Chapter 52

Evolutionary Aside 52.1--Adaptive Benefit of Temperature-Sensitive Sex Determination

Temperature-sensitive sex determination (TSD) could be adaptive in a number of ways. For example, in some cases it might be better for a female to produce sons rather than daughters (or vice versa). Suppose, for example, there was a shortage of males in a population. Then, on average, each male would be a parent of more offspring than each female (because each offspring must have a mother and a father), and hence the female would be better off producing sons. As another possibility, it might be that the condition of a female affected the quality of its young: females in good shape might produce offspring that grew up to be robust, strong individuals, whereas females in poor shape might produce offspring that remained stunted through life. Imagine as well that only the best fit males were able to hold territories and reproduce, whereas most females were able to join a male's territory and bear young. In this case, a female in good shape would be better off producing a son, because very healthy males are likely to produce more offspring than very healthy females.

The bottom line is that there are many scenarios in which a female might be better off producing a male than a female, or vice versa. If the temperature at which an egg developed affected the resulting sex, and if females were able to place eggs in different thermal environments, then selection might favor females to lay eggs in places in which they would result in offspring of the appropriate sex.

Another way in which TSD might be adaptive is if the quality of the offspring was affected by temperature. Imagine that eggs laid in cool places produce poor-quality offspring, whereas eggs in warmer spots produce high-quality offspring. Just as in the previous example, it would be adaptive—at least in species in which males are highly territorial—for cool nests to produce females and warm nest to produce males.

So, in theory, it is possible that TSD could evolve adaptively. However, scientists currently have very few case studies actually demonstrating that this has happened.