

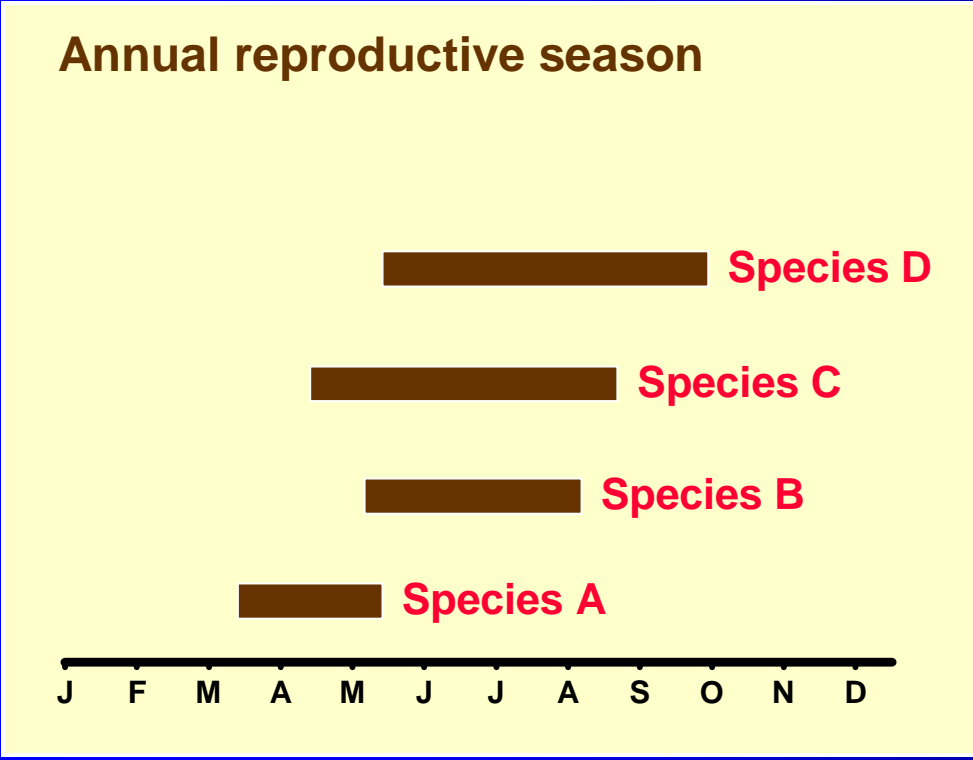
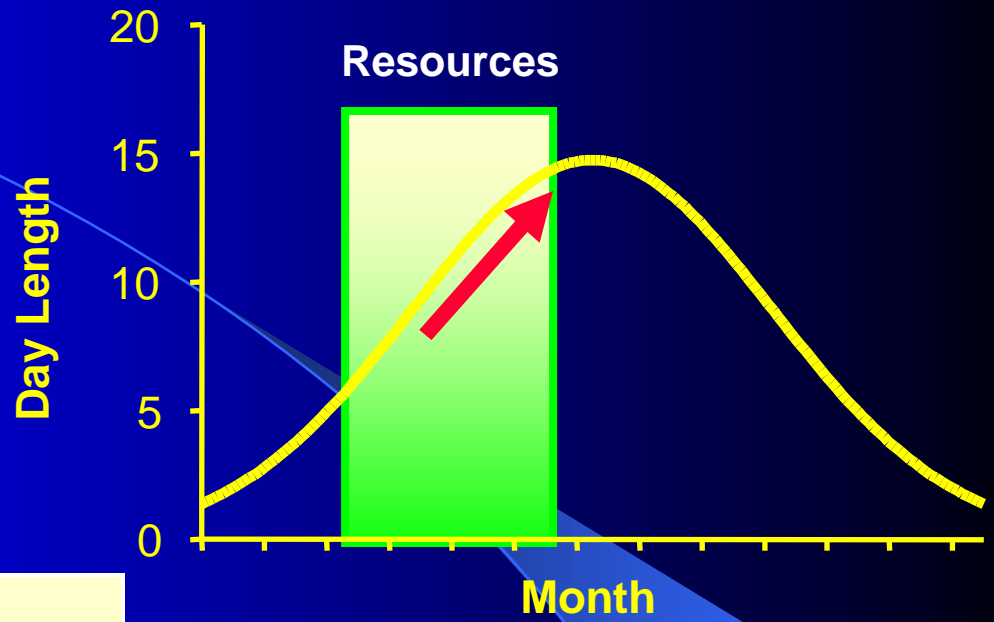


**Pierre Deviche
School of Life Sciences
Arizona State University**

**Avian reproductive flexibility in the Sonoran
Desert: What studies at the SRER have (or
not) taught us...**



RISE, Tucson, 11 Oct. 2008



Temperate regions





Light

GnRH: Gonadotropin-releasing hormone
LH: Luteinizing hormone
FSH: Follicle-stimulating hormone

