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An Observation of Parasitism of Black Rat Snake (*Elaphe obsoleta*) Eggs by a Beetle (*Nicrophorous pustulatus*) in Illinois

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ABSTRACT

Parasitism of the eggs of black rat snakes (*Elaphe obsoleta*) by a burying beetle (*Nicrophorous pustulatus*) was recently reported in Ontario, Canada (Blouin-Demers and Weatherhead 2000). This relationship may be the first documented case of a vertebrate host of an insect parasitoid, and may be an important, previously unrecognized factor affecting reproductive success in oviparous snakes. We document a similar case of egg parasitism in Illinois, suggesting the relationship may be widespread and general within the range of *N. pustulatus*.

INTRODUCTION

Blouin-Demers and Weatherhead (2000) recently reported observations of the burying beetle, *N. pustulatus*, attacking eggs of black rat snakes in Ontario, Canada. These beetles bored holes into live snake eggs allowing access to developing embryos by beetle larvae, making this probably the first reported case of a vertebrate host of an insect parasitoid. Blouin-Demers and Weatherhead (2000) also noted that mortality factors affecting snake populations are often poorly known, and this relationship, if it proves to be general, could be an important, previously unknown factor affecting the reproductive success of oviparous snakes.

During a recent study of habitat use by snakes (Keller and Heske 2000), we made a similar observation on a clutch of black rat snake eggs in Illinois. Our observation is noteworthy because it suggests that the relationship noted by Blouin-Demers and Weatherhead (2000) may be widespread and deserving of additional study.

We collected a 122-cm long female *E. obsoleta* at the Middle Fork Fish and Wildlife Area, Vermilion County, Illinois, on 18 April 1998, implanted the snake with a radio transmitter at the University of Illinois, and then released it at the capture site on 20

April. The black rat snake was subsequently located in or near a pile of wood chips and trash from 15 June to 1 July. The chip pile was overhung by tree branches and shrubs on its west side so it was not exposed to direct sunlight. On 27 July, we carefully excavated the chip pile to gain data on clutch size and oviposition site for the black rat snake, beginning under a metal object where the snake had spent several days.

RESULTS AND DISCUSSION

An egg with a small (about 12-mm diameter) circular hole in the side was found 5 cm below the surface. The top three eggs of the rest of the clutch were found 10 cm below that. Each egg had a similar circular hole. Just below these eggs were four more, two with similar circular holes, one with the posterior of a large black beetle sticking out of a hole in the egg, and one with the posterior of a of a large white grub protruding from a hole in the egg. The eggs with holes were empty, and the holes appeared similar to those described by Blouin-Demers and Weatherhead (2000). Below these eggs were six more with no hole. The temperature was 26.1° C at the surface of the chip pile and 27.2° C at the uppermost egg. The intact eggs were taken to the laboratory and incubated on vermiculite in a ventilated container sitting in a water bath of 28.1° C. All intact eggs hatched young black rat snakes on 5 Sept. The beetle also was collected and determined to be *N. pustulatus* by J. Bouseman of the Illinois Natural History Survey. We did not collect the grub or further examine the eggs being consumed by the beetle and grub.

Nicrophorus pustulatus was previously known only from Champaign and McHenry counties in Illinois and is not considered common in the state (J. Bouseman, pers. comm.). Other members of the genus *Nicrophorus* are commonly called burying beetles for their habit of laying eggs on a small carcass that they then bury, and are noted for their complex brood-rearing behaviors (Scott 1998). Prior to the report of Blouin-Demers and Weatherhead (2000), the resource used by *N. pustulatus* for larval feeding was unknown. Apparently, adult *N. pustulatus* open holes in snake eggs to allow access by developing larvae, and for their own feeding (Blouin-Demers and Weatherhead 2000).

Blouin-Demers and Weatherhead (2000) suggested that *N. pustulatus* may be a significant cause of egg mortality for black rat snakes. They found up to 100% of otherwise viable eggs in a clutch destroyed by *N. pustulatus*. They also noted that only nests with multiple clutches suffered beetle attack in their study, and that the large mass of such multiple clutches could explain the high fecundity of *N. pustulatus*. The site of the nest we excavated at the MFFWA lends itself to annual use by multiple females, however, this possibility has not been investigated. Animal carcasses are distributed in an unpredictable and variable pattern, and are the limiting factor in the reproductive success of burying beetles (Ramel 1999). Consequently, beetles that can find and utilize clutches of snake eggs may have a reproductive advantage. The period when *N. pustulatus* reproduces (June-August, Ramel 1999) coincides with that given by Ernst and Barbour (1989) for nesting (May-July) and hatching (July -mid September) of black rat snakes. It is unknown at this time if *N. pustulatus* limits itself to the eggs of the genus *Elaphe*, or for that matter, serpents.

While *N. pustulatus* is considered rare in eastern North America (Anderson and Peck 1985), it may not prove to be rare in snake nests. More research is needed to determine if this small beetle plays a significant role in the population biology of certain reptiles.

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