

## **Brown Creeper (*Certhia americana*) Fatality Exhibits Signs Associated with Lead Poisoning**

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**Abstract:** Post-mortem clinical necropsy of a Brown Creeper (*Certhia americana*) found an object consistent with being an eroded lead shot in the gizzard and several physiological signs commonly associated with lead poisoning. This may be the first documented incidence of possible lead poisoning in the family Certhiidae of wild passerines and one with an internal tangible lead source.

**Keywords:** Brown Creeper, *Certhia americana*, lead poisoning

Lead (Pb) poisoning of numerous species of waterfowl from fortuitous ingestion of spent lead shot while bottom-feeding in various aquatic habitats has been well documented since the early 20<sup>th</sup> Century (Bowles 1908) and recognized as a serious problem facing the welfare of many waterfowl species populations (McAtee 1908, Jordon and Bellrose 1950, Sanderson and Bellrose 1986). Poisoning from accidentally ingested lead shot has also been reported in several species of ground-feeding upland game birds (i.e., pheasant, quail, doves) (Campbell 1950, Hunter and Rosen 1965, Westemeier 1966, Locke and Bagley 1967, Lewis and Legler 1968). Lead shot in ammunition used for hunting waterfowl and rails was phased out in the United States starting in 1986, but lead is still permitted in ammunition used for hunting upland game (Rattner et al. 2008). Predators and scavengers have been shown to suffer secondary lead poisoning from spent shot embedded or ingested in their prey (Benson et al. 1974, Janssen et al. 1986, Pain et al. 1993, Clark and Scheuhammer 2003, Fisher et al. 2006). There are far fewer documentations of lead poisoning of wild birds in other major bird groups while identifying the source of the poisoning and the method of contact. Regardless, numerous forms of solid, dissolved, or atomized lead in the environment may have potential to jeopardize the welfare of many bird species and/or populations into the future.

I present in this paper results of a Brown Creeper (*Certhia americana*) clinical necropsy exhibiting signs commonly associated with lead toxicosis in birds, and possibly constituting a previously undocumented internal source of lead poisoning of a wild passerine in the family Certhiidae.

## THE SPECIMEN

The recently dead Brown Creeper was found beneath a tree near a bird feeder outside a residential home near the village of Bozman, Talbot County, Maryland on 8 December 1980. Upon collection, the specimen was sealed in a plastic Ziploc<sup>®</sup> bag with a date and location label and placed in the freezer. I removed the specimen from the freezer on a late January 1981 date, performed a clinical necropsy and prepared the specimen as a scientific study skin (JR Preparation Catalog Number 949; Smithsonian Institution, National Museum of Natural History, Division of Birds Catalog Number USNM 599312).

## RESULTS

Necropsy of the creeper found the specimen totally lacking of subcutaneous fat, and seriously emaciated with notably shrunken pectoral muscles besides the exposed ventral portion of the sternum keel. The esophagus was empty and did not appear abnormal. The cardiac cavity was watery and lacked coronary fat while the heart did not appear abnormal. The posterior end of the proventriculus and lining of the gizzard were stained green while the lining of the gizzard appeared thickened and brittle. The gizzard was empty of food items, but contained several granules of grit and what appeared to be an eroded lead shot approximately 1 mm (0.04 in) in diameter. The pancreas and gall bladder were discolored green-black and swollen with similarly colored bile contents. Some green staining was obvious on the shiny surface of the liver lobes adjoining these organs. It is uncertain if the intestine was swollen and no food items could be identified, but it did contain green liquid, giving a greenish cast to the exterior walls. The cloaca was stained green while the exterior vent area was stained with greenish diarrhea. The skull was 100% pneumatized indicating the creeper may have been more than one-year old, while an internal gonad inspection found the non-enlarged testes of a male.

The creeper had no fractures of the bill, blood on the plumage, skin punctures, hemorrhaged areas beneath the epidermis, broken bones, detectable parasites, fungus, or any other signs of death from trauma such as collision with a window, talon punctures from a predator strike, or serious disease infection or parasite infestation.

Under a stereoscope the shot appeared a typical gray color of lead, was easily malleable when pinched with a pair of needle-nosed pliers, and not attracted to a magnet. Chemical analysis of body tissues and/or organs was beyond the access of this biologist, thus beyond scope of this clinical necropsy.

## DISCUSSION

The clinical necropsy of a Brown Creeper found dead on a residential lawn revealed signs commonly associated with lead poisoning that may have caused and/or contributed to its death.