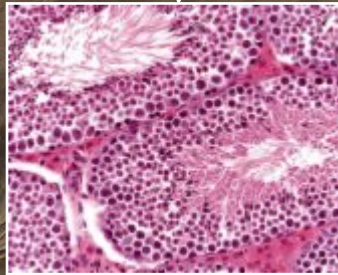
Hypothalamus

GnRH

Pituitary gland

LH, FSH

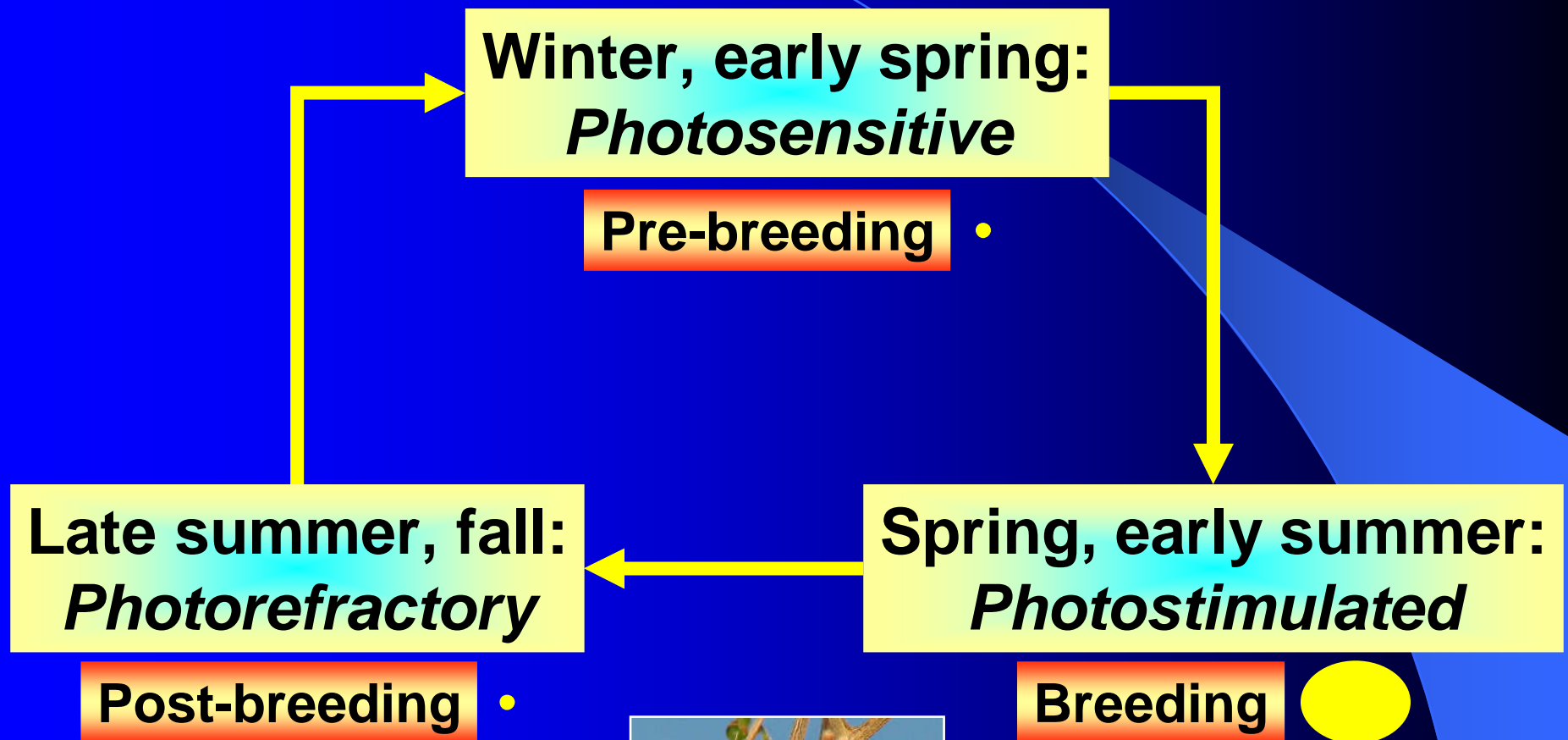
**Gonads
(testes, ovaries)**

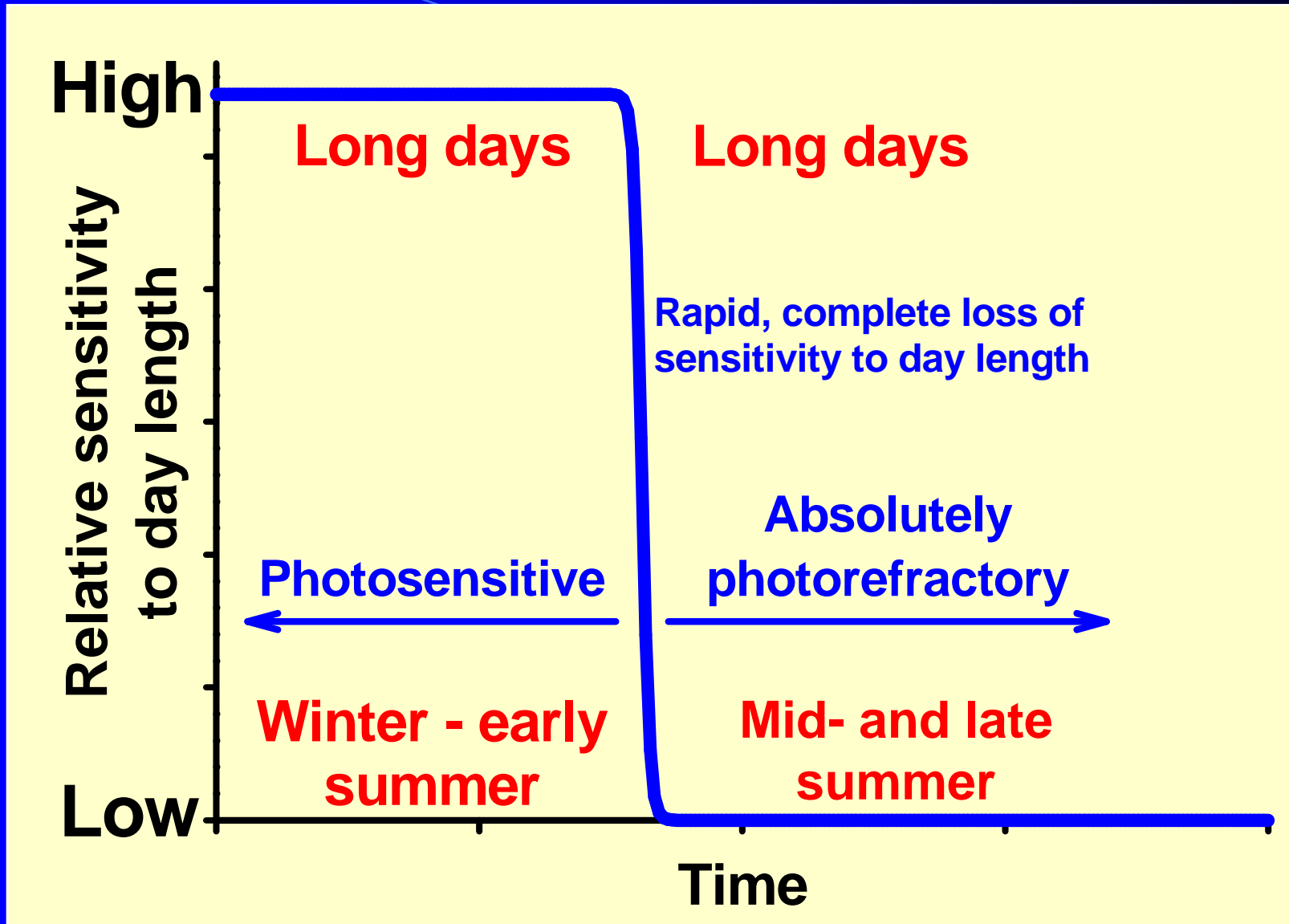


**Reproductive
Hormones
+ Gametes**

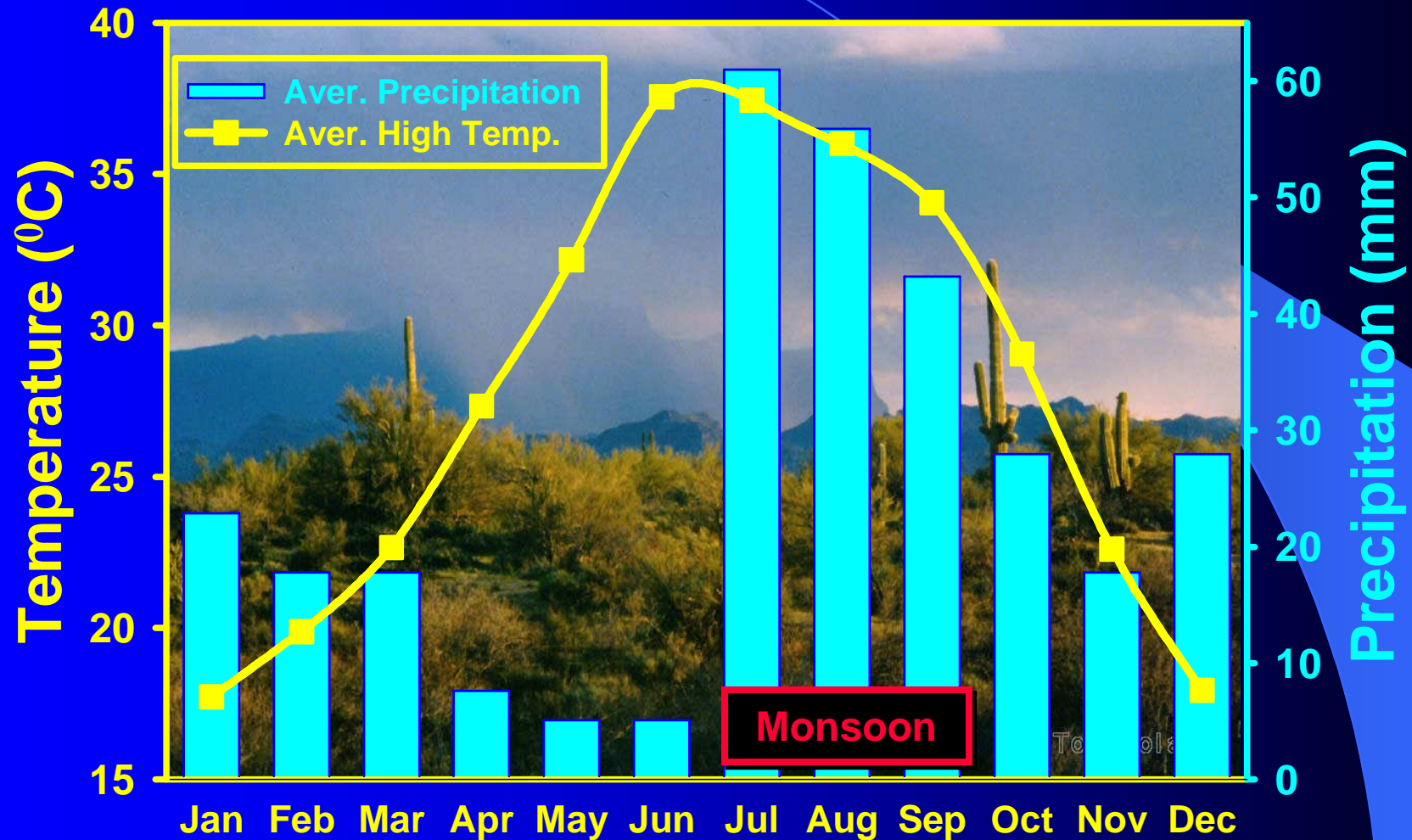
