Comparative Reproduction Studies of Colubrid Snakes

(Thamnophis sirtalis parietalis, Lampropeltis triangulum syispila)

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INTRODUCTION

According to Fitch (1970) snakes are known from all definable temperate zones and from a wide variety of surroundings, including dry deserts, forests and aquatic situations. The types of surroundings affect reproductive cycle regulated by humidity. The number of eggs or young in a clutch will vary according to environmental surroundings. If enough food is not available, a surviving clutch will be very small, but the survival rate will be high when an abundance of food is present. Reproductive cycles of snakes may be triggered by precipitation or length of daylight. In captivity, the environmental conditions may be altered by the removal of predators and control of light source, but some snakes will do well in captivity and will breed during their normal breeding season. Others will not do well because of the altered environment. Most snakes do not use the prolonged period of hibernation as a trigger for breeding, but inactivity during hibernation keeps them alive through the cold winter months.

Different types of breeding cycles are dependent on the length of time for the development from birth to maturity, the number of eggs or young per clutch, the interval between each clutch, the size of the parent snake and the size at birth of the young snakes. In most cases the smaller amount of young, the longer they will be at maturity. In some species the young will be one-half the size of the parent snake but they will have a shorter growth time to maturation. Some young snakes are one-fourth smaller than the parent snake. The majority of snakes will fall in this latter group of size of young. The relationship of size difference between young and parent is noticeable, but this relationship is affected by ecological factors and food habits. The abundance of food may let the snakes grow to their optimal size. Young snakes do not remain with their parents, but disperse at birth.

(1)
In most snakes the size of a clutch is seven. Most broods fall in the range of two to sixteen. The most productive genera are the giant boas and pythons. There are some snakes which produce a relatively small clutch of from one to four young. In each species there has been some variation in size and age of the production of young and old females is unnoticeable, but in some species there will be a significant difference.

This project involves comparative reproductive studies of colubrid snakes and requires data on the weight of eggs and young of colubrid snakes. The red milk snake (Lampropeltis triangulum eypspila) and the red-sided garter snake (Thamnophis sirtalis parietalis) were used in this study to compare reproductive modes. Much of the following information on these species is based on Collins (1974).

The preferred food of red milk snakes consists primarily of small lizards, other snakes and small mice. Food items are overpowered by constriction. The above food items are comparatively scarce, and when encountered may present a threat to red milk snakes. Thus this species may exhibit a comparatively high death rate during its predation activities.

Red-sided garter snakes feed primarily on earthworms, frogs, toads, salamanders and small fish. They overpower prey food by grabbing and swallowing it. Constriction is not employed. Potential prey items eaten by this species are abundant, and present little threat to survival.

In eastern Kansas, red milk snakes inhabit the rocky hill-sides of open woods or woodlands. They are fossorial and spend much time beneath ground or under rocks and logs. They are annually active from April to November. During hot summer months the red milk snake becomes nocturnal. Since they rarely prowl in the open, red milk snakes frequently take shelter under a sunwarmed rock, or log to maintain optimal body temperatures.
figure 1. Red-sided garter snake (Thamnophis sirtalis parietalis)

figure 2. Red milk snake (Lampropeltis triangulum syspila)
Red-sided garter snakes inhabit diverse habitats such as marshes, wet meadows, margins of ponds, woodland edge, flood plains and cultivated fields. They prefer moist situations. The red-sided snake is annually active from March to November. It tolerates a wider range of air temperature than the red milk snake, and will even emerge from hibernation on warm days in December and February. The red-sided garter snake is diurnal and has a home range of 22-25 acres, an activity area wider than that of the red milk snake.

The most common predators of the red-sided garter are the hawks, large snakes and small mammals, and predation pressure is apparently high in this species. The red milk snake has similar predators, but predation pressure comparatively lower due to its more secretive habits.

Red milk snakes apparently have low population density when compared to red-sided garter snakes. Red-sided garter snakes average more young per brood(approx.33) than red milk snakes which have fewer eggs per clutch(approx.7). Survival of the young is probably greater in red milk snakes because of lower population density.
Figure 3. (a-d) an egg-laying sequence of the female red milk snake with posterior side showing.

