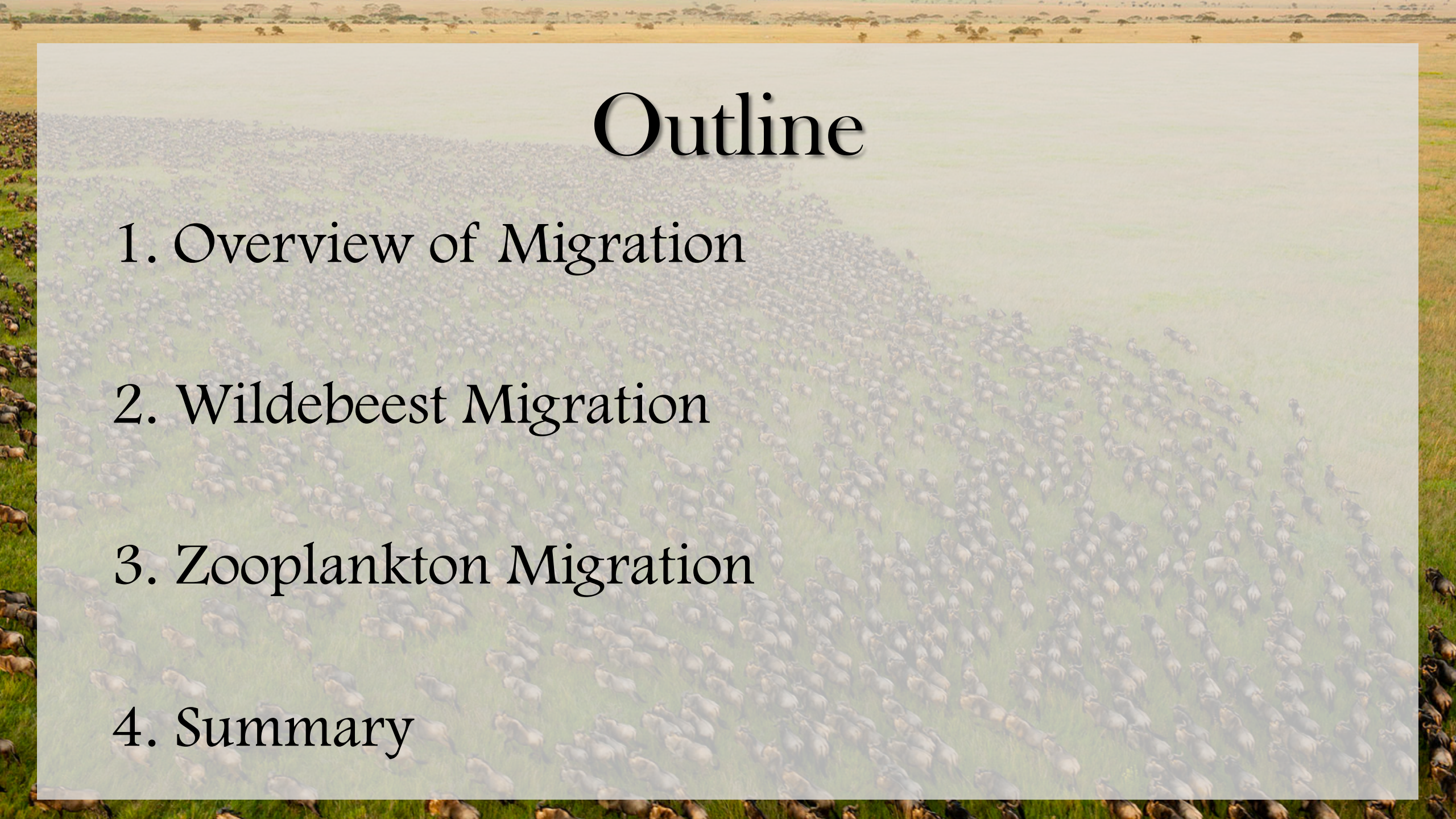


An aerial photograph showing a vast herd of wildebeest migrating across a dry, yellowish-brown savanna landscape. The herd is concentrated in a central area, with some individuals visible along the edges of the frame. The text "Migration, Tracing the Journey" is overlaid on the image in a large, black, serif font.