**Testosterone, estradiol,
Sperm, ova**

Annual Cycle – Temperate Region Birds

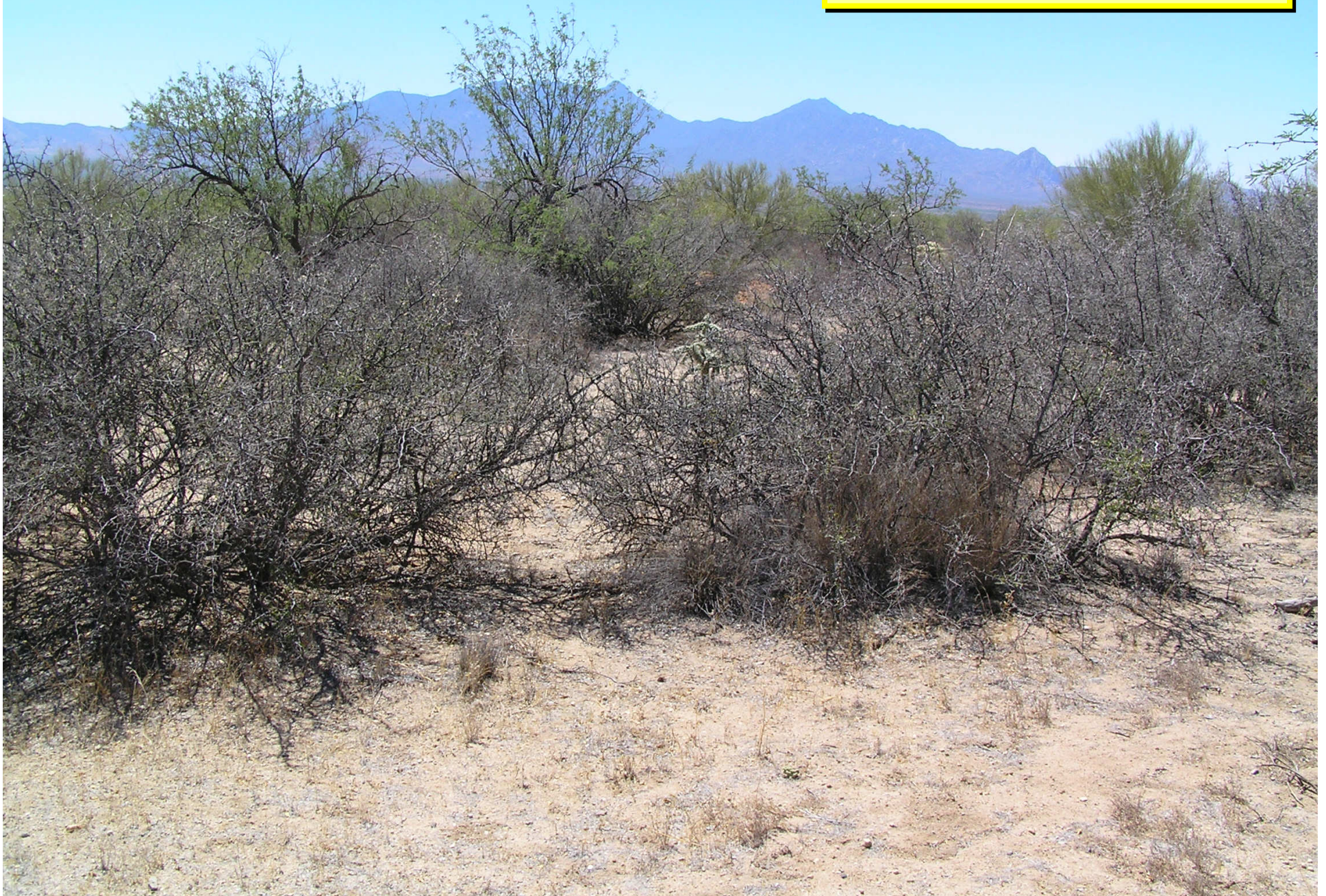




Sonoran desert: Average precipitation and temperature (Tucson, AZ)



Pre-monsoon (mid-June)



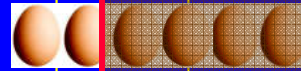
Monsoon (August)



