific Loon in Alaska

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ABSTRACT: Lead poisoning, associated with ingestion of spent lead shot, was diagnosed in an adult female Pacific loon (*Gavia pacifica*) observed with partial paralysis on 13 June 2002 and found dead on 16 June 2002 on Kigigak Island, Yukon Delta National Wildlife Refuge, western Alaska, USA. A necropsy revealed three pellets of ingested lead shot in the loon's gizzard and a lead liver concentration of 31 ppm wet weight, which was consistent with metallic lead poisoning. This is the first report of lead poisoning in a Pacific loon and is the only account of lead toxicosis associated with ingestion of lead shot in any loon species breeding in Alaska.

Key words: Alaska, case report, *Gavia pacifica,* lead shot, lead toxicosis, Pacific loon.

Lead poisoning in waterfowl has been documented since the late 1800s (Phillips and Lincoln, 1930; Bellrose, 1959; Pain, 1996). More recently, the detrimental effects of anthropogenically deposited lead have been documented in waterbirds and upland birds (Franson, 1996). In the common loon (*Gavia immer*), poisoning through ingestion of lead fishing weights occurs throughout its geographic range (Locke and Bagley, 1982; Daoust et al., 1998; Stone and Okoniewski, 2001), and on lakes in New England, lead poisoning is the leading cause of loon death (Pokras and Chafel, 1992). On the Yukon-Kuskokwim Delta (YKD) in western Alaska (USA), documented waterfowl mortality events have been attributed to ingestion of spent lead shot (Franson et al., 1995), and lead exposure could be influencing the population dynamics of breeding spectacled eiders (*Somateria fischeri*), long-tailed ducks (*Clangula hyemalis*), and common eiders (*Somateria mollissima*) in the region (Flint et al., 1997; Grand and Flint, 1998). Although these reports have resulted in management efforts to reduce the use of lead shot for traditional waterfowl and upland bird harvest, illegal use of lead shot persists on the YKD (M. Rearden, US Fish and Wildlife Service [USFWS] Yukon Delta National Wildlife Refuge [NWR], pers. comm.). Lead poisoning of a breeding loon on the YKD is cause for concern because it indicates that the effects of spent lead shot might be more widespread than previously recognized. Lead poisoning in a Pacific loon (*Gavia pacifica*), expands the list of species affected by spent lead shot and introduces a new source of mortality for loons on Alaskan breeding grounds.

We first observed the moribund adult Pacific loon hauled out on a mudflat within a breeding colony of black brant (*Branta bernicla nigricans*) on 13 June 2002 at Kigigak Island, Yukon Delta NWR, Alaska (60°50′N, 165°50′W). The loon was found dead 3 days later at the same location. The bird was emaciated, and the perianal plumage was matted with greenish feces. After collection, the carcass was chilled for 5 days, frozen, and shipped to the National Wildlife Health Center (Madison, Wisconsin, USA) for necropsy. Necropsy examination revealed the loon to be an adult female weighing 1,030 g; approximately 640 g lighter than healthy female Pacific Loons at the onset of incubation (Petersen, 1989). The loon had several 3–4-mm atretic follicles in its ovary, and its shell gland was approximately 2 cm wide, suggesting the bird had attempted to nest on the YKD. Three lead shot shell pellets (3 mm in diameter each) were found in the gizzard content. These pellets were consistent with lead— soft, (i.e., easily deformed with dissecting instruments), shiny, and not attracted to a magnet, which confirms nonferrous composition. The relatively

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uneroded and undeformed spherical condition of the pellets suggested recent ingestion. Internal examination revealed no subcutaneous, coelomic, or epicardial fat. There was marked atrophy of the pectoral musculature and the koilin of the gizzard was thickened, rough, brown, and fractured. The gall bladder was flaccid, collapsed, and filled with a large volume of inspissated, autolyzed, gray-green material. At the time of necropsy, the female was in poor postmortem condition and had extensive decomposition of internal organs, rendering the carcass unsuitable for ancillary microbiologic or histologic tests. A liver sample was collected, homogenized, dried, and ashed in preparation for lead analysis by atomic absorption spectrophotometry according to Locke et al. (1991). The mean recovery rate for standard samples spiked with lead was 95%. The liver lead concentration was 31 ppm wet weight, well above the 8 ppm wet weight threshold considered indicative of lead intoxication in waterfowl (Friend, 1985). A diagnosis of lead poisoning was issued on the basis of the presence of spent lead shot pellets in the gizzard, gross necropsy findings, and high liver lead concentration.

Five species of loons nest in Alaska: red-throated (*Gavia stellata*), arctic (*Gavia arctica*), Pacific, common, and yellow-billed loons (*Gavia adamsii*) (Gabrielson and Lincoln, 1959; American Ornithologists' Union, 1985). Suspected lead-related mortality has been reported in red-throated, Pacific, arctic, and common loons in southcentral Alaska, all in association with ingestion of lead fishing gear (B. Doak, Anchorage Bird Treatment and Learning Center, pers. comm.). Loons in other areas commonly suffer lead poisoning through ingestion of fishing sinkers and associated tackle, but ingestion of spent shot is an uncommon cause of lead poisoning in loon species. Neither Scheuhammer and Norris (1996) nor the *Field Manual of Wildlife Diseases* (Franson, 1999), include loons in their list of avian species at risk for lead shot poisoning, presumably because of their specialized piscivorous diet.