Migration, Tracing the Journey

The background of the slide is a photograph of a massive herd of wildebeest migrating across a vast, open savanna landscape. The herd is dense and stretches far into the distance, filling much of the frame. The terrain is a mix of green grass and dry, yellowish-brown earth. In the far background, there are scattered trees and a clear sky. The overall scene conveys a sense of scale and movement.

Outline

1. Overview of Migration

2. Wildebeest Migration

3. Zooplankton Migration

4. Summary

Migration

- A pattern of movement
 - Regular
 - Directional (latitudinal, altitudinal)
 - Seasonal

Migration



General Framework

~Response to spatiotemporal variation (*Heterogeneity*)

- Resources
- Threats



General Framework

Effects on the environment

- Trophic
- Transport/Vector

Tertiary
consumers

Secondary
consumers

Primary consumers

Primary producers

General Framework

Effects on the environment

- Trophic
- Transport/Vector

Tertiary
consumers

Secondary
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Primary consumers

Primary producers

General Framework

Effects on the environment

- Trophic
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Tertiary
consumers

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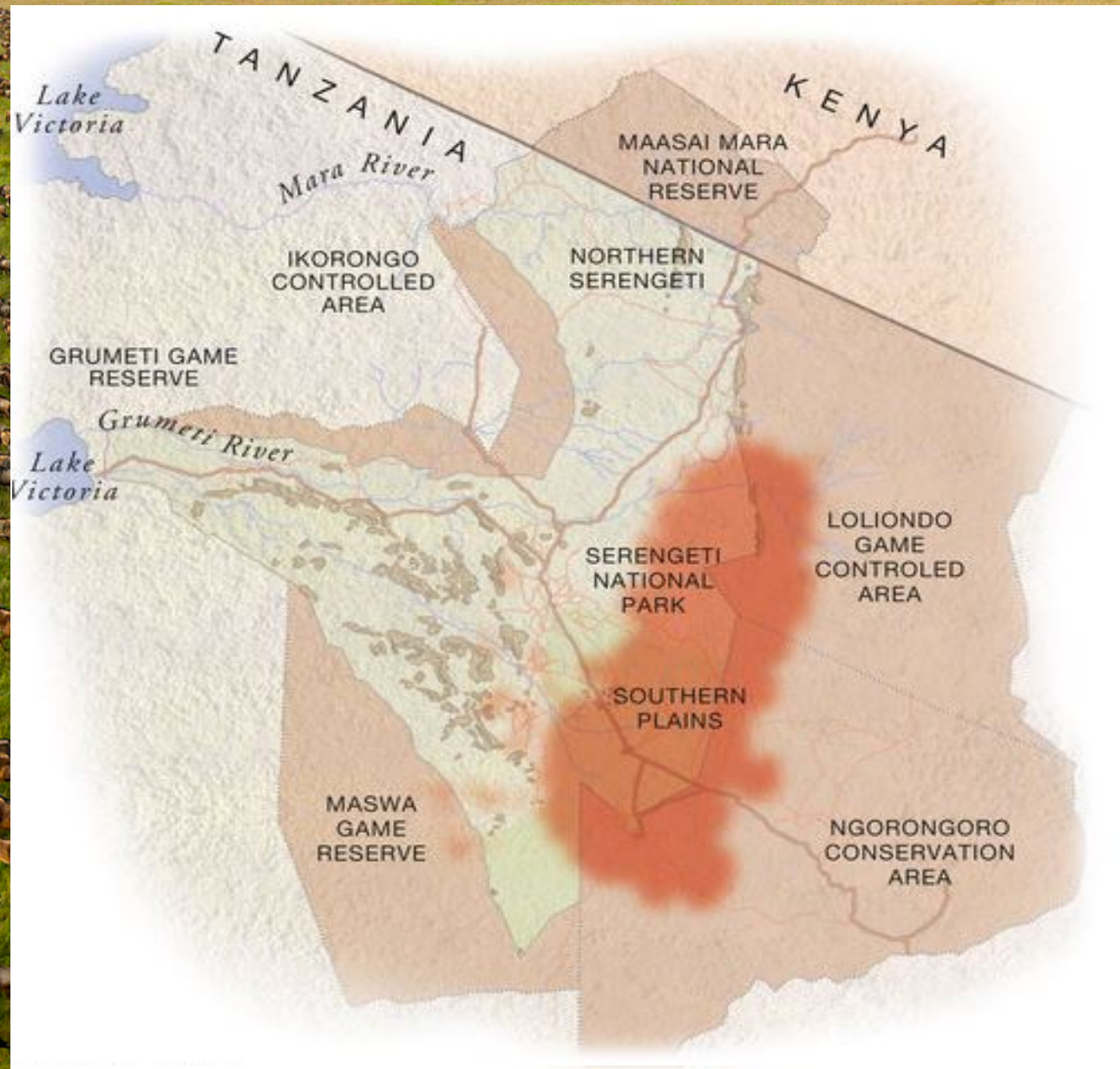
Wildebeest Migration



