GECKODAILY CLASSROOM RESOURCES · RESEARCH SPOTLIGHT

Research Spotlight: Temperature and Sex in an Ancient Gecko Lineage

Why does the temperature of a rock matter more than genetics for a baby leopard gecko's sex?

In most vertebrates you learned about in class, sex is set at fertilisation by chromosomes - XY in humans, ZW in birds. Leopard geckos work differently. There are no distinct sex chromosomes at all. Instead, the temperature at which a female incubates her eggs - buried in sand or soil, not tended after laying - determines whether hatchlings develop testes or ovaries. This is temperature-dependent sex determination, or TSD.

Researchers studying Eublepharidae (the family that includes leopard and African fat-tailed geckos) have found that eggs incubated in the mid-80s Fahrenheit (around 29-31°C) tend to produce a mix of both sexes, while eggs at the warmer end of the viable range skew toward more males. The exact mechanism is still an active area of research, but it appears to involve temperature-sensitive gene expression during a critical window early in development, rather than any chromosome being switched on or off.

This matters beyond gecko biology. TSD appears across many reptile groups - most turtles, all crocodilians, and some lizards - but the specific temperature thresholds, and even which temperature favours which sex, vary by lineage. In some turtles, warmer eggs produce more females; in leopard geckos, warmer eggs tend to produce more males. Comparing systems like this is one way biologists study how the same broad strategy (letting environment set sex) can evolve different specific rules in different groups.

It also raises a real conservation question for TSD species generally: if incubation environments shift - because of climate change, habitat loss, or altered nesting sites - population sex ratios can shift too, sometimes with no obvious warning sign until a population's breeding structure is already skewed.

Why it matters in class

TSD is a clean, concrete example of gene-environment interaction that doesn't require advanced genetics to understand, making it a useful entry point before covering more complex chromosomal systems.

Discuss

If you incubated an entire clutch of leopard gecko eggs at a single constant temperature, would you expect all the hatchlings to be the same sex? What variable would you need to control for in an experiment testing this?

Sources: IUCN Red List; Wikipedia (Leopard gecko, Temperature-dependent sex determination); Animal Diversity Web.