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MUSKRAT PREDATION ON SOFTSHELL TURTLES

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ABSTRACT

Partially eaten carapace and plastron sections of two eastern spiny softshell turtles, *Trionyx spiniferus spiniferus*, were recovered March 4, 1988 among discarded valves of freshwater mussels at a muskrat feeding station in the Little Pigeon River, Sevierville, Sevier County, Tennessee. This is the first evidence of muskrats feeding on these aquatic turtles.

INTRODUCTION

Literature dealing with the ecology and life history of the muskrat, *Ondatra zibethica*, is replete with data on the feeding habits of and foods consumed by this aquatic rodent, although the studies by Johnson (1925), Butler, (1940) and Errington (1961) are the most comprehensive. The bulk of foods eaten by muskrats is typically vegetable and, depending upon local habitat conditions, geographical location, and/or season of the year, any or all parts of a particular plant including roots, stems, bark, leaves and/or seed heads may be taken. Johnson (1925), in his major treatise on the muskrat in New York, lists 26 species of plants consumed, but indicates the list "...is unquestionably very incomplete even for the particular localities where they were found..." However, based on Johnson's study and others (e.g., Enders, 1932; Takos; 1947), the following plants are considered preferred food of this rodent: cattail, *Typha* spp.; arrowhead, *Sagittaria* spp., American lotus, *Nelumbo lutea*; dock, *Rumex* spp.; najas, *Najas* spp.; willow, *Salix* spp., water lily, *Nymphaea advena*; clover, *Trifolium* spp.; sedge, *Carex* spp., and bulrush, *Scirpus* spp.

Although considered vegetarian for the most part, muskrats are known to feed on a variety of both invertebrate and vertebrate species. Predation on animal species appears to depend upon their availability and abundance, and often season of the year, in relation to accessability of preferred plant foods. Schwartz and Schwartz (1959) state that "Muskrats dwelling in [Missouri] Ozark streams feed to a great extent upon freshwater clams. Snails, crayfish, fish, frogs, reptiles, young birds, and dead muskrats may also be taken." Doutt, et al. (1966) also noted that "Freshwater clams are eagerly searched out, expertly opened and devoured. Any dead animal, turtle, fish, or even another muskrat, will be eaten, or at least sampled." Turtles are one of the least often mentioned of the animal foods consumed by muskrats, and actual species identification of the turtles is rare. An extensive search of the literature failed to locate any reference to muskrats feeding on softshell turtles, *Trionyx* sp.

The most comprehensive regional life history studies of the muskrat have taken place in the upper Midwest (Errington, 1961) and in the Northeast (Johnson, 1925). In these and other works that enumerate the foods of this rodent, freshwater mussels are invariably recorded as the primary source of meat in their diet: e.g., Hall (1955), "Some animal matter is eaten; mussels are frequently consumed"; Webster, et al. (1985), "Muskrats also eat many kinds of field crops, and occasionally animal matter such as shellfish is consumed." However, it is in the northern latitudes, and particularly during the winter season, that animal matter appears to play a more important role in the subsistence of this rodent, possibly reflecting periods of unavailable or reduced amounts of preferred plant foods that may occur during the winter and early spring. On the other hand, Errington (1961) implies the use of animal foods may be an individualistic trait: "Some muskrats behave like congenital vegetarians; others show the 'meat tooth.' On the same tract of marsh at the same time, some muskrats eat dead or dying fishes or the bodies of dead or helpless young water birds or young muskrats, while other muskrats ignore this sort of material."

STUDY AREA

During a two year study (June, 1985–May, 1987) of the molluscan fauna of the Little Pigeon River, Sevier

County, Tennessee (Parmalee, 1988), collections were made at least once each month primarily in the Little Pigeon River and its major tributary, the West Prong Little Pigeon River. Populations of freshwater mussels, 11 endemic species and the Asiatic clam, *Corbicula fluminea*, occur primarily in stretches of both rivers that flow through the city of Sevierville. During periods of normal flow, depths in this area vary from ca. 0.2 to 1.0 m. Stretches of the rivers with sustained current provide suitable habitat for a varied aquatic macrofauna that includes, in addition to mollusks, fish (especially sunfishes, Centrarchidae; suckers, Castostomidae; minnows, Cyprinidae) and turtles (spiny softshell, *Trionyx spiniferus*; snapping turtle, *Chelydra serpentina*; stinkpot, *Sternotherus odoratus*; map turtle, *Graptemys geographica*).