Wildebeest Migration



Wildebeest Migration



January- March

April

June

Start of the Dry Season

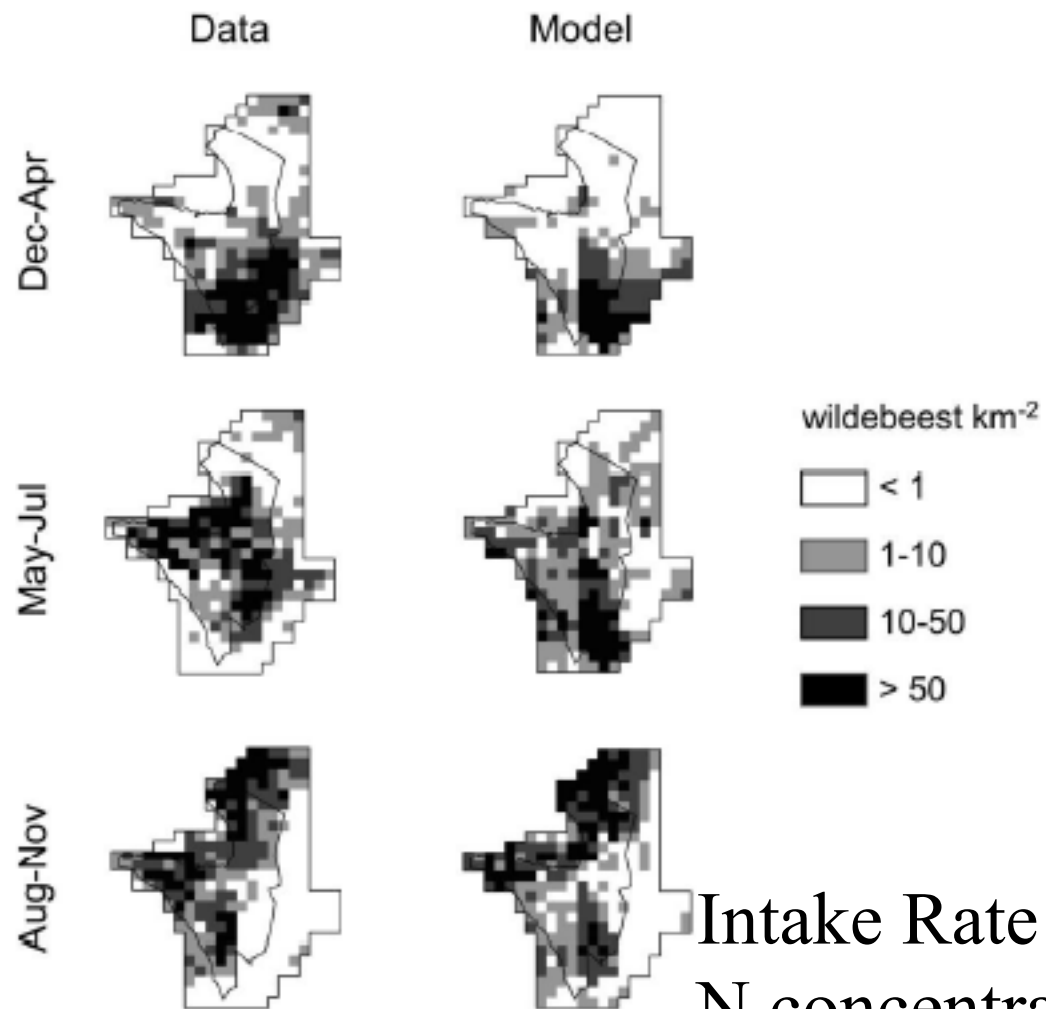
