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LETHAL *PROCYRNEA* INFECTION IN A BLACK-BACKED WOODPECKER (*PICOIDES ARCTICUS*) FROM CALIFORNIA

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Abstract: The black-backed woodpecker (*Picoides arcticus*) is a species of management concern in California. As part of a study of black-backed woodpecker home range size and foraging ecology, nine birds in Lassen National Forest (Shasta and Lassen Counties, California) were radio-tracked during the 2011 breeding season. One of the marked birds was found dead after being tracked for a 10-wk period in which it successfully nested. A postmortem examination of the dead bird revealed that it was emaciated and autolyzed, with the presumptive cause being numerous spiruroid nematodes of the genus *Procyrnea* in the gizzard. This first observation of *Procyrnea* nematodes in a black-backed woodpecker is notable because the *Procyrnea* infection was considered lethal and because *Procyrnea* has been implicated in substantial die-offs in other bird species, including woodpeckers.

Key words: Black-backed woodpecker, *Picoides arcticus*, *Procyrnea colaptes*, *Procyrnea pileata*, spiruroid nematodes, woodpeckers.

BRIEF COMMUNICATION

The black-backed woodpecker (*Picoides arcticus*) is a species of management concern in California,^{7,8} where it was recently designated as a candidate species for listing as threatened or endangered in the state. Conservation concern for the species is driven by its apparently small population and substantial dependence on recently burned conifer forest,⁴ a habitat that is ephemeral, limited in extent, and vulnerable to postfire salvage logging.

As part of a study of black-backed woodpecker home range size and foraging ecology, nine birds in recently burned areas of Lassen National Forest (Shasta and Lassen Counties, California) were radio-tracked during the 2011 breeding season. Each bird was marked with an approximately 2.5-g radio transmitter glued and tied to one of its inner tail feathers. One adult male was marked in late April 2011 and then located and tracked several times each week for 10 weeks, during which it and its mate nested and successfully fledged young. On July 6, we observed the

bird behaving lethargically. Three days later, the bird's radio transmitter led us to its carcass, which was on the ground at the base of a tree, with no obvious sign of trauma. No other marked birds died during the study.

A postmortem examination at the California Animal Health and Food Safety Laboratory System at Davis, California, revealed that the bird was severely emaciated, with several nematodes noted in the gizzard koilin. Multiple tissues were immersed in 10% neutral buffered formalin and processed for routine histologic examination. Aside from the emaciation, significant histopathologic findings were limited to the gizzard, where the surface koilin and mucosal glands were markedly disrupted by numerous sections of a nematode parasite embedded within the koilin and underlying distorted and dilated mucosal gland lumina (Fig. 1). Numerous exfoliated epithelial cells and free red blood cells were also admixed with large bacterial colonies within the koilin (Fig. 1).

Several nematodes (roughly 6–10) were collected from the formalin-fixed gizzard and placed in 70% ethanol. Representative specimens were cleared and studied in temporary mounts of lactophenol and then returned to the preservative. Voucher specimens were deposited under accession number 104877 in the U.S. National Parasite Collection in Beltsville, Maryland. The nematodes (Fig. 2) were identified as spiruroids of the genus *Procyrnea* (Spiruroidea: Habronematidae) on the basis of the following combination of characters: two tri-lobed lips, thick-walled buccal cavity, esophagus divided into muscular and

From The Institute for Bird Populations, P.O. Box 1346, Point Reyes Station, California 94956, USA (Siegel, Bond, Wilkerson); the California Animal Health and Food Safety Laboratory, University of California, Davis, California 95616, USA (Barr); the Veterinary Pathology Service, Joint Pathology Center, 606 Stephen Sitter Avenue, Silver Spring, Maryland 20910, USA (Gardiner); and HelmWest Laboratory, 2108 Hilda Avenue, Missoula, Montana 59801, USA (Kinsella). Correspondence should be directed to Rodney Siegel (rsiegel@birdpop.org).