Muskrats, as evidenced by their burrows in the river banks, droppings, and residue from their feeding activities (plant cuttings, shells), are common along the rivers and are a major predator of freshwater mussels in the Little Pigeon River system. During my two year study of the mussel fauna of this river, feeding stations used by muskrats provided the primary source of shells. Sand and gravel bars, isolated rocks and logs projecting above the water level, and piles of debris along the shore appear to have been favored feeding stations. Although the two year mussel survey ended in May, 1987, populations were monitored periodically for another year.

Results and Discussion

Remains of two partially eaten softshell turtles, *Trionyx spiniferus* (Figure 1), were recovered among discarded mussel valves at a muskrat feeding station on a gravel and sand island in the Little Pigeon River ca. 750 m downstream from Hwy. 66 bridge, Sevierville, on March 4, 1988. This represents the only evidence of predation by muskrats on a vertebrate encountered during the study—or in the last 15 years of collecting mussels in rivers throughout the Southeast. The Little Pigeon River was surveyed at this locality again March 17 and on April 2, 16, and 29, 1988, and although a muskrat continued to use the same feeding station and preyed upon mussels, no additional turtle remains were encountered. In all probability these juvenile softshell turtles were encountered on the river bottom, or when partially buried (hibernating?) in the substrate, by the muskrat while it was foraging for mussels. The cold water would make the turtles lethargic and thus more susceptible to capture than would be the case during warm months. It appears that these turtles were captured alive as their remains exhibited no signs of decomposition.

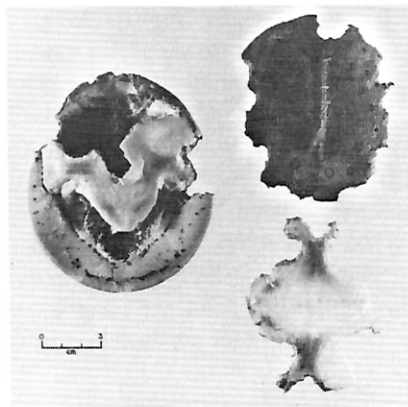

Figure 1. Carapace and plastron remains of two spiny softshell turtles, *Trionyx spiniferus*, recovered from a muskrat feeding station, Little Pigeon River, Sevierville, Tennessee.

Of the two softshell turtles found at a muskrat feeding station in the Little Pigeon River, only one was complete enough to obtain measurements of the carapace (length, 111.0 mm; width, 95.5 mm). In this specimen, the carapace and plastron were still held together by portions of the bridge; the head, tail, legs and most of the internal organs were missing and presumed eaten by the muskrat. Although the carapace was nearly intact, the anterior half and center of the plastron and a portion of the left bridge had been gnawed away (Figure 1). All that remained of the second individual, approximately the same size as the other with an estimated carapace length of ca. 100.0 mm, were the separated carapace and plastron sections that exhibited considerable gnawing around their margins.

Cory (1912) provides the following interesting quote from W.H. Dall (malacologist): "In 1863, I visited Kankakee, Illinois, on a collecting tour for river mollusks, in July. You know how the muskrats throw up mounds of the shells they dig out. I examined many of these for *Unios*, etc. On several I saw the skeletons of fish (chiefly suckers, I believe) partly or wholly denuded of their flesh, and showing the marks of muskrat (or at least rodent) teeth. I also saw the shell of a common mud turtle, so gnawed and in the same situation." Errington (1941) mentions muskrats inhabiting northwestern Iowa lakes feeding on the western painted turtle (*Chrysemys picta belli*). In a later general discussion on their food habits, Errington (1961) stated that "Sluggish mud turtles have tails and feet gnawed away from the edges of their shells, and the muskrats even open up the shells to eat of the soft parts within." The carnivorous tendencies of muskrats inhabiting a fish culture pond in north-central Oklahoma were reported by Glass (1952). Receding water levels exposed hibernating turtles, *Chrysemys scripta troosti*, that were subsequently dug out of the mud by raccoons (*Procyon lotor*). Although the raccoons would kill the turtles and in some instances eat the limbs and head, they were usually unable to eviscerate them. "Muskrats would find the carcasses, gnaw them open, and feed on the contents. The shells were completely cleaned and chewed

to varying extents." This account leaves no doubt that muskrats will feed on the flesh of dead turtles. However, turtles discovered by muskrats partially buried in the substratum or on the surface of a river bottom, particularly during cold months when they are lethargic, would be easy prey.

Because of the soft and leathery nature of the shell and easily accessable appendages, muskrats could conceivably find softshell turtles a desirable food resource. The discovery of remains of these two juvenile softshell turtles at a muskrat feeding station in the Little Pigeon River may represent a unique case of consumption of and probable predation on *Trionyx spiniferus*. This may have been an isolated instance by one opportunistic muskrat, but it does add one more item to the restricted list of reported vertebrate species consumed by muskrats.

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