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Cover Page Footnote

The Arkansas Game and Fish Commission and U.S. Fish and Wildlife Service provided Scientific Collecting Permits to CTM to salvage migratory birds, permit numbers 020520191 and MB84782C-0, respectively. We thank Drs. Scott L. Gardner and Gabor Racz (HWML) for expert curatorial assistance, Mike Kinsella (HelmWest Lab, Missoula, MT) for assisting in helminth identification and technical assistance, and staff of the Hochatown Rescue Center (Broken Bow, OK) for donating the owl.

Helminth Parasites of Eastern Screech Owl, *Megascops asio* (Aves: Strigiformes: Strigidae) from Arkansas

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Running Title: Helminth Parasites of *Megascops asio*

Abstract

The eastern screech owl (*Megascops asio*) is a small owl that is relatively common in eastern North America. Nothing is known of the parasites of this owl in Arkansas. Here, we document 3 helminths from a single injured *M. asio* that subsequently died and was donated by a rehabilitation center for parasitic examination. Found were 2 digenetic trematodes, *Brachylaima mcintoshi* and *Neodiplostomum americanum*, and a habronematid nematode, *Excisa excisiformis*. The former trematode represents a new host record for *M. asio*, and *B. mcintoshi* and *E. excisiformis* are reported from Arkansas for the first time.

Introduction

The eastern screech owl, *Megascops asio* (L., 1758) is a diminutive owl that occurs in eastern North America from southern Ontario, eastern Montana and the Great Lakes to the Gulf of México southward to Tamaulipas, northeastern México; in Arkansas, this owl is found statewide (Peterson 2002; Sibley 2016). This species is native to wooded environs of its distribution, and more so than any other owl in its range, has adapted well to urban development. Like many other owls, it feeds on insects and other arthropods, small mammals, birds, and other small vertebrates (König and Weick 2008).

Little is available on the parasites of *M. asio* (Kinsella *et al.* 2001; Richardson and Kinsella 2010; Woodyard *et al.* 2017; McAllister *et al.* 2019c) and nothing has been published on its parasites from Arkansas. Nevertheless, over the last few years, novel information on the parasites of owls has been gained by our research consortium from examination of salvaged road-killed specimens from Arkansas (McAllister *et al.* 2019a, 2019b) and Oklahoma (McAllister *et al.* 2017, 2018, 2019b, 2019c). In one of

these studies, McAllister *et al.* (2019c) reported a nematode, *Porrocaecum depressum* from *M. asio* from Oklahoma. Here, we document, for the first time, 3 helminth parasites in *M. asio* from Arkansas.

Materials and Methods

On 7 December 2019, a single adult *M. asio* that was found to be severely injured by unknown causation at an unspecified locale in Sevier County, Arkansas, was brought to the Hochatown Rescue Center in McCurtain County, Oklahoma (34°08'22.074"N, -94°44'47.328"W), for treatment. Unfortunately, the individual died soon thereafter and was donated to the senior author for parasitological examination. Its feathers were vigorously brushed over a white enamel tray to observe possible ectoparasites. A mid-ventral incision was made from the cloaca to throat to expose the viscera and the trachea, lungs, air sacs, esophagus, proventriculus, gizzard, gallbladder, liver, kidneys, and intestine were placed in individual Petri dishes containing 0.9% saline, opened, and their contents washed. Digestive contents, as well as the mucosal surfaces, were examined at 20 to 30× under a stereomicroscope and parasites found were rinsed of mucus. Feces from the rectum was collected and placed in a vial containing 2.5% (w/v) potassium dichromate (K₂Cr₂O₇) and, after flotation in Sheather's sugar solution (sp. gr. 1.30), examined for coccidians and parasite ova by brightfield microscopy. Trematodes were fixed without coverslip pressure in nearly boiling water and transferred to 95% (v/v) molecular grade ethanol. They were stained with acetocarmine, dehydrated in a graded ethanol series, cleared in methyl salicylate, and mounted in Canada balsam. Nematodes were fixed in near boiling water and preserved in 70% (v/v) ethanol. They were later cleared and identified as temporary mounts of lactophenol and then returned to the preservative.