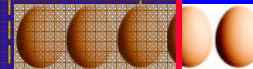
Peak egg dates of *Aimophila* sparrows

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

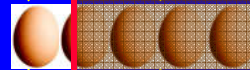
Rufous-winged



Cassin's



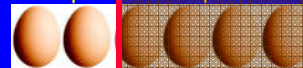
Five-striped

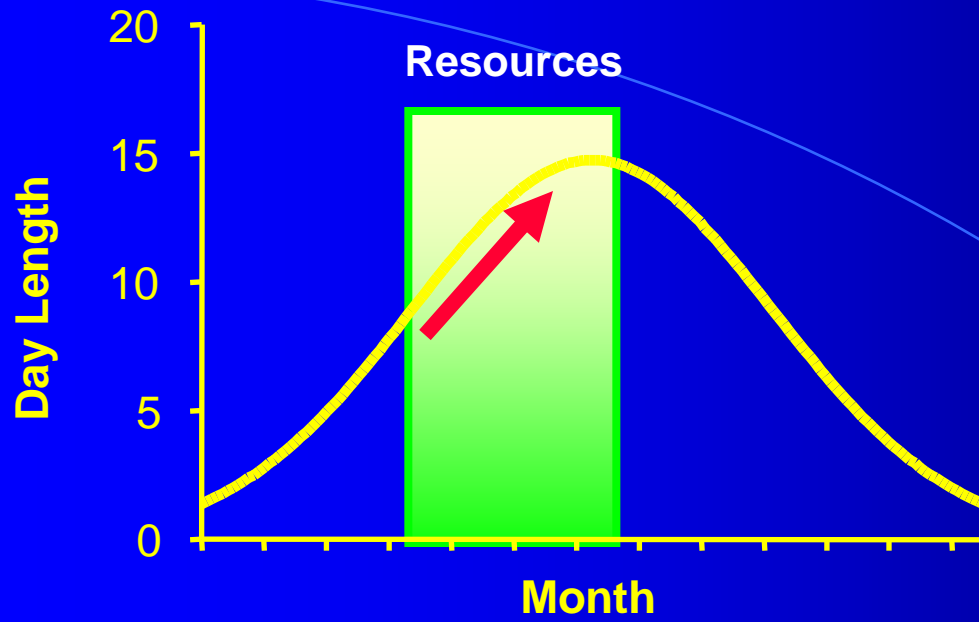


Rufous-crowned



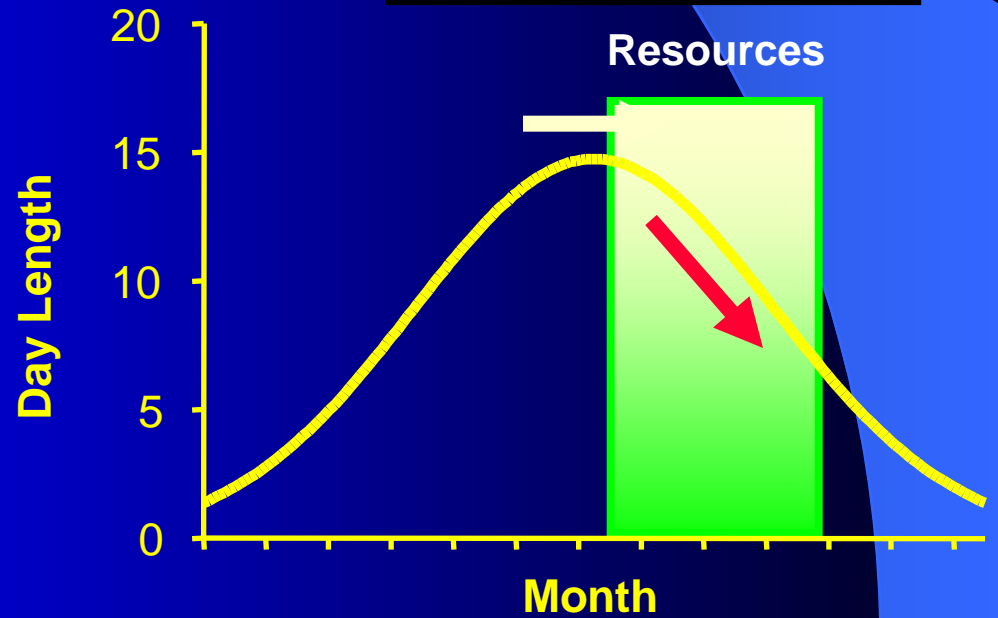
Botteri's





Temperate regions

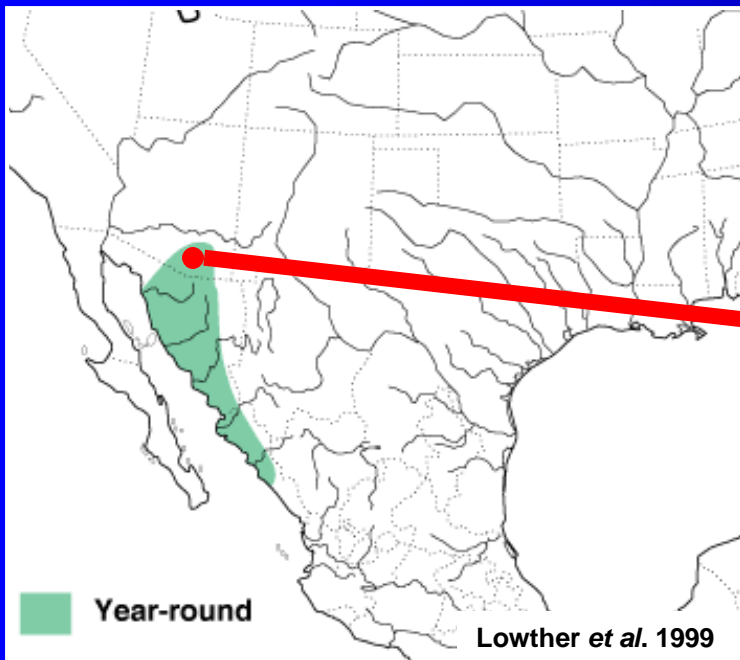
Sonoran Desert



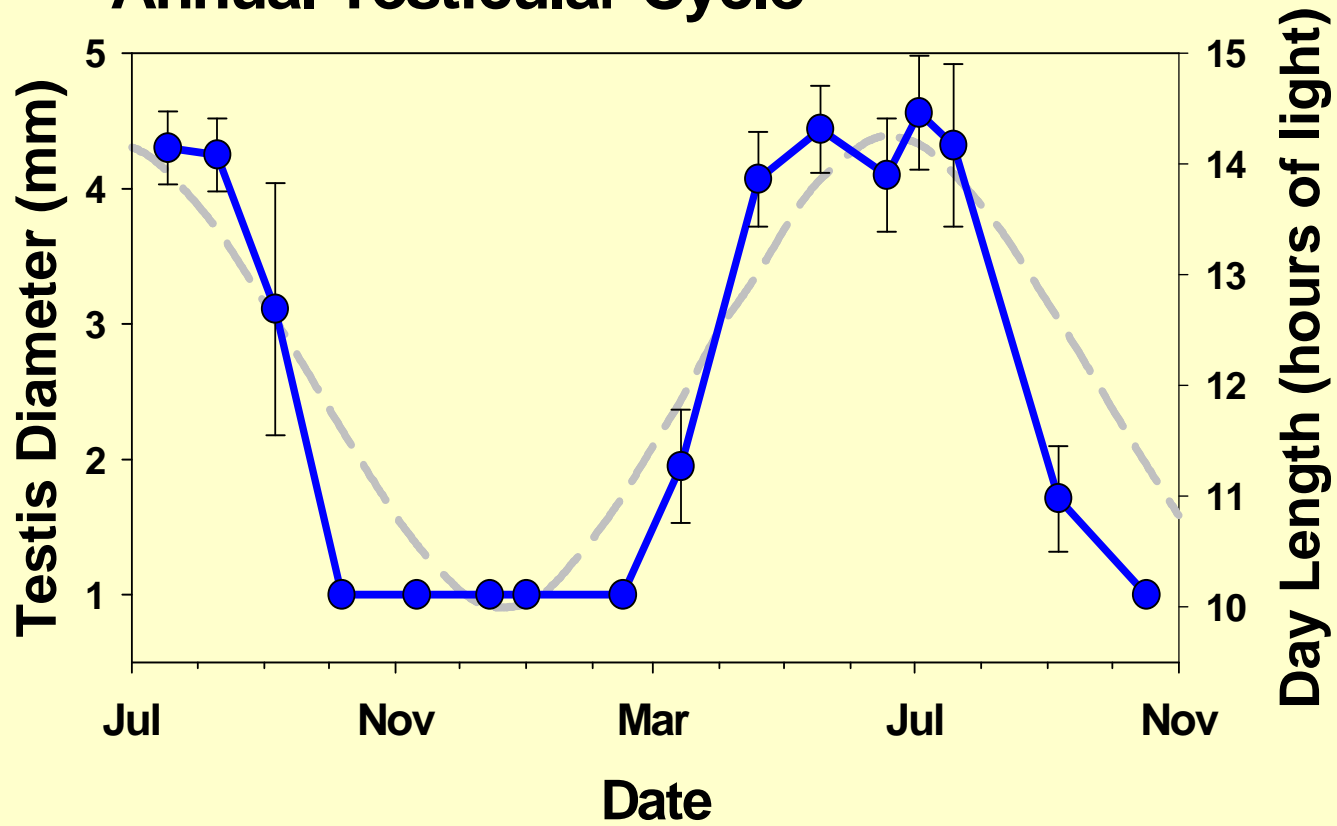


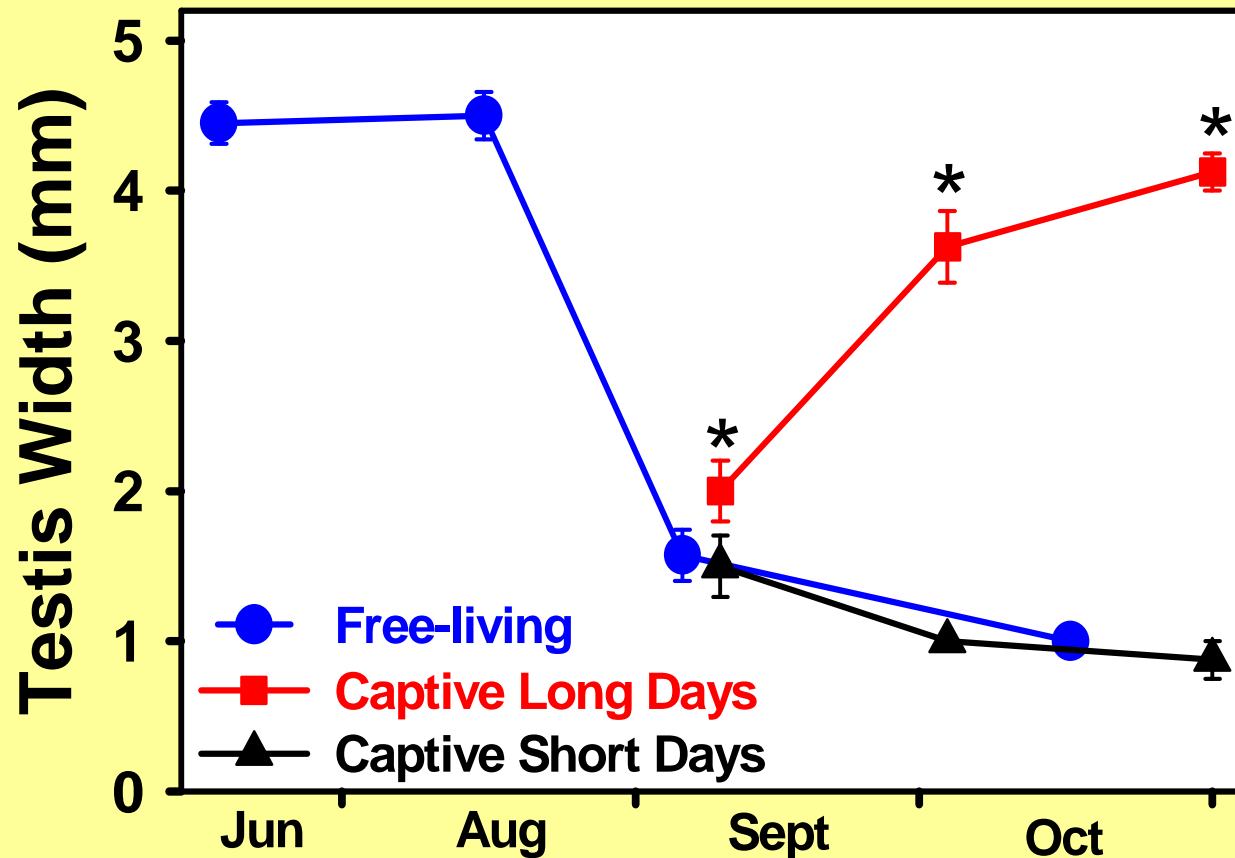
Rufous-winged Sparrow
Aimophila carpalis

