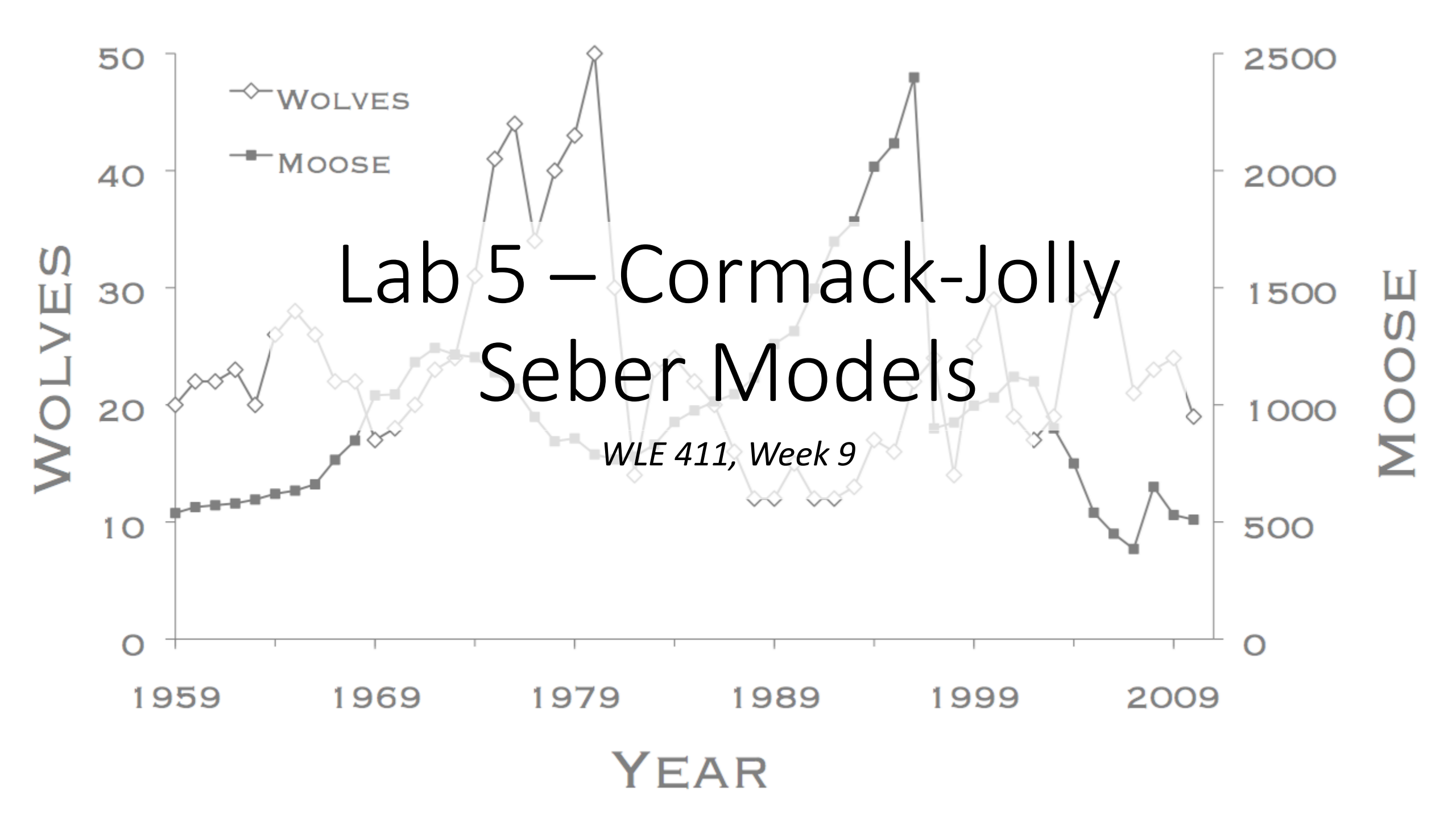

Lab 5 – Cormack-Jolly Seber Models

WLE 411, Week 9

Survival- a special case of Bernoulli trial

- Flip a coin. If it’s heads, keep flipping until it’s tails or you reach 5 flips
- Write down the results as “1” for heads, and “0” for tails
- The results should look like this:
  - Survived 0 coin flips: 00000
  - Survived 3 coin flips: 11100

Survival- a special case of Bernoulli trial

- What's the probability of the coin "surviving" from one interval to the next?
  - 0.5
- We're going to call this parameter Φ, pronounced phi or fee
- In wildlife populations, this parameter represents apparent survival
  - Probability that an animal survives & doesn't emigrate until the next interval

Capture histories

- Capture histories are used to determine when an animal died/emigrated
  - Rows indicate individuals, columns indicate capture intervals (days, weeks, etc.)

Week 1	Week 2	Week 3	Week 4	Week 5
1	1	0	0	0
1	1	1	1	1
1	0	0	0	0

Capture histories

- In the coin example, we had perfect knowledge of whether each coin “lived” or “died”
- In the real world, we’re often uncertain regarding an animal’s current state

Week 1	Week 2	Week 3	Week 4	Week 5
1	1	0	0	0
1	1	1	1	1
1	0	0	0	0

New parameter: *p*

- *p* represents recapture/detection probability
- The probability of recapturing an animal in a mark recapture study is defined as:
  - The probability of the animal surviving from the prior interval (Φ) * the probability of reobserving the animal *(p)*

Revised capture histories

- Once we've incorporated *p* into our models, we can have gaps in our capture histories
  - Gaps represent animals surviving undetected to be resighted in late weeks

Week 1	Week 2	Week 3	Week 4	Week 5
1	0	1	0	0
1	1	0	0	1
1	0	0	0	0

Capture history likelihoods

- Much like binomial likelihoods, we can calculate how likely a given capture history is given certain values of Φ and p
- Example:
  - The likelihood of observing the capture history 111 can be expressed as:
    - $\Phi_1 * p_2 * \Phi_2 * p_3$
  - The likelihood of observing 101 can be expressed as:
    - $\Phi_1 * (1 - p_2) * \Phi_2 * p_3$

The probability of being observed in interval 3

The probability of surviving from interval 1 to interval 2

The probability of not being observed in interval 2

The probability of surviving from interval 2 to 3

Cormack-Jolly Seber (CJS) model

- The model we've been describing is called a CJS model
  - Basic survival model with two parameters, Φ and *p*
  - Data collected using a mark-recapture framework
- We can calculate Φ and *p* parameters separately for different sexes, time periods, etc.
  - We can then compare different model structures using AIC, as demonstrated last week

Program MARK Interface

File Window Help

Program MARK

You can obtain context-sensitive help with the F1 key,
and can investigate objects with the Shift-F1 key.
See the Help menu for known problems.

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