September

November

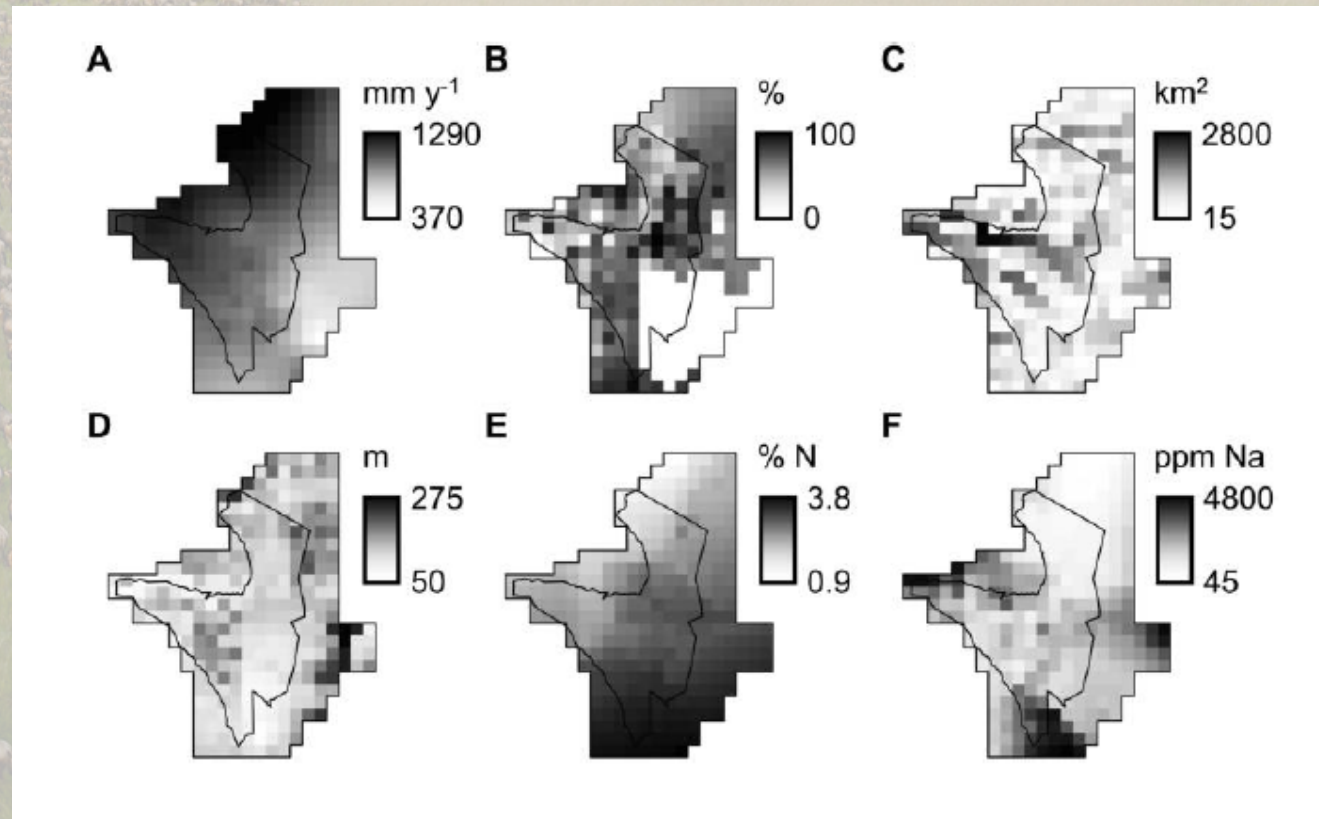
Start of the Wet Season

December

Why?