- **Sonoran Desert endemic**
- **Sedentary**
- **Socially monogamous**
- **Paired and territorial year-round**
- **Dry open scrubland specialist**



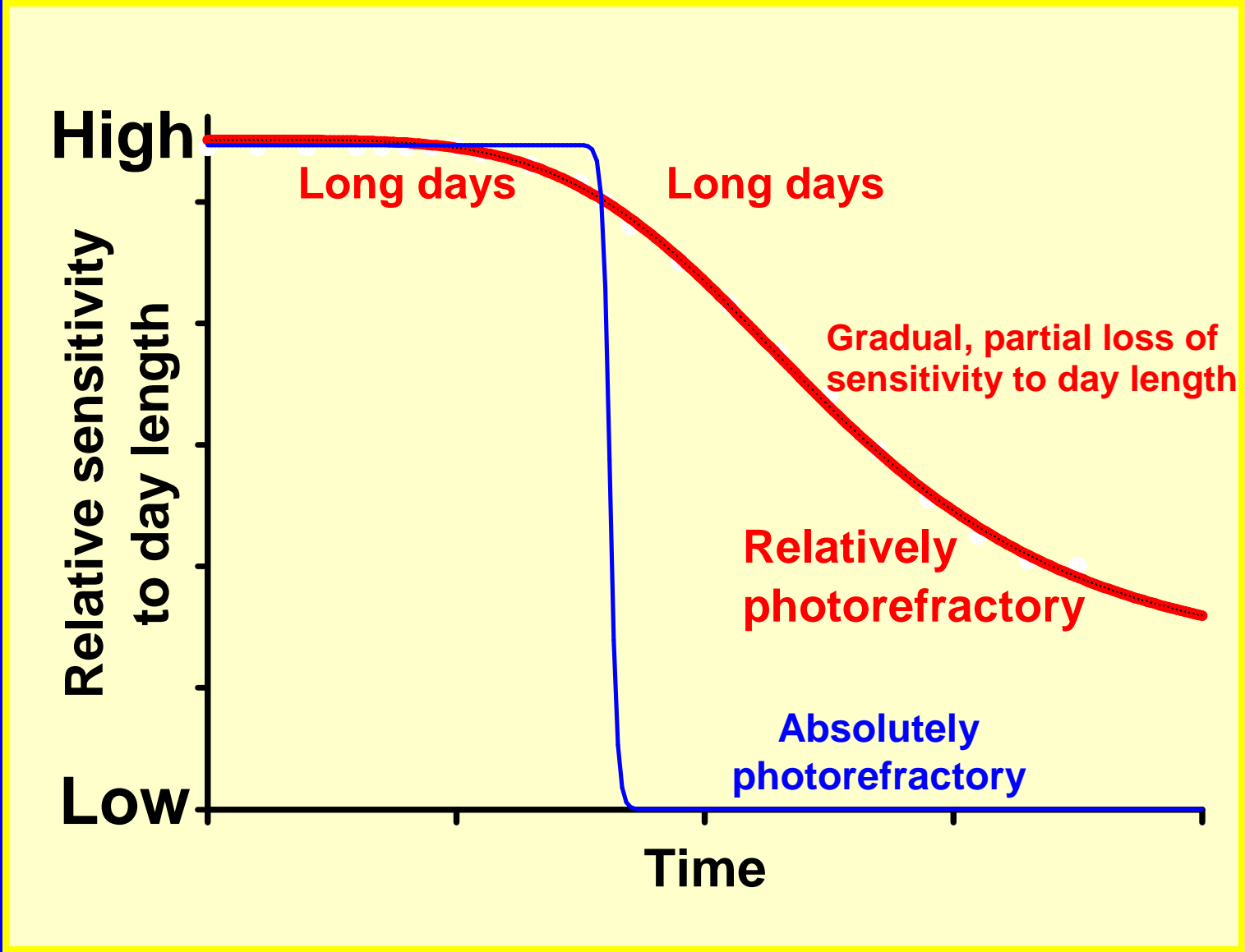
Rufous-winged Sparrow Annual Testicular Cycle

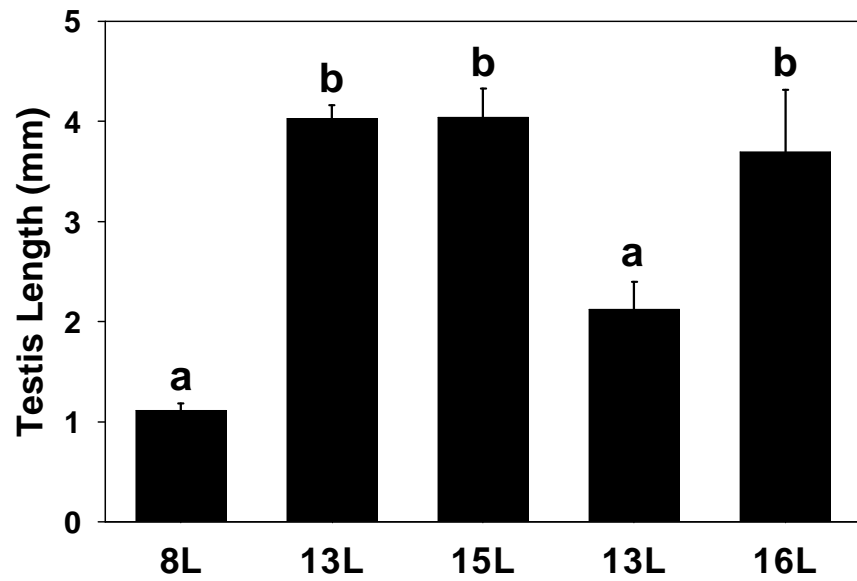




Small et al., 2007a

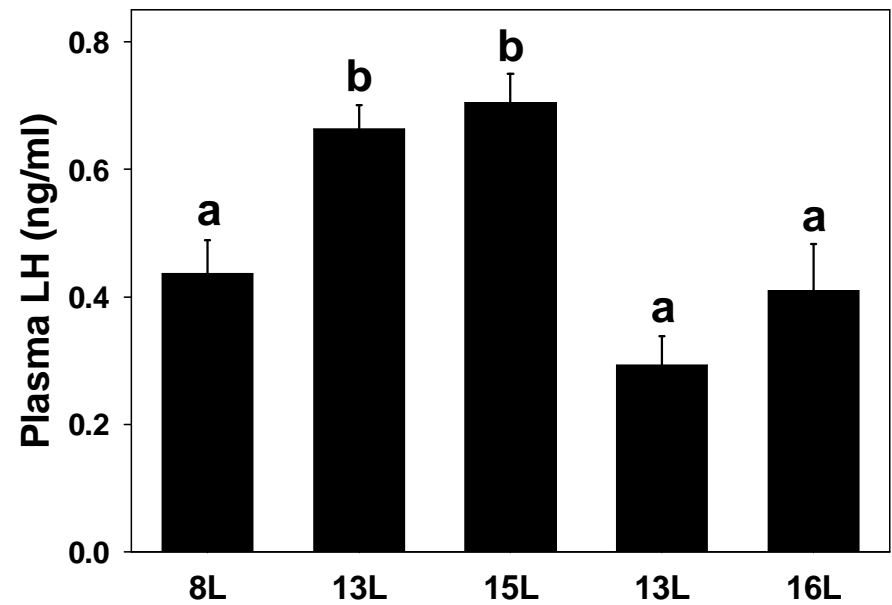
- Photostimulation during gonadal regression stimulates gonadal recrudescence
- Autumnal gonadal regression not caused by photorefractoriness





Relatively
photorefractory?

YES!