The pathway for lead shot ingestion in the subject Pacific loon is unknown. In western Alaska, red-throated and Pacific loons use similar coastal tundra habitats for nesting (Petersen, 1976). However, unlike more marine-foraging red-throated loons, incubating Pacific loons primarily feed in small terrestrial ponds during incubation and brood rearing (Bergman and Derksen, 1977; Petersen, 1989). Although little human fishing activity exists in these ponds, the coast of the YKD is hunted for waterfowl, and tundra ponds might contain unknown densities of spent lead shot (Flint et al., 1997; W. O'Connell, Alaska Sealife Center, pers. comm.). Breeding loons could accidentally ingest lead shot from sediments as they forage or collect shot during the process of acquiring grit. Alternatively, pellets could be accumulated directly from the fish they consume.

Settlement rate of lead shot in tundra wetlands on the YKD is relatively slow, and shot might continue to be available to birds more than 3 yr after deposition (Flint, 1998). Thus, current efforts to reduce lead shot might not be effective in curtailing the continued exposure and poisoning of birds on the YKD. Recovery of carcasses alone might not be a useful indicator of the magnitude of lead toxicosis (Pain, 1991). We recommend additional blood sampling of loons on the YKD and across the Alaskan breeding range in order to determine the distribution and significance of lead toxicosis at the population level.

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LITERATURE CITED

AMERICAN ORNITHOLOGISTS' UNION. 1985. Thirty-fifth supplement to the American Ornithologists' Union check-list of North American birds. Auk 102: 680–686.

BELLROSE, F. 1959. Lead poisoning as a mortality factor in waterfowl populations. Illinois Natural History Survey Bulletin 27: 235–288.

BERGMAN, R. D., AND D. V. DERKSEN. 1977. Observations on Arctic and red-throated loons at Storkersen Point, Alaska. Arctic 30: 41–51.

DAOUST, P.-Y., G. CONBOY, S. MCBURNEY, AND N. BURGESS. 1998. Interactive mortality factors in common loons from maritime Canada. Journal of Wildlife Diseases 24: 471–476.

FLINT, P. L. 1998. Settlement rate of lead shot in tundra wetlands. Journal of Wildlife Management 62: 1099–1102.

———, M. R. PETERSEN, AND J. B. GRAND. 1997. Exposure of spectacled eiders and other diving ducks to lead in western Alaska. Canadian Journal of Zoology 75: 439–443.

FRANSON, J. C. 1996. Interpretation of tissue lead residues in birds other than waterfowl. *In* Environmental contaminants in wildlife: Interpreting tissue concentrations, W. N. Beyer, G. H. Heinz, and A. W. Redmon-Norwood (eds.). Society of Environmental Toxicology and Chemistry Special Publication, CRC Press, Inc., Boca Raton, Florida, 265–279 pp.

———. 1999. Lead. *In* Field manual of wildlife diseases: General field procedures and diseases of birds, M. Friend, J. C. Franson, and E. A. Ciganovich (eds.). US Geological Survey, Biological Resources Division, Information and Technology report 1999-001, 438 pp.

———, M. R. PETERSEN, C. U. METEYER, AND M. R. SMITH. 1995. Lead poisoning of spectacled eiders (*Somateria fischeri*) and of a common eider (*Somateria mollissima*) in Alaska. Journal of Wildlife Diseases 31: 268–271.

FRIEND, M. 1985. Interpretation of criteria commonly used to determine lead poisoning problem areas. US Fish and Wildlife Service, Fish and Wildlife. Leaflet 2, 5 pp.

GABRIELSON, I. N., AND F. C. LINCOLN. 1959. The birds of Alaska. The Stackpole Company, Harrisburg, Pennsylvania, and Wildlife Management Institute, Washington, D.C., 922 pp.

GRAND, J. B., AND P. L. FLINT. 1998. Effect of lead poisoning on spectacled eider survival rates. Journal of Wildlife Management 62: 217–221.

LOCKE, L. N., AND G. E. BAGLEY. 1982. Lead poisoning in common loons (*Gavia immer*). Avian Diseases 26: 392–396.

———, M. R. SMITH, R. M. WINDINGSTAD, AND S. J. MARTIN. 1991. Lead poisoning of a marbled godwit. Prairie Naturalist 23: 21–24.

PAIN, D. J. 1991. Why are lead-poisoned waterfowl rarely seen? The disappearance of waterfowl carcasses in the Camargue, France. Wildfowl 42: 118–122.

———. 1996. Lead in waterfowl. *In* Environmental contaminants in wildlife: Interpreting tissue concentrations, W. N. Beyer, G. H. Heinz, and A. W. Redmon-Norwood (eds.). Society of Environmental Toxicology and Chemistry Special Publication, CRC Press, Inc., Boca Raton, Florida, pp. 251–264.

PETERSEN, M. R. 1976. Breeding biology of Arctic and red-throated loons. MS Thesis, University of California, Davis, California, 55 pp.

———. 1989. Nesting biology of Pacific loons, *Gavia pacifica,* on the Yukon-Kuskokwim Delta, Alaska. Canadian Field-Naturalist 103: 265–269.

PHILLIPS, J. C., AND F. C. LINCOLN. 1930. American waterfowl, their present situation and the outlook for their future. Houghton Mifflin Company, New York, New York, 312 pp.

POKRAS, M. A., AND R. M. CHAFEL. 1992. Lead toxicosis from ingested fishing sinkers in adult common loons (*Gavia immer*) in New England. Journal of Zoo and Wildlife Medicine 23: 92–97.

SCHEUHAMMER, A. M., AND S. L. NORRIS. 1996. The ecotoxicology of lead shot and lead fishing weights. Ecotoxicology 5: 279–295.

STONE, W. B., AND J. C. OKONIEWSKI. 2001. Necropsy findings and environmental contaminants in common loons from New York. Journal of Wildlife Diseases 37: 178–184.

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