Intake Rate
N concentration



Holdo *et al.* (2009)

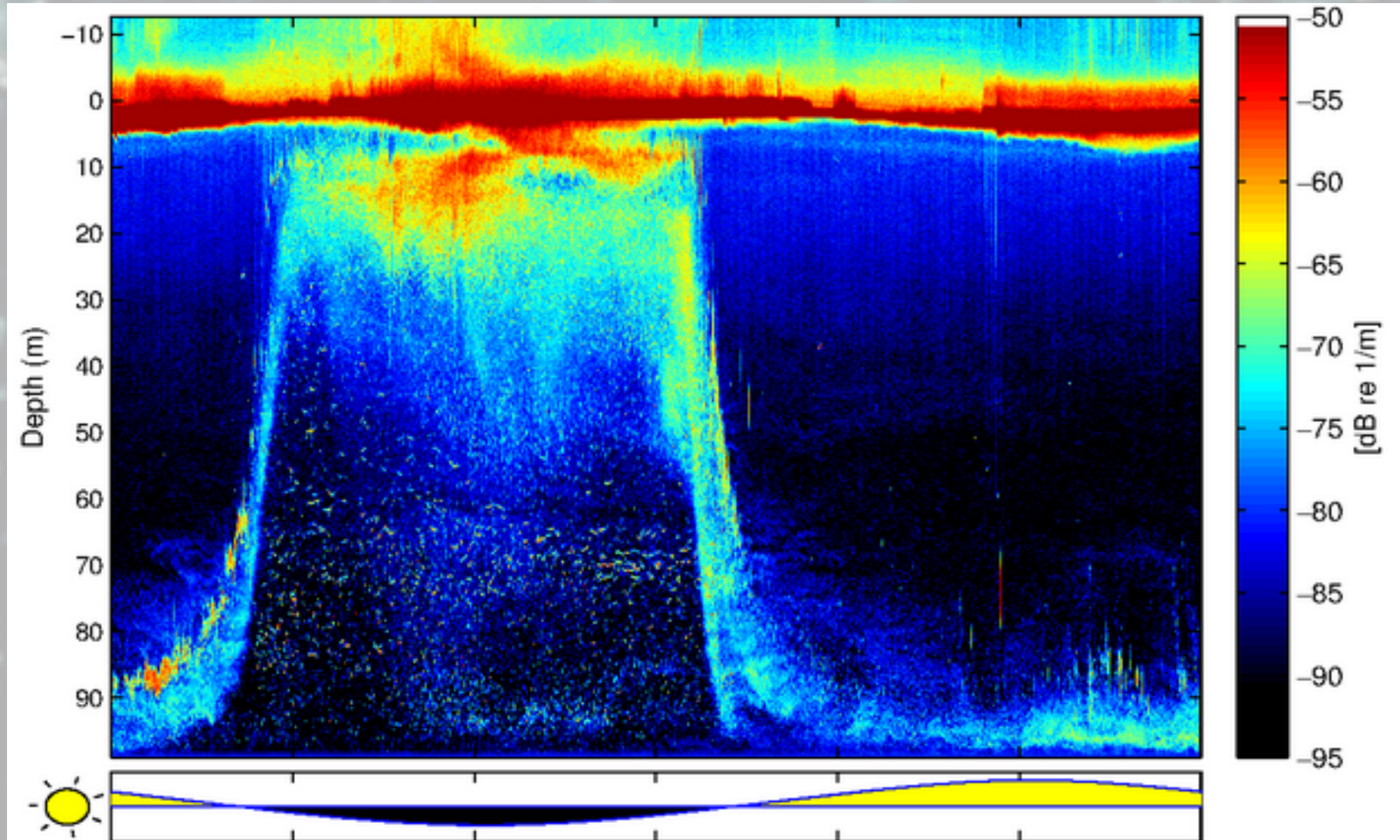
Effects of Wildebeest Migration

- Transport/Vector
 - Nitrogen Cycle
- Trophic Effect
 - Predators
 - Other Herbivores