June-Sept. Precipitation (mm)

400
300
200
100
0

Jun 10

Jun 20

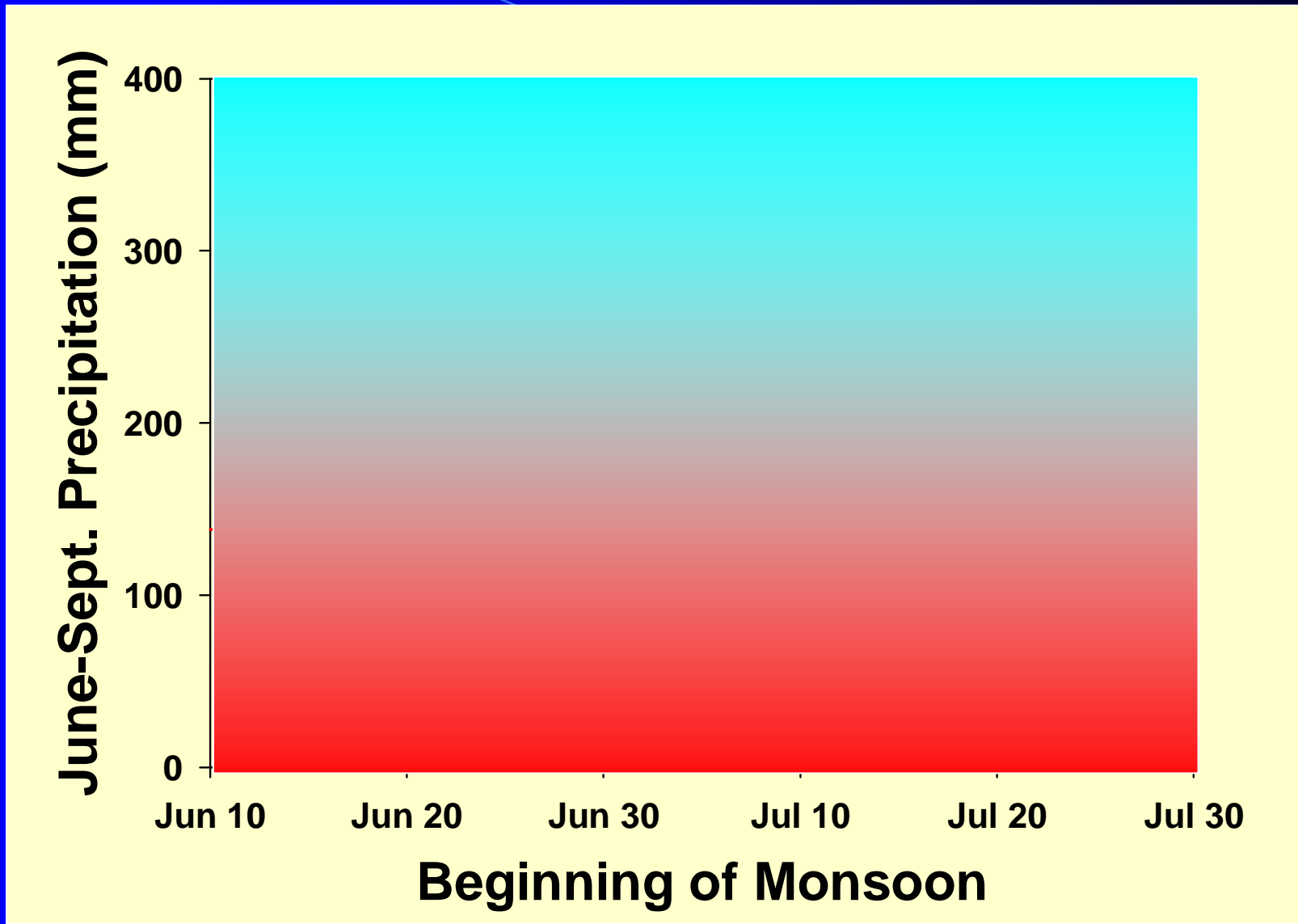
Jun 30

Jul 10

Jul 20

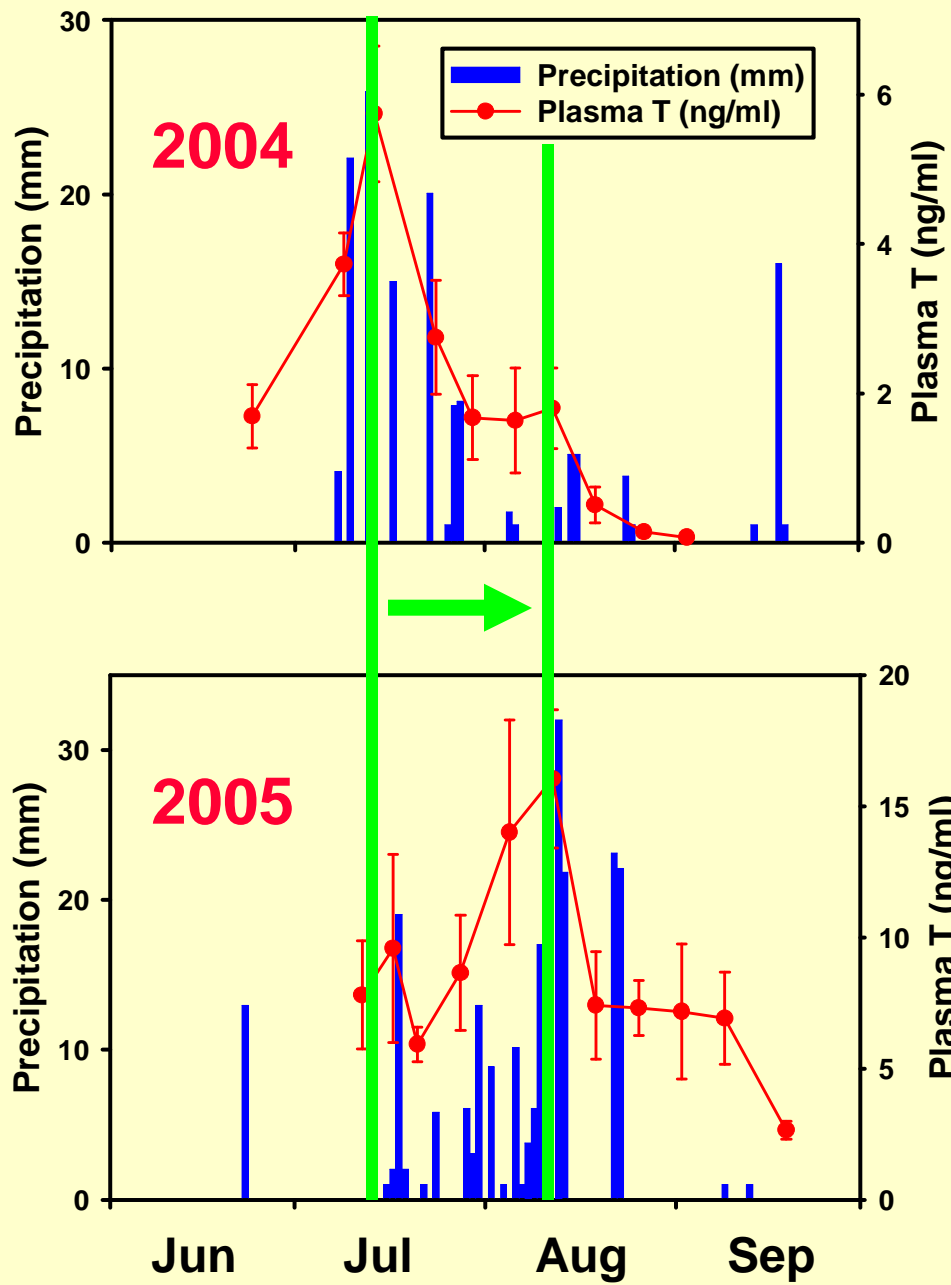
Jul 30

Beginning of Monsoon





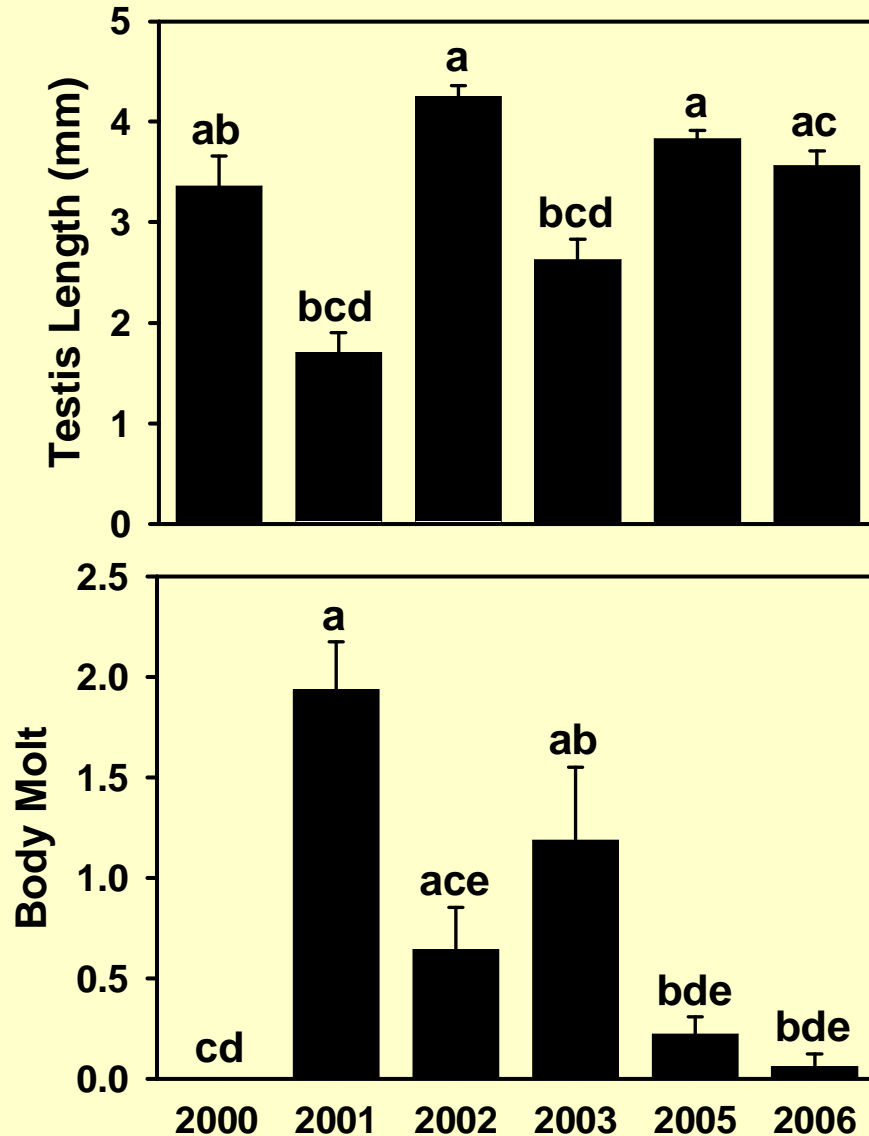
March 12, 2005



Deviche *et al.*, 2006

- Seasonal changes in plasma testosterone are environment-driven.