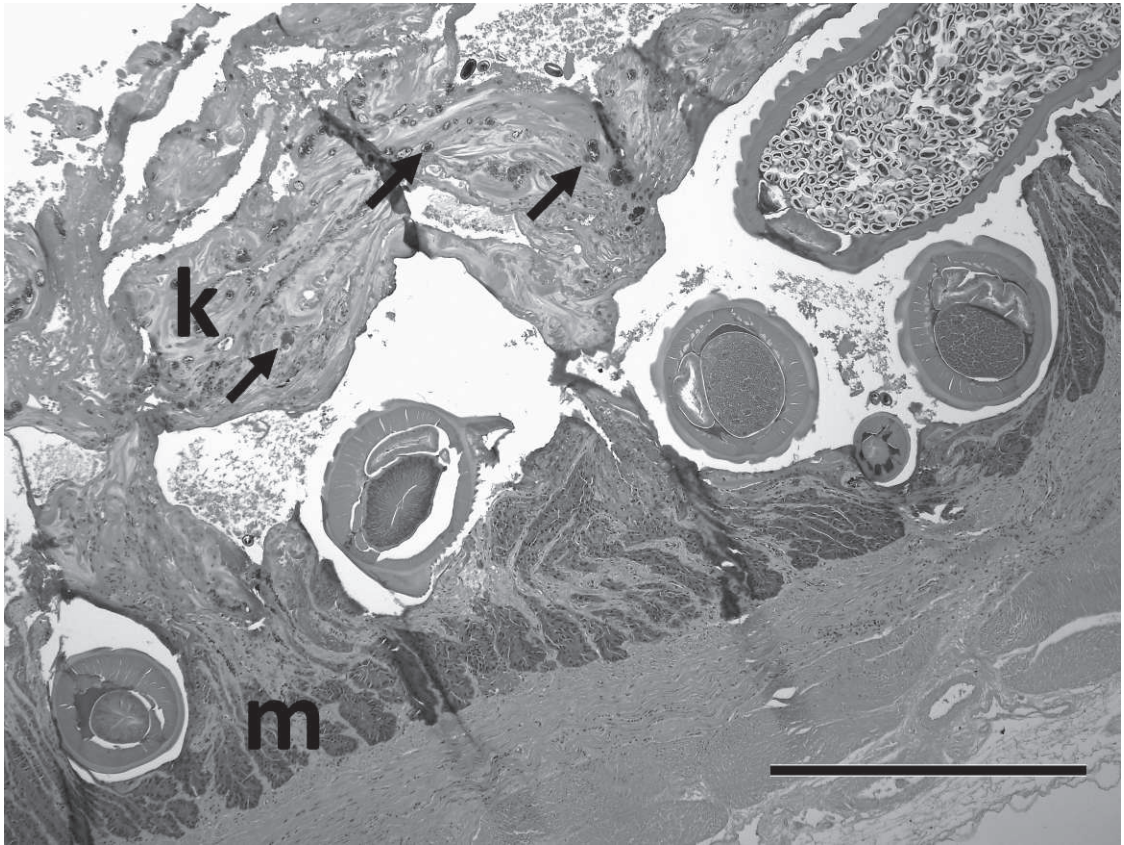


Figure 1. Low-magnification photomicrograph demonstrating the high density of nematode cross sections lying within the gizzard koilin (k) or underlying mucosal (m) dilated gland lumen. There is marked splitting of the koilin which contains numerous large bacterial colonies (arrows). H&E. Bar = 500 μm .

glandular portions, coiled male tail with prominent caudal alae, unequal spicules, presence of a gubernaculum, and vulva in females near mid-body.¹ Identification to the species *Procyrnea pileata*⁹ was based primarily on the shape and size of the spicules in the males and the distance of the vulva from the anterior end in the females; the left spicule ranged in length from 1,560 to 1,770 μm , and the right spicule from 380 to 430 μm .⁶

The life cycle of *Procyrnea* requires arthropods as intermediate hosts, which are then consumed by the definitive host, in which the nematodes parasitize the upper gastrointestinal tract. Apparent intermediate hosts of *P. pileata* include pillbugs (*Armadillidium vulgare*) and earwigs (*Euborellia annulipes*) (St. Leger and others, unpubl. data). Black-backed woodpeckers forage primarily on the larvae of wood-boring beetles and bark beetles,² neither of which is a known or likely vector for *P. pileata*. The birds forage mainly by excavating beetle larvae from the sapwood of dead or ailing trees, a strategy that is unlikely to

result in consuming arthropods that are intermediate *Procyrnea* hosts. However, during 1,198 observations of black-backed woodpecker foraging bouts (R. Siegel et al., unpubl. data) the gleaning of prey items from the outer surface of tree bark was noted as part of 113 bouts (9.4%). Gleaning prey items from the surface of tree trunks and logs introduces the potential for more frequent consumption of arthropods that could be *Procyrnea* vectors.

