

# The Box Turtle as a Host for Dipterous Parasites

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The occurrence of myiasis in the box turtle, *Terrapene carolina*, although briefly noted by several authors, is almost completely undocumented in herpetological literature. The entomological literature is correspondingly scanty, and consists of a few very short notes, which merely report the observation of the infestation of a single specimen, with the exception of Aldrich's "*Sarcophaga*" (1916), and the detailed study by Knipling (1937).

All of the earlier authors found the larvae only in the neck or nuchal region of the turtle. Aldrich quotes an ambiguous label on his holotype, stating that the specimens were from "larva bred in sore in side of box turtle," which might be considered the first report of the larvae attacking elsewhere than in the neck region. Packard (1882) was the first to report the occurrence, and pictured the larvae. Wheeler (1890) first successfully bred the larvae, but he refused to describe the species as new, after assigning it to the genus *Sarcophaga*. Emerton (1904) also bred larvae, but here again no attempt was made to determine the species of *Sarcophaga* represented. Kepner (1912) gives an extensive report on the larva, but published his work before one pupating larva could hatch. He also assigned his specimens to *Sarcophaga*, with no species designation. Aldrich (*loc. cit.*, p. 278) described the species for the first time, assigning it the name *Sarcophaga cistudinis*. This is the most detailed account of the adult fly available. Emerton reported a total of 5 larvae, from a swelling on the left side of the neck; Kepner found 4 larvae, all on the right side of the neck; Packard quoted Prof. J. W. P. Jenks in stating that eight or ten were found under the skin of the back of the neck, close to the shell; True (1884) found 13 "bot-flies" in the muscles on either side of the neck; Wheeler found eight larvae in a swelling on the neck, near the carapace; Babcock (in letter) states that he found the larvae in a lump on the underside of the neck; Cahn (1937) found larvae in the neck region of two turtles. The localities in which the turtles were collected were Long Island, New York; Middleboro, Massachusetts; Cape Cod, Massachusetts; Plainfield, New Jersey; and Windsor, Connecticut. Kepner's specimen was probably taken in Virginia. Cahn gives no locality, it is presumably Illinois. Babcock (1919) and Pope (1939) both state that the infestation occurs, with no further discussion.

Townsend (1917) states that *Sarcophaga cistudinis* (for which he erected the new genus *Cistudinomyia*) was a "true parasite confined to the box-turtle." Knipling's report, however, was based primarily on specimens of *S. cistudinis* from *Gopherus polyphemus*, the gopher turtle. He mentions a single specimen of *Terrapene* from Florida in which he found larval flies, presumably of

the species *T. carolina*, but of a different subspecies. He suggests that the flies seek an abrasion or weakness in the skin of the turtle for a point of larviposition, and that the most often used weakness is scar-tissue left due to attacks by the tick, *Amblyomma tuberculatum* Marx. Larvae penetrated the skin of a tortoise through undamaged skin in one of eight experimental attempts. It is unfortunate that additional information on the records of D. G. Hall (briefly mentioned by Knipling) has not been published. It appears that he has seen more cases of turtle infestation (about 35) than are found in the entire literature on the subject. He found that 25% of all turtles collected over a three year period in Georgia were infested. The species of turtles are not given. McMullen (1940) also based his findings on another species, the ornate box turtle (*Terrapene ornata*), taken in Oklahoma. He gives the first report of infestation elsewhere than in the neck region in the genus *Terrapene*. Five lesions were found, the most anterior on the neck, the most posterior at the junction of the skin and the eleventh marginal scute. Three lesions were posterior to the shell bridge. He found a total of 27 larvae in the five lesions, with a range of 1 to 18. Chidester (1915) reported the larva from the painted turtle (*Chrysemys picta*).

Two specimens of *Terrapene carolina* collected by me in 1940 were found to be heavily attacked by this insect larvae. The first turtle was taken September 6, 1940, about 2½ miles west of Greenup, Cumberland County, Illinois, in a swampy section of bottom land, buried in the mud of a small pond. This turtle had a small hole through the flesh immediately anterior to the hind legs on either side, both of which were clogged with suppurative matter. After removing this matter, I took 15 larvae from the hole on the right side, and 2 from the left. On September 14, I removed additional matter from the left side, and two more larvae. The hole on the right side was healing rapidly, and was almost closed. Signs of suppurative matter were observed at the same time on the second specimen, collected on August 9, 1940, ½ mile west of Greenup, Cumberland County, Illinois, but this specimen was left undisturbed in the hope that some of the larvae would metamorphose. This had not been observed by November 20, so the infestations were cleaned out. The holes were in almost exactly the same position as in the first specimen, about three mm. anterior to the hind leg insertion. The hole on the left side was so full of larvae they protruded through it, and 14 were removed. Six larvae were taken from the hole on the right side. This specimen had lost all control of its hind legs, and they were dragged limply along in locomotion. This specimen died on November 28, and was dissected. A third hole was found above and just behind the right hind leg. This hole contained 2 larvae, the left lower side had 2, and the right lower side none. The total larvae in the first specimen was 19, in the second 24.

The larvae had attacked the lymph glands and the cloaca of the dissected specimen. The cloaca was enlarged and contained extraneous tissue, grown to accommodate the parasites. The lymph glands had also expanded their tissue, and had formed a thick wall about the space occupied by the larvae. The larvae affect muscular and nervous control, as is seen by the turtle's inability

to use its limbs, and were quite possibly the cause of death. The first specimen died on April 9, 1941, and was dissected at the time. The left side still showed a small hole, the right side was completely healed, and only a trace of scar tissue remained. Thus, the turtles are capable of surviving an attack by this parasite if the larvae are removed, although a heavy infestation may cause death.

Since no imago were obtained, it cannot be safely ascertained that this is Aldrich's *Sarcophaga cistudinis*. If so, and I consider it probable, this constitutes a long extension of the known range, into central Illinois. It is interesting that this is the first time that the parasite has been found in the hind leg and anal region of this species of turtle, and that it is present in such numbers.

Six specimens of the larvae of this fly are now deposited in the collections of the University of Michigan, Museum of Zoology. Many thanks are due Dr. J. Speed Rogers, of this institution, for his kind assistance in the identification of the larvae.

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