- Yearly differences in monsoon rain patterns correlate with differences in circulating concentrations of reproductive hormone.

Sept. 09 (± 1 d.)

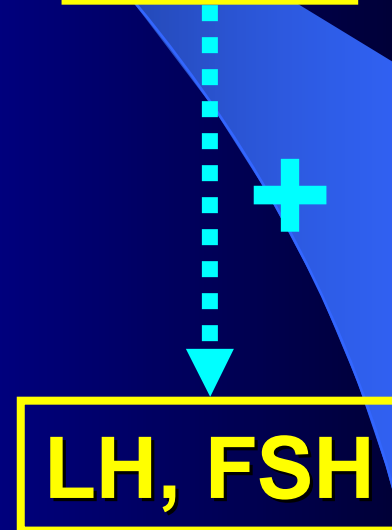


Post-breeding timing of gonadal regression and onset of prebasic molt vary between years

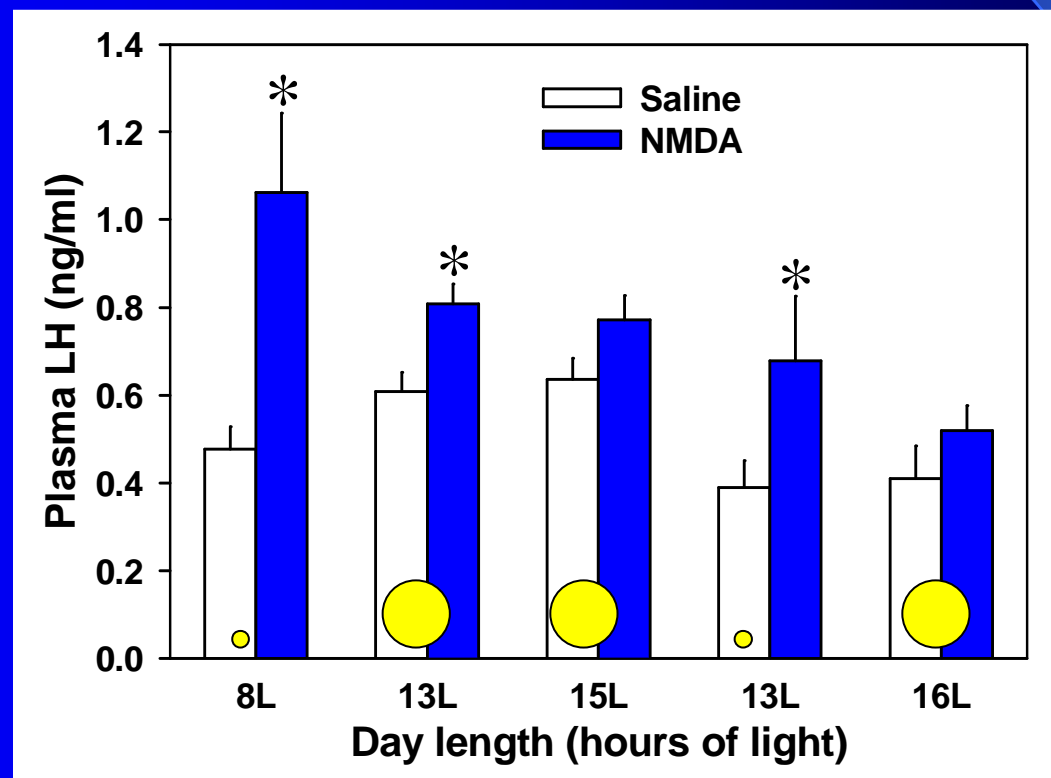
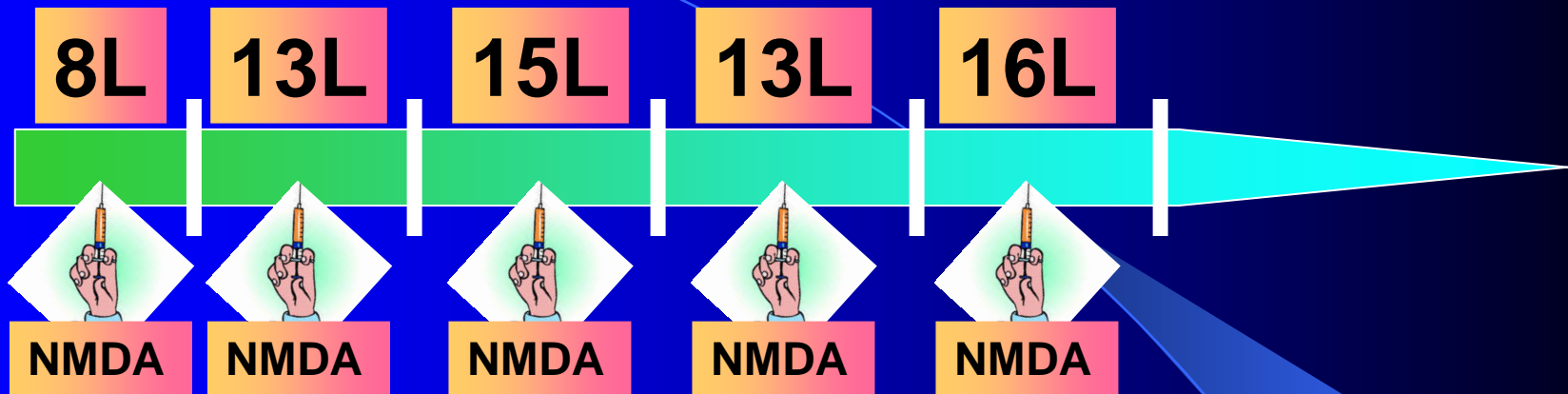