This was the original snake that my data came from.
MATERIALS and METHODS

I initially obtained living, gravid specimens from J.T.Collins (JTC) in cooperation with the Museum of Natural History at the University of Kansas. I visited the museum daily and recorded the weights of the speckled kingsnake and the western massasauga, a small rattle snake. I confined the snakes for weighing by using a cotton cloth bag as a container for each of the snakes while weighing. I then subtracted the weight of the bag from the weight of the snake, and in this way obtained proper comparative weights. I weighed daily with JTC assisting me when handling the rattle snake. The weights of the two different types of snakes showed significant difference and the day-by-day data indicated that there was great variability of weights in the two species initially selected for the project. I occasionally consulted with JTC when I encountered a particularly difficult logistical problem.

My project encountered problems because of the cool temperatures in the museum, the female snakes reabsorbed their developing eggs and young, and this part of my project was terminated. I consulted with George Pisani and Joseph T. Collins, and they gave me similar data on two other colubrid snake species. Their data were obtained from the red milk snake (Lampropeltis triangulum syspila) and the red-sided garter snake (Thamnophis sirtalis parietalis) two snakes common in northeastern Kansas.
figure 4. The geographical area in the United States of the red milk snake.
figure 5. The geographical area in the United States of the red-sided garter snake.
RESULTS

Comparative results on red-sided garter snakes and red milk snakes gave insights into egg-laying modes and live bearing modes or reproduction in snakes.

Adult lengths of the two species compared were not uniform; the red-sided garter snake was 1125mm total length (TL) and the red milk snake was 630mm TL. The red-sided garter snake weighed 437.7 grams before birth and weighed 331.1 grams after birth, and the red milk snake weighed 61.1 grams before birth and weighed 33.1 grams after birth.

The brood of the red-sided garter snake consisted of 33 young and they averaged 2.33 grams per young. The red milk snake used in this study laid 7 eggs and the average weight of each young was 3.2 grams. The length of the red-sided garter snake young, averaged 213mm, and the length of the red milk snake young averaged 223mm. The individual eggs averaged 3.8 grams in weight.
figure 6. The weights of the red-sided garter and red milk snake females before birth (b.b.) and after birth (a.b.)

figure 7. The average lengths of the red-sided garter snake and red milk snake young.
CONCLUSIONS

After birth the amount of body weight loss was 25\% (331.1 grams) in the red-sided garter snake. The red milk snake laid 7 eggs, and comparative weight loss after birth was 45\%(33.9 grams).

When comparing the brood of the red-sided garter snake which averaged 2.33 grams per young in weight, and the red milk snake egg-clutch which averaged 3.8 grams in weight, there was a difference of 1.47 grams.

Then comparing the young of the red-sided garter snake that averaged 2.33 grams in weight to the red milk snake young that averaged 3.2 grams in weight, difference was .87 grams. There wasn't a significant difference between the average lengths of the red-sided garter snake and the red milk snake.
DISCUSSION

The red milk snake showed a greater amount of weight loss than the red-sided garter snake which is shown in the conclusions and charts. Questions that come to mind are 1) What type of factors will influence the large amount of weight loss in the red milk snake versus red-sided garter snakes, and 2) What influence do these factors have in the development of two distinct reproductive modes. Referring to an earlier part of my report, I find factors that interact with each other and have an influence on weight loss and show reasons for developing two distinct reproductive modes. There may be other factors, but that would involve extensive research.

The factors I consider most significant are predation, food, activity, and habitat of the two species of snakes. Food and predation interact with each other. Food is scarce for the red milk snake but when encountered it can present a threat to the red milk snake. There is a high death rate during this predation activity. Since food is scarce, the red milk snake may lose weight, grow weak, and not be able to defend itself.

The activity-habitat factor involves seasonal activity from April to November, and although the red milk snake is rarely active above ground, it can travel great distances by night to find food. The red milk snake is nearly always under shelter, to regulate body temperature and for protection from predators.

Red milk snake young weigh much more at birth than the red-sided garter snake young, and this means that the young red milk snakes are better adapted when born than the red-sided garter snake.

The reason for this better adaptation is because of having an egg in which to grow, and having a fewer number of young, therefore larger eggs are able to be formed and laid for the red milk snake. This largeness will be to the advantage to the
young red milk snake so that predators will not be so tempted to attack. Also the young red milk snakes are able to catch prey such as toads, salamanders etc. without too much problems, again because of their larger size.
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LITERATURE CITED

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