Studies have found elevated levels of lead in blood, feathers, and/or body tissues of wild passerine species commonly living and/or nesting in habitat within, or in close proximity to, known sources of lead as opposed to their counterparts in nearby less contaminated habitats (Table 1). Field studies in contaminated areas and/or laboratory studies with dosed passerines found some species pass lead shot avoiding adverse toxic effects (Custer et al. 2003, Hofer et al. 2010) and others suffer little or no effects of lead toxicity (Getz et al. 1977, Undevitz et al. 1980). Other studies found lead toxicity may affect ages, sexes, or species differently (White and Stendell 1977, Blus et al. 1995, Vyas et al. 2000, Vyas et al. 2001, Beyer et al. 2013). Studies have also found eroded shot may be more toxic than non-eroded shot to some species (Vyas et al. 2001). Results of these studies suggest there is still a lot to be learned about the toxic susceptibility of a multitude of passerine species (including susceptibility based on the age and sex of a victim) to solid versus atomized or dissolved forms, exposure duration, non-eroded versus eroded shot, and various tissue concentrations necessary to cause mortality.

Alimentary tract discoloring and compromised endocrine glands may possibly be signs associated with emaciation or other ailments. However, severe emaciation, swollen endocrine glands, and green staining throughout the Brown Creeper's alimentary system are signs more commonly associated with acute toxicosis consistent with oral lead exposure (see examples in Locke and Bagley 1967, Locke and Young 1973, Baldassarre and Bolen 1994, Friend 1999). Furthermore, the shot found in the creeper's gizzard provides evidence as a source of lead poisoning despite the lack of confirmatory laboratory tissue analysis.

Documented incidences of an ingested tangible source of lead for potential lead poisoning in wild passerines are lacking. Thus, the lead shot in the Brown Creeper's gizzard is an important occurrence. Possibly the creeper ingested the shot while collecting grit from the ground, while a more plausible explanation may be dislodging the shot while gleaning tree bark. If the latter is true, possibly other bark-gleaners such as woodpeckers, nuthatches, and some warbler species may also be at risk.

Dislodging lead shot or fragments while bark gleaning is believed responsible for elevated levels of lead found in the liver or kidney of wild Red-headed Woodpecker (*Melanerpes erythrocephalus*), Red-bellied Woodpecker

**Table 1. Passerine families with taxa found to have elevated levels of lead in blood, feathers, and/or tissues when found living in habitats containing a source of lead contamination.**

Family and Species	Lead levels above reference habitat	Source of lead in habitat	Citation
<b>Tyrannidae</b>			
Eastern Phoebe <i>Sayornis phoebe</i>	Exceeding level of no adverse effect	Small arms firing range	Johnson et al. 2007
<b>Vireonidae</b>			
Blue-headed Vireo <i>Vireo solitarius</i>	Diagnosed with lead poisoning	Firearms training facility	Lewis et al. 2001
<b>Corvidae</b>			
Blue Jay <i>Cyanocitta cristata</i>	Elevated in contaminated habitat	Firearms training facility	Lewis et al. 2001
Blue Jay	Greater than reference areas	Lead mining and smelting complex	Beyer et al. 2013
Common Raven <i>Corvus corax</i>	During hunting season	Field of fall of shot big game	Craighead and Bedrosian 2008
<b>Hirundinidae</b>			
Tree Swallow <i>Tachycineta bicolor</i>	Significantly higher than rural area swallows	Lead mining and smelting complex	Blus et al. 1995, Custer et al. 2003
Bank Swallow <i>Riparia riparia</i>	Elevated in contaminated habitat	Lead mining and smelting complex	Niethammer et al. 1985
Barn Swallow <i>Hirundo rustica</i>	Greater than rural area swallows	Highway vehicle emissions	Grue et al. 1984
<b>Certhiidae</b>			
Brown Creeper <i>Certhia americana</i>	Unknown	Ingested lead shot	This study
<b>Troglodytidae</b>			
House Wren <i>Troglodytes aedon</i>	Significantly higher in contaminated habitat	Urban brownfield site	Hofer et al. 2010
Carolina Wren <i>Thryothorus ludovicianus</i>	Elevated in contaminated habitat	Firearms training facility	Lewis et al. 2001
Carolina Wren	Greater than reference areas	Lead mining and smelting complex	Beyer et al. 2013
<b>Turdidae</b>			
Swainson's Thrush <i>Catharus ustulatus</i>	Elevated above reference area	Lead mining and smelting complex	Hansen et al. 2011
Wood Thrush <i>Hylocichla mustelina</i>	Exceeding level of no adverse effect	Small arms firing range	Johnson et al. 2007
Wood Thrush	Greater than reference areas	Lead mining and smelting complex	Beyer et al. 2013
Eurasian Blackbird <i>Turdus merula</i>	Significantly higher than rural area	Moderately polluted urban area	Scheifler et al. 2006
American Robin <i>Turdus migratorius</i>	Significantly higher than reference area	Lead contaminated floodplain	Johnson et al. 1999
American Robin	Greater than reference areas	Lead mining and smelting complex	Beyer et al. 2005, 2013
American Robin	Significantly higher than rural area	Urban developed area	Roux and Marra 2007
American Robin	Significantly lower than House Wren in area	Urban brownfield site	Hofer et al. 2010
American Robin	Elevated above reference area	Lead mining and smelting complex	Hansen et al. 2011