Diel Vertical Migration

Zooplanktons



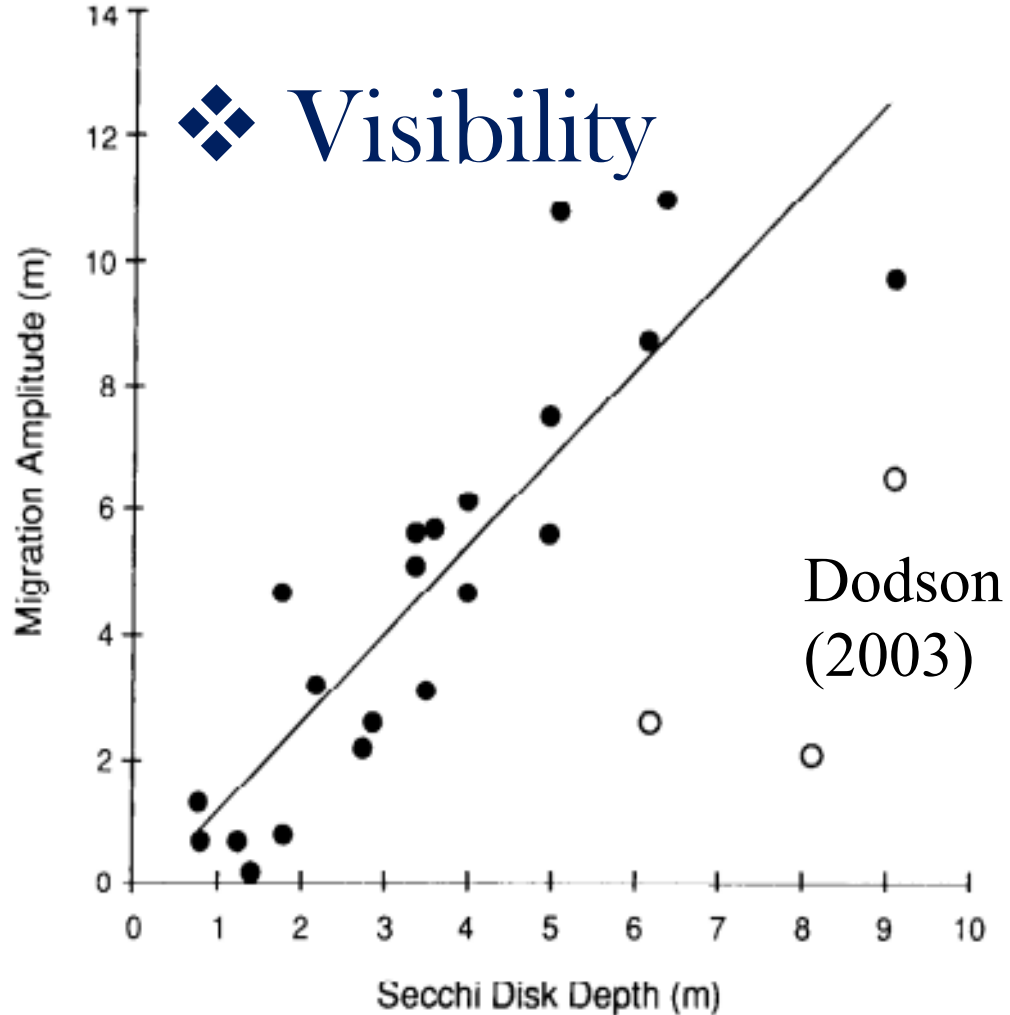
Environmental Factors

- Food
 - Phytoplankton & microzooplankton
- Temperature
- Predators
 - Fish

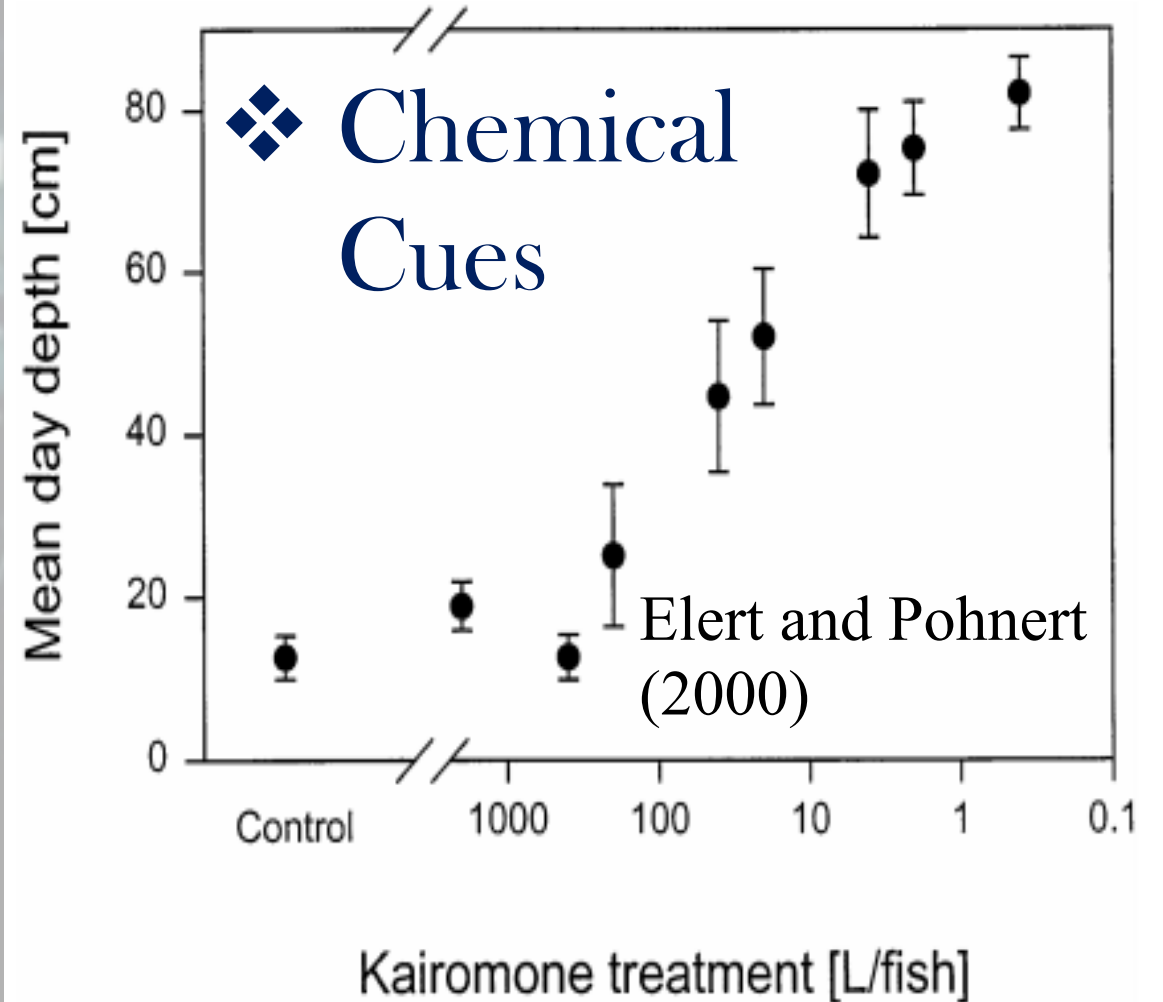


