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## Map Turtle Winter Leech Loads

T. E. Graham, R. A. Saumure\*, and B. Ericson, Biology Department, Worcester State College, Worcester, Massachusetts 01602; \*Department of Natural Resource Sciences, McGill University, Macdonald Campus, 2111 Lakeshore Road, Ste-Anne-de-Bellevue, Québec, Canada H9X 3V9

**ABSTRACT:** Adult common map turtles, *Graptemys geographica* (n = 243), were obtained in November 1995 from a hibernation site in the Lamoille River, Vermont. Of the 208 female turtles examined, 151 (72.6%) had at least 1 leech (*Placobdella parasitica*) attached and 10 of 35 males (28.6%) were similarly parasitized. Mean abundances were 1.49 (SD = 1.461, n = 208) for female turtles and 0.34 (SD = 0.591, n = 35) for males; the difference was significant ( $t = 4.558$ ,  $df = 241$ ,  $P < 0.001$ ). Leech broods were found on 34 of 208 female turtles (16.3%) and 2 of 35 males (5.7%). One of the leeches was of record size (77.7 mm total length); another specimen measuring 64.4 mm had 153 brood-sized ( $\bar{x} = 4.5$  mm) young attached to its venter. Because of poor visibility and partial ice cover, only 7 turtles were recovered in March 1996. All of these turtles had attached leeches, and 4 turtles had broods of 9–52 young ranging in length from 4.58 to 5.78 mm. One *Placobdella ornata* was found in the March sample. Our results suggest that leeches of various size classes remain attached to hibernating adult map turtles throughout the winter.

The genus *Placobdella* contains 50% of all North American leech species known from turtles. These haematophagous annelids are attracted by movement of their chelonian hosts (Mann, 1962). Leeches need only 1 blood meal/yr to survive but more for growth and reproduction (Sawyer, 1986). Feeding throughout the winter is not required; moreover, leech metabolism at prevailing winter temperatures is undoubtedly low (Mann, 1958). Hulse and Routman (1982) felt that brooding leeches in Pennsylvania attach to wood turtles, *Clemmys insculpta*, in the fall and pass the winter dormant on the host, thereby assuring themselves a continuous supply of food over winter. Whereas we agree that brooding leeches apparently attach to some turtle species in the fall, we suspect that they probably feed very little during hibernation. The advantage to the leech of already being on the host when temperature increases and feeding drive resumes in the spring is obvious.

The seasonal prevalence of leeches on freshwater turtles is poorly documented. Ernst (1971) found that *Placobdella parasitica* was absent from the painted turtle, *Chrysemys picta*, from October through February, but no turtle was examined from January to February, and only 7 were checked from October through December, so their apparent absence may have resulted from inadequate sampling. Koffler *et al.* (1978) found a high percentage of *P. parasitica* infestation on wood turtles

in New York and New Jersey in November and April. Their discovery of masses of juvenile leeches on hosts in the fall led them to conclude that leeches remain on *C. insculpta* during their aquatic hibernation period. The presence of *P. parasitica* on both the first and last Ontario snapping turtles (*Chelydra serpentina*) caught during the spring and summer suggested to Brooks *et al.* (1990) that *P. parasitica* may overwinter on *C. serpentina*, but their May–August sampling failed to provide any supportive data.

In an effort to quantify leech occurrence on common map turtles, *Graptemys geographica*, we used self-contained underwater breathing apparatus (SCUBA) to obtain 288 hibernating adults for examination on 11 November 1995 from the Lamoille River, Colchester, Chittenden County, Vermont. Turtles were hibernating in a trench at a depth of 7 m. Water temperature was 3 C and pH was 8.9. We measured and marked all 288 turtles; males ranged in carapace length (CL) from 98.9 to 167.9 mm ( $\bar{x} = 122.2$ ,  $SE = 1.671$ ,  $n = 57$ ), whereas females ranged in CL from 136.0 to 271.4 mm ( $\bar{x} = 222.9$ ,  $SE = 1.827$ ,  $n = 231$ ). We were able to examine only 243 turtles (208 females, 35 males) for leeches because of difficult working conditions. All animals were held in a vinyl-coated wire mesh pen in the river prior to processing and were released within 24 hr at the capture site. Our protocol for leech preparation followed Madill (1983). Leeches were relaxed in 10% ethanol and subsequently measured with dial calipers accurate to 0.1 mm.

