NORTHERN ILLINOIS UNIVERSITY

THE IMPORTANCE OF PRE- AND POSTNATAL THERMAL CONDITIONS IN DETERMINING GROWTH TRAJECTORIES IN THREE VIVIPAROUS GRASSLAND SNAKES

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ABSTRACT

In many reptile species, the onset of reproductive maturity is determined by size rather than age. Rapid growth during the first year may therefore promote population growth by shortening generation time and increasing the probability of survival to reproduction. Patterns of neonatal growth were observed over five years in three sympatric grassland snakes at Potawatomi Woods in Northern Illinois. Growth of Dekay's Brownsnakes (*Storeria dekayi*), Red-bellied Snakes (*S. occipitomaculata*) and Common Gartersnakes (*Thamnophis sirtalis*) varied in parallel among years such that neonates achieved 20-44% greater SVL in warmer years (mean April 1 thru September 30 temperature) than in cooler years ($F_{1,10} = 45.29$, $P < 0.001$). Variation in expected SVL on October 1 was better explained by mean April-May temperatures (partial $\eta^2 = 0.77$) than by June-July (partial $\eta^2 = 0.49$) or August-September temperatures (partial $\eta^2 = 0.48$), despite the fact that year-to-year variation in mean temperature was greatest for June-July (range in mean temperature among years = 4.1 °C vs. 3.2 °C for April-May and 1.8 °C for August-September). I interpret this result as evidence of the greater importance of environmental temperature on timing of ovulation (during April-May) than on embryonic development (during June-July), possibly because females can transcend year-to-year variation in temperature during gestation through behavioral thermoregulation. To test this, I conducted an enclosure experiment in which thermoregulatory opportunities were manipulated. Individual enclosures were used to house 25 wild-caught gravid *S. dekayi* females divided among two temperature treatments. Females with greater opportunities to thermoregulate (Sun treatment) had parturition dates significantly earlier than females with restricted opportunities to thermoregulate (Shade treatment) ($F_{1,14} = 25.22$, $P < 0.001$). Together, field and experimental data suggest that females may be able to behaviorally compensate for lower temperatures during gestation, whereas lower

temperatures in spring (April-May) may delay ovulation, resulting in smaller neonates by October 1 and potentially reducing population growth rates