Family and Species	Lead levels above reference habitat	Source of lead in habitat	Citation
<b>Mimidae</b>			
Gray Catbird <i>Dumetella carolinensis</i>	Significantly higher than rural area	Urban developed area	Roux and Marra 2007
Brown Thrasher <i>Toxostoma rufum</i>	Elevated in contaminated habitat	Firearms training facility	Lewis et al. 2001
Northern Mockingbird <i>Mimus polyglottos</i>	Significantly higher than rural area	Urban developed area	Roux and Marra 2007
<b>Sturnidae</b>			
European Starling <i>Sturnus vulgaris</i>	Significantly higher than rural area	Urban developed area	White et al. 1977
European Starling	Significantly higher than rural area	Highway vehicle emissions	Grue et al. 1986
<b>Passeridae</b>			
House Sparrow <i>Passer domesticus</i>	Significantly higher than agricultural area	Urban developed area	Chandler et al. 2004
House Sparrow	Significantly higher than rural area	Urban developed area	Roux and Marra 2007
<b>Passerellidae</b>			
Eastern Towhee <i>Pipilo erythrophthalmus</i>	Greater than reference areas	Lead mining and smelting complex	Beyer et al. 2013
Song Sparrow <i>Melospiza melodia</i>	Significantly higher than reference area	Lead contaminated floodplain	Johnson et al. 1999
Song Sparrow	Significantly higher than rural area	Urban developed area	Roux and Marra 2007
Song Sparrow	Elevated above reference area	Lead mining and smelting complex	Hansen et al. 2011
White-throated Sparrow <i>Zonotrichia albicollis</i>	Significantly higher in contaminated area	Trap and skeet range	Vyas et al. 2000
Dark-eyed Junco <i>Junco hyemalis</i>	Significantly higher in contaminated area	Trap and skeet range	Vyas et al. 2000
<b>Icteridae</b>			
Brown-headed Cowbird <i>Molothrus ater</i>	Significantly higher in contaminated area	Trap and skeet range	Vyas et al. 2000
Common Grackle <i>Quiscalus quiscula</i>	Elevated in contaminated habitat	Firearms training facility	Lewis et al. 2001
<b>Parulidae</b>			
Palm Warbler <i>Setophaga palmarum</i>	Elevated in contaminated habitat	Firearms training facility	Lewis et al. 2001
Yellow-rumped Warbler <i>Setophaga coronata</i>	Diagnosed with lead poisoning	Firearms training facility	Lewis et al. 2001
<b>Cardinalidae</b>			
Northern Cardinal <i>Cardinalis cardinalis</i>	Elevated in contaminated habitat	Firearms training facility	Lewis et al. 2001
Northern Cardinal	Elevated above reference area cardinals	Lead mining and smelting complex	Beyer et al. 2005, 2013
Northern Cardinal	Exceeding level of no adverse effect	Small arms firing range	Johnson et al. 2007
Northern Cardinal	Significantly higher than rural area	Urban developed area	Roux and Marra 2007

(*Melanerpes carolinus*), and Pileated Woodpecker (*Dryocopus pileatus*) in Georgia, and in the liver of Gray-headed Woodpecker (*Picus canus*) and White-backed Woodpecker (*Dendrocopos leucotos*) in Sweden, although the gizzards contained no tangible source of lead (Mörner and Petersson 1999, Lewis et al. 2001).

Thus, this Brown Creeper may be the first documented incidence of possible lead poisoning in the passerine family Certhiidae, while further contributing to the identification of species impacted by lead's toxic effects, the source of the lead, and an understanding of the far reaching effects of lead products in the environment.

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