A Recent Advance in Reptile Ecology

Discovering Effects of Incubation Temperature & Divining Their Meaning

Reptiles are Ectotherms

- Thermoregulating critical to fitness
- Thermal conditions during incubation/gestation critical too

Influence of Incubation Temperature

- Physiology:
  - Gestation time
    - Higher temperatures = faster gestation
  - Yolk conversion
    - Higher temperatures = lower yolk use
  - Survival
    - No pattern

Relationship between thermal opportunity & incubation period (oviparous)

Andrews, Mathies, Warner. 2000, Herp Monogr

Relationship between thermal opportunity & gestation period (live bearer)

Schwarzkopf, Shine. 1991, Oecologia

Influence of Incubation Temperature

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Influence of Incubation Temperature

- **Morphology**
  - **Body length**: High temperature often smaller
  - **Mass & condition**: High temperature often lighter
  - **Limb & tail length**: High temperature often shorter

Relationship between incubation temperature & size & shape (oviparous)


My Experiment

- **Sydney Mothers**
  - Cool conditions 6hr, 17°C
  - Warm conditions 10hr, 22°C
- **Townsville Mothers**
  - Cool conditions
  - Warm conditions


Relationship between incubation temperature & size & shape (viviparous)


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Relationship between incubation temperature & size & shape (viviparous)

Influence of Incubation Temperature
- Performance
  - Running speed
  - Activity
  - Thermoregulation
  - Post-hatching growth rate

Post-hatching Growth Rate

Caley, Schwarzkopf 2004. Evolution

Influence of Temperature
- Behaviour
  - Predator escape
  - Sexual display
  - Aggression

Influence of Temperature
- Gender
  - Partial or complete sex determination

Interaction between TSD & other effects
- Which came first: TSD or Temperature Dependent Incubation Effects?
- Incubation effects occur in both TSD & GSD species - may drive evolution of TSD

Importance
- How long do TDIE last?
- Are they evolutionarily important?
  - Evidence both ways
- How relevant are artificial incubation conditions?
  - Sometimes similar to “natural”
Conclusions

- There are a staggering number of TDIE
- They vary in whether their effects are universal - which are universal and why?
- How important are "natural" versus "artificial" incubation conditions?
- Relationship between TDIE & TSD needs closer examination - which drives which?
- More evidence for evolutionary importance - fitness effects, intergenerational effects