The Constricting Habits of Lampropeltis (Kingsnakes) and Elaphe (Rat Snakes)

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The snake habit of constricting prey has received little attention by herpetologists. Most books containing chapters on feeding habits merely mention that constrictors wrap themselves around their prey and kill it by restricting its breathing.

The purpose of this study was to look for variations in constriction among species or subspecies of the genera *Lampropeltis* and *Elaphe*.

These genera were selected because of their availability and usual hardiness in captivity.

In order to control as many factors as possible, only domestic mice *(Mus musculus)* were used as prey. The mice were placed alive in the snakes' cages and actions of the snakes recorded.

Constriction is a three-step process involving seizing, winding, and actual constriction. In the first step, the snake simply grasps the prey with its teeth. In the second step, coils are applied by rotating the mouse around its long axis similar to winding a rope onto a windlass. For each 360° the windlass is turned, one more coil of rope is wrapped around it. Similarly, imagining the windlass to be the mouse and the rope to be the snake, for each 360° the mouse is rotated, one more coil is applied. In the process of winding, the coils are always applied in a vertical spiral. Near the end of this step, the animals may fall over so that the spiral lies horizontally. The final step, the actual constriction, involves no motion at all. The snake squeezes the mouse, without breaking or crushing bones, so that it is unable to breathe. This step requires anywhere from about 20 seconds to 4 minutes.

Several actions were constant in each snake's behavior. The first

act involved the direction of the ventrals (belly scutes) with relation to the snake's head. The ventrals are either directed forward toward the snake's head or backward. No snake was observed to constrict with the venter or dorsum directed straight toward the prey.

The habits of constriction were studied in *Lampropeltis getulus, L. calligaster, Elaphe obsoleta, E. guttata, E. vulpina,* and *Pituophis melanoleucus*. The various subspecies and numbers of each used are listed in Table I.

All kingsnakes tested constricted with the venter forward, whereas the rat snakes constricted with the venter backward. When all forms of *Lampropeltis* and *Elaphe* have been studied, a distinct generic difference in this respect may be demonstrated.

Another act was constant in the genera, but more or less as a side effect of venter direction. In the rat snake, the coils usually remain in a vertical spiral while the kingsnake usually falls over to a horizontal position because with vertical coils, it would have to rest on its back.

TABLE I. SNAKE TAXA USED

Taxa	No. of Specimens
Lampropeltis getulus getulus	2
L. g. niger	1
L. g. holbrooki	1
L. g. yumensis	1
L. g. californiae	1
L. calligaster calligaster	1
Elaphe obsoleta obsoleta	2
E. o. spiloides	1
E. o. quadrivittata	1
E. guttata guttata	1 hatchling
E. g. emoryi	1
E. vulpina	1
Pituophis melanoeucus sayi	2 hatchlings

Another act, not actually constant, but more of a tendency, concerns the spiral direction. Kingsnakes tend to prefer one direction over another. One specimen of *L. getulus getulus* applied clockwise coils five times in five feedings. In contrast, when two mice were placed in a cage with *E. vulpina,* one was constricted with clockwise coils and the other in counterclockwise fashion. No specimens of *E. obsoleta* showed preference for spiral direction. Data on the feeding behavior of *E. guttata* are insufficient to warrant a statement.

The last and partially constant act involves the method of winding. Two methods were observed: (1) the snake pulls the mouse back into his coils as he winds so that both snake and mouse end up in the snake's original position. (2) the snake throws his body toward the mouse as the mouse is rotated so that both snake and mouse end up in the mouse's original position. The kingsnakes tested used only method (2). *E.*

obsoleta used both methods, but the data were insufficient to show whether both methods are used by a given subspecies or individual. An arboreal snake that could pull the prey toward his own position would have the advantage of minimizing the chance of falling from a tree. *E. obsoleta* is commonly found in trees, and the presence of feathers in the feces of newly captured individuals shows that they do eat birds in the wild.

No act in feeding was constant enough to demonstrate a specific pattern.

One act varied among individuals of a subspecies. An individual of *L. g. getulus* consistently grasped mice by the rear end. If the mouse approached head first, the snake circled around behind it. Another individual of the same subspecies consistently took mice by the head.

Although most snakes applied as many coils as they possibly could, this was not always true.

The question arose as to why the previously described acts in feeding were constant from one individual to another. The kingsnakes and rat snakes at the Lincoln Park Zoo, Oklahoma City, had been fed dead food for periods of a year or more. Dead food was not constricted, but when live food was introduced, the snakes consistently constricted the prey. Evidently the habit of constriction was developed through natural selection as a behavior pattern.

It appeared in this study that very young snakes were not able to constrict. Three individuals were studied, one *E. guttata guttata,* and two of *Pituophis melanoleucus sayi.* The mice were eaten alive, the snakes making no attempt to kill them. According to Oliver (1955), the young of a species may have different feeding habits than the adults, making a greater total amount of food available to the population as a whole. Since the habits concerning what food is eaten are different, the habits concerning how food is eaten could also be different. As adult feeding habits develop, constricting habits may also develop.

Sometimes the snakes did not constrict, as when the food was dead. The second, and more interesting case, was that sometimes kingsnakes did not constrict reptilian food. If the prey was another snake, there was a good deal of intertwining, but this usually appeared to be an effort by the prey to keep from being eaten. One individual constricted other snakes, but this process required about two hours to kill the prey.

Often the pattern in which coils were looped about the prey was irregular, so that sometimes the snake and mouse formed what seemed a ball of total confusion. It appeared that the snakes had a perfect coiling pattern, but they could improvise, if the mouse took some sort of evasive action. In one *E. guttata emoryi* and several *L. getulus,* identical looping patterns were applied several times.

SUMMARY

It was found that kingsnakes constrict with the venter facing the head (forward) while in rat snakes the venter faced away from the head (backward). In rat snakes, the coils tended to stand in a vertical stack, while in kingsnakes the spiral lay on its side. Kingsnakes tended to prefer one spiral direction over another, while some rat snakes showed no preference. When kingsnakes applied coils, the snake's body was thrown around the mouse, while in rat snakes, the snake either threw his body around the mouse or pulled the mouse back to its own position. It was observed that very young snakes did not constrict.

LITERATURE CITED

Oliver, James A. 1955. *The Natural History of North American Amphibians and Reptiles.* Van Nostrand, Princeton, N. J.