Pharmacological approach

***N*-methyl-D-aspartate
= glutamate agonist
= NMDA**

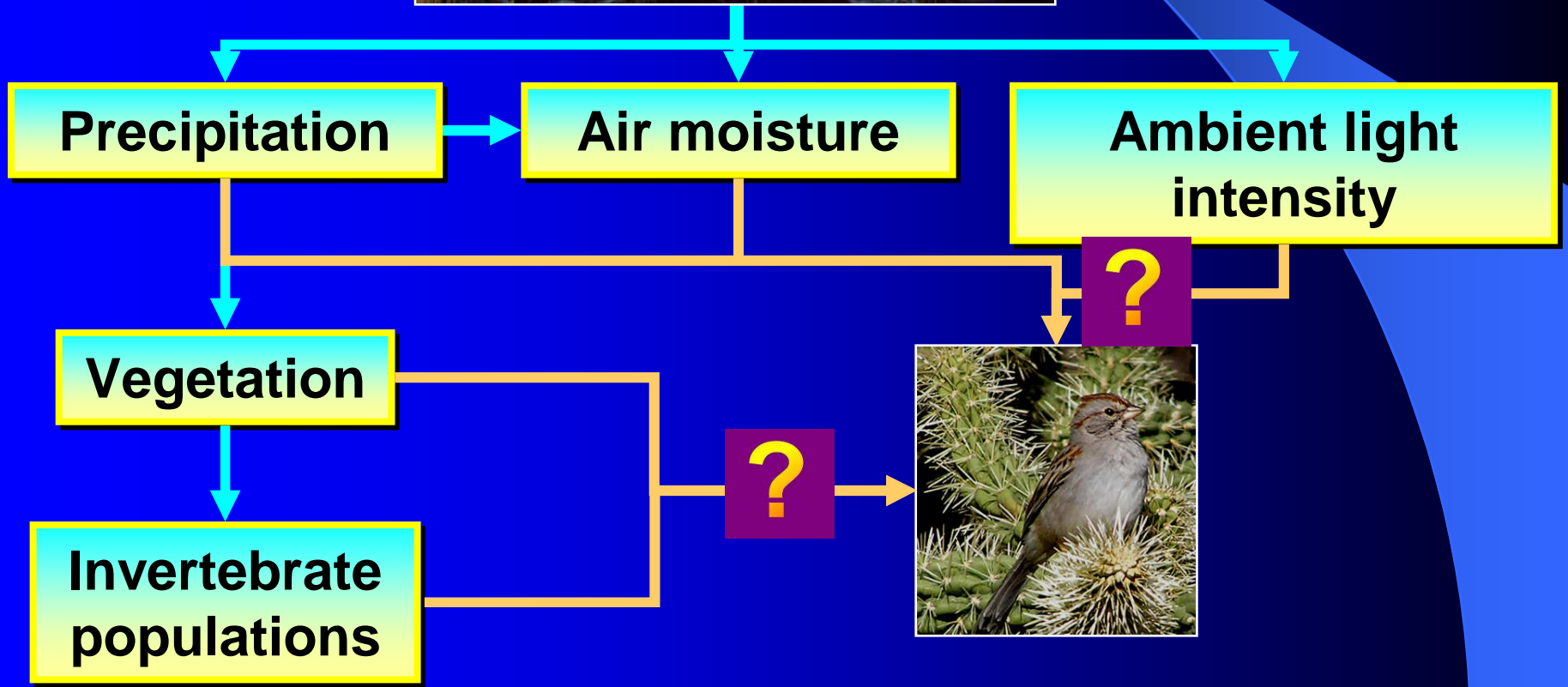


Light Schedule





Monsoon



Precipitation

Air moisture

Ambient light intensity

Vegetation

Invertebrate populations



Effect of “visual” cues on reproductive system?

Control



Group 1

Simulated precipitation



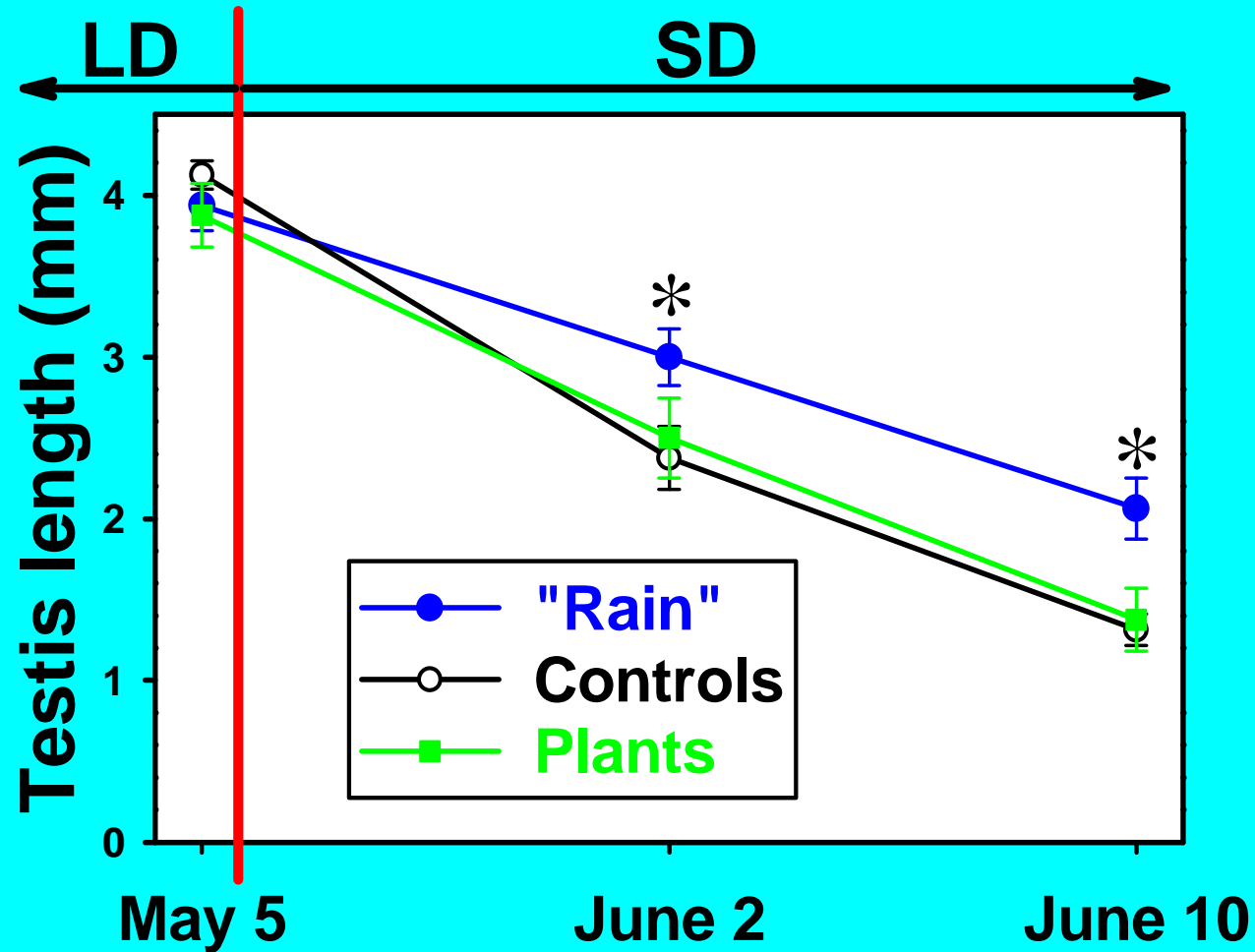
Group 2

Green vegetation



Group 3





Exposure to artificial precipitation delays short day-induced reproductive system regression

**Sonoran Desert
Songbirds**



**Temperate Region
Songbirds**



Seasonal Predictability

Low

Dependency on day length:

High

High **Dependency on non photoperiodic cues:**

Low

Relative **Photorefractoriness:**

Absolute

Thanks to....

**Tom Small
Christy Strand
Lori Hurley
Bobby Fokidis
Joey Georges
Russ Martin
Sara O'Brien
Karine Marechal
Blandine Bricault**

And....

**Peter Sharp (Edinburgh, Scotland)
George Bentley (U.C. Berkeley)
Kazu Tsutsui (Tokyo, Japan)
John Wingfield (U.C. Davis)**

