

## Western Ecological Research Center

# Publication Brief for Resource Managers

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## Giant Gartersnake Body Condition and Growth

Understanding temporal patterns in the body condition of reptile species can provide valuable information on mass:energy allocation during different seasons. These data can also promote management of prey resources appropriate for the conservation of reptiles. USGS scientists Peter Coates, Glenn Wylie, Brian Halstead, and Michael Casazza evaluated seasonal patterns of variation in body condition and growth rate of the giant gartersnake (*Thamnophis gigas*). Their study has been published in *The Journal of Zoology*.

The giant gartersnake is the largest and most aquatic of the gartersnakes. It is endemic to the Central Valley of California, and is listed as threatened at the state and

### Management Implications:

- Capture-mark-recapture studies of the giant gartersnake revealed that temporal patterns in body condition and growth rate of males and females differ dramatically.
- Because male giant gartersnakes allocate their time and stored energy to mating in the early spring, management that supports a large, diverse prey base of fish and amphibians in late spring and early summer is likely critical for males to recover their body condition and grow.
- Ensuring a large prey base in the late summer and early fall will enable females to recover from birth and prepare to support a litter the following year, and allows males to store enough energy to get through hibernation and the early spring mating season.



Giant gartersnake. Photo © by Carly Broaddus, used with permission.

federal levels because of extensive anthropogenic loss of its emergent wetland habitat. The current distribution of the giant gartersnake is limited primarily to remnant wetlands, rice agriculture, and canals associated with rice agriculture that provide emergent aquatic habitat during the active season (primarily April – September).

Eleven years of capture-mark-recapture studies from four major sites in the Central Valley demonstrated dynamic changes in body condition of the giant gartersnake. Temporal patterns in body condition varied drastically between the sexes. In particular, male body condition rapidly declined in the spring emergence and mating period, while female body condition slightly increased. Female condition continued to gradually increase until late summer, when it reached a plateau. In males, however, condition began to rapidly increase after breeding until late September, when both sexes

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exhibited similar body condition. During hibernation, male body condition decreased more rapidly than female body condition. These temporal patterns in body condition are closely related to different demands of reproduction upon each sex. In early spring, males use stored energy to search for, court, and copulate with females; their rapid decline in body condition is a consequence of their allocation of time to mate searching and mating, rather than feeding. Females, in contrast to males, likely conserve energy and forage at this time to store enough energy to support embryonic development. At the conclusion of the mating season, males begin to forage and rapidly regain body condition lost during hibernation and mating. Females also continue to increase in condition until they give birth, but they apparently are able to regain energy allocated to embryos quickly after birthing and prior to hibernation. Males likely lose more body condition than females during hibernation because they maintain relatively greater body temperatures, which might allow them to emerge from hibernation earlier to search for mates. This strategy, however, has energetic costs evidenced by the greater decrease of male condition during hibernation.

Growth rates of the giant gartersnake were most strongly influenced by snake length. Longer snakes grew more slowly than shorter snakes, regardless of

sex. Although overall growth rates did not differ between the sexes, after controlling for snake length male growth rates were significantly less than female growth rates during the mating period. Male snakes therefore not only forego foraging during the mating period, but allocate their use of stored energy to mating activity, rather than growth. Whether this strategy entails greater mortality of males awaits further study.

Temporal patterns in body condition and growth rate of the giant gartersnake reveal behavioral patterns important to consider when managing foraging habitat where the giant gartersnake is found. For example, ensuring an adequate prey base during late spring and early summer might be critical for survival of males after the mating season. Late summer and early fall prey resources might be particularly critical for both sexes of the giant gartersnake as females recover from giving birth and prepare for the next year's reproduction, and males store enough fat to last through an energetically expensive hibernation and mating period.

*Coates, P.S., G. D. Wylie, B.J. Halstead and M.L. Casazza. 2009. Using time-dependent models to investigate body condition and growth rate of the giant gartersnake. Journal of Zoology 279(3):185-293.*

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