This study is the first observation of *Procyrnea* in black-backed woodpeckers and apparently the first description of any disease findings in the species. *Procyrnea pileata* infection has previously been documented in red-bellied woodpeckers (*Melanerpes carolinus*) in Florida³ and appears to have been responsible for 18 deaths in multiple species of captive rhamphastids (a family comprising the toucans, toucanets, and aracaris) at Sea World in southern California (St. Leger and others, unpubl. data). Another *Procyrnea* nematode, *Procyrnea colaptes*, was identified as a factor

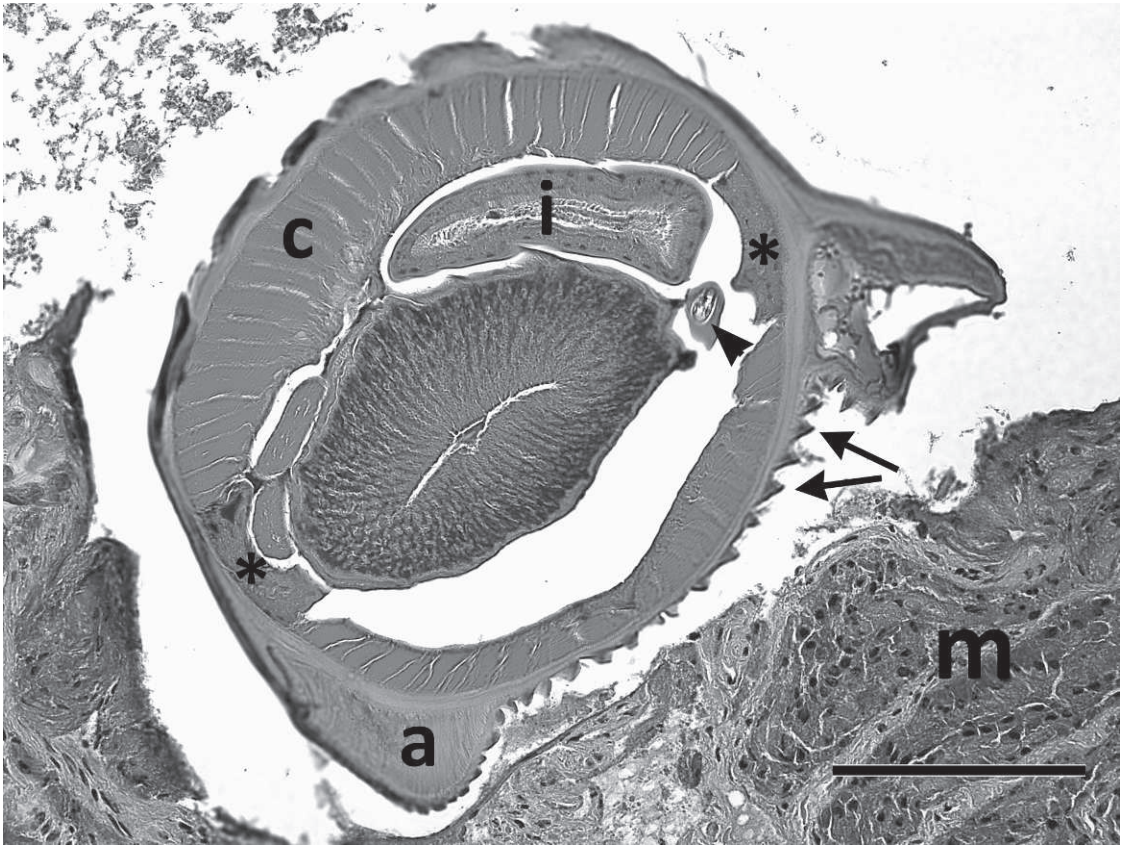


Figure 2. High-magnification photomicrograph of a single cross section through the posterior end of a male spirurid nematode. There is a small spicule (arrowhead) within the pseudocoelom. The nematode has coelomyarian musculature (c) with lateral chords (*), numerous ventral ridges (arrows) along one side of the cuticle, and two large projecting caudal alae (a). i, intestine; m, mucosa. H&E. Bar = 100 μ m.

in a substantial die-off of northern flickers (*Colaptes auratus*) in New Mexico during the winter of 1997 (J. Harden, pers. com.).

The black-backed woodpecker fatality reported here is only an anecdotal incident, but it has been suggested that helminth parasites might be capable of regulating bird populations in some cases.⁵ If *Procyrnea* nematodes occur frequently in black-backed woodpeckers, they could be a significant factor limiting population growth in this species of management concern.

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