The host voucher was deposited in the EOSC

vertebrate collection, Idabel, Oklahoma. Voucher specimens of parasites were deposited in the Harold W. Manter Laboratory of Parasitology (HWML), University of Nebraska, Lincoln, Nebraska.

Results and Discussion

Two digenean trematodes and a spirurid nematode were recovered from *M. asio*. The host did not possess ectoparasites nor were coccidians being passed in its feces. Data is presented below in annotated format.

TREMATODA: DIGenea: BRACHYLAMIDAE

***Brachylaima mcintoshii* Harkema, 1939.** – Two specimens (HWML 216252) were found in the small intestine of this host. *Brachylaima* is a large genus with well over 90 described species (Ubelaker and Dailey 1966). The terrestrial triheteroxenous life cycle includes 2 distinct or same species of land snail as first intermediate (with sporocysts) or second intermediate hosts, the latter which harbors unencysted metacercariae in their kidneys (Yamaguti 1975). Definitive hosts include humans, mice, various species of shrews, birds (especially owls) and reptiles. This digenean has been reported from barred owls (*Strix varia*) from Florida, North Carolina, Texas, and Virginia, and great horned owls, *Bubo virginianus* from Florida (Harkema 1939; Little and Hopkins 1975; Kinsella *et al.* 2001). We document *B. mcintoshii* in a screech owl and from Arkansas for the first time.

DIPLOSTOMIDAE

***Neodiplostomum americanum* Chandler and Rausch, 1947.** – Several specimens (HWML 216253) were found in the small intestine of the owl. This trematode was originally described from *B. virginianus* in Wisconsin (Chandler and Rausch 1947). It has also been reported previously from *M. asio* from Connecticut, Florida, and Mississippi (Kinsella *et al.* 2001; Richardson and Kinsella 2010; Woodyard *et al.* 2017), from *B. virginianus* from Arkansas (McAllister *et al.* 2019a) and Florida (Kinsella *et al.* 2001), and from *S. varia* from Florida (Kinsella *et al.* 2001). Other hosts include *Accipiter* spp., long-eared owl (*Asio otus*), burrowing owl (*Athene cunicularia*), *Buteo* spp., and *S. varia* from Connecticut, Florida, Louisiana, Mississippi, and Ontario, Canada (see Woodyard *et al.* 2017). In the life cycle of other *Neodiplostomum* spp., freshwater snails have been reported as first intermediate hosts (Chung *et al.* 2002) and amphibians have been implicated as second intermediate hosts (Pearson 1961). We report *N. americanum*, a relatively

common helminth of *M. asio*, from Arkansas for the second time.

NEMATODA: SPIRURIDA: HABRONEMATIDAE

***Excisa excisiformis* (Yamaguti, 1935).** – a single male specimen (HWML 111455) was taken from the small intestine of the owl. This species was described from *A. otus* in Japan by Yamaguti (1935). It was reported for the first time in North America (Florida) from *S. varia*, *B. virginianus*, and *M. asio* by Kinsella *et al.* (2001) and was considered by them to be a “raptor generalist.” It is a rare nematode of owls and Ferrer *et al.* (2004) and Santoro *et al.* (2012) include scops owls (*Otus scops*) from Spain, and *A. otus* from Italy, respectively, as hosts. This nematode has also been reported from the tawny frogmouth (*Podargus strigoides*) from North Queensland, Australia (Ogden 1967). Its life cycle is unknown but like other spirurid nematodes, may involve an arthropod intermediate host. It is reported from Arkansas for the first time, and more importantly, only the second locale documented from North America for *E. excisiformis*.

In conclusion, examination of road-killed or deceased hawks and owls have been shown to be noteworthy in studying their ecto- and endoparasites (see McAllister *et al.* 2017, 2018, 2019a, 2019b, 2019c; Woodyard *et al.* 2017). Future studies on rarely examined raptors in the state should provide additional new host and distributional records as well as the possibility of discovering novel parasite species.

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