Of the 208 female turtles examined, 151 (72.6%) had at least 1 leech (*P. parasitica*) and 10 of 35 male turtles (28.6%) were similarly parasitized. Mean leech abundance per female *Graptemys* ( $\bar{x} = 1.49$ ,  $SD = 1.46$ ,  $n = 208$ ) was significantly greater ( $t = 4.558$ ,  $df = 241$ ,  $P < 0.001$ ) than that of males ( $\bar{x} = 0.34$ ,  $SD = 0.59$ ,  $n = 35$ ). Clusters of young leeches were found on 34 of 208 female turtles (16.3%) and 2 of 35 males (5.7%). One leech (ROM IZI 4260) removed from an adult female turtle measured 77.7 mm and was of record length (Klemm, 1982). Another specimen (ROM IZI 4262; 64.4 mm long) had 153 brood-sized ( $\bar{x} = 4.5$  mm) young attached to its venter.

A second sample was taken at the same site at the end of winter (24 March 1996). Because of poor visibility, colder wa-

ter (1 C), and partial ice cover, only 7 map turtles (6 females, 1 male) were obtained. However, all 7 turtles had leeches attached, and 4 turtles had broods of 9–52 young ranging from 4.6 to 5.8 mm in length (ROM IZI 4263–4270). We also noted a single *Placobdella ornata* (ROM IZI 4271; 38 mm long) separated from its host in our holding bag. In contrast, all *P. parasitica* (n = 2 adults, 5 juveniles, and 131 brood-sized young) in this sample were firmly attached to their hosts. Saumure and Livingston (1994) reported both *P. ornata* and *P. parasitica* attached to *G. geographica* in Ontario but noted that only a *P. ornata* detached from its basking host. R. Saumure (unpubl. obs.) discovered a detached *P. ornata* (ROM IZI 4258) curled up on a wood turtle nest site in Québec. These isolated findings suggest that *P. ornata* has a much lower desiccation tolerance than *P. parasitica*, but this needs to be tested experimentally.

Sawyer (1972) stated that *P. parasitica* leave the host to become free living in late summer during mating, incubation, and brooding of young. He noted that brooding parents are rare on turtles. The fact that *P. parasitica* and *P. ornata* are associated only with stone and gravel substrata when free living (Sawyer, 1986) suggests that these parasites may avoid hypoxic conditions and, therefore, shun potential chelonian hosts that bury in mud substrates in winter. *Graptemys geographica* (Graham and Graham, 1992) and *C. insculpta* (Graham and Forsberg, 1991) are known to overwinter fully exposed (unburied) on the bottom of slow-moving rivers. Such microhabitats are relatively rich in dissolved oxygen and provide conditions for cutaneous uptake of oxygen by both turtles and their ectoparasites. The absence of *P. parasitica* from hibernating painted turtles reported by Ernst (1971) and from softshells (*Apalone spinifera spinifera*) in Vermont (T. Graham, unpubl. obs.) may result from the tendency of both species to bury in the substratum during the winter.

The significantly lower leech intensity of male *Graptemys* probably results from differences in turtle size (Dodd, 1988; Brooks *et al.*, 1990) and behavior. Female map turtles at our study site move less frequently and over shorter distances in late fall than do males (Graham and Graham, 1992). Pronounced sexual size dimorphism in this species may also make the highly mobile males more elusive targets for hungry leeches.

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## Marked Eosinophilia in Interleukin-5 Transgenic Mice Fails to Prevent *Trichinella spiralis* Infection

S. Hokibara, M. Takamoto\*, A. Tominaga†, K. Takatsu‡, and K. Sugane\*§, Department of Pediatrics, Shinshu University School of Medicine, 3-1-1 Asahi, Matsumoto 390, Japan; \*Department of Parasitology, Shinshu University School of Medicine, 3-1-1 Asahi, Matsumoto 390, Japan; †Department of Medical Biology, Kochi Medical School, Kohatsu, Okoh-cho, Nankoku 783, Japan; and ‡Department of Immunology, Institute of Medical Science, The University of Tokyo, 4-6-1 Shirokanedai, Minato-ku, Tokyo 108, Japan. §To whom correspondence should be addressed.

ABSTRACT: In order to study the role of eosinophils in the host defense against *Trichinella spiralis* infection, worm recovery after infection with *T. spiralis* was compared between interleukin-5 transgenic (IL-5 Tg) mice with a constant high level of peripheral eosinophils and non-

transgenic C3H/HeN mice. No significant difference in the recovery of muscle larvae or adult worms in the small intestine, fecundity of female adult worms, or infectivity of newborn larvae was observed between nonimmunized C3H/HeN and IL-5 Tg mice or C3H/HeN and IL-5 Tg