Predator Evasion Theory

❖ Visibility

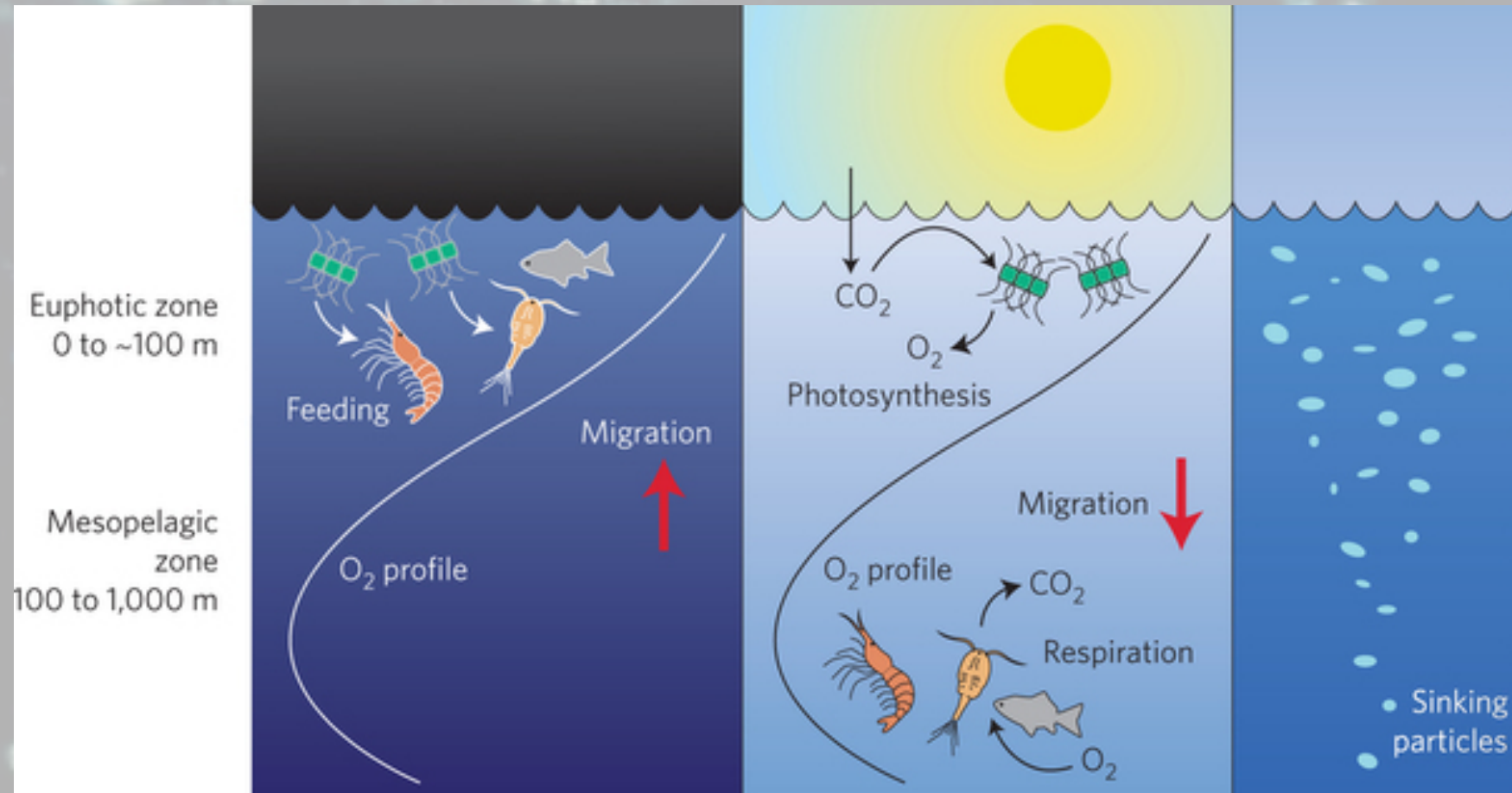


❖ Chemical Cues



Effects of DVM

- Active transport of organic matter



Doney and
Steinberg (2013)

Migration: Summary

Response to spatiotemporal variation in

- Resources

Food abundance, food quality

- Threats

Predators

- *DVM – Migration or not?*

References

Dingle, H. and A.V. Drake. 2007. What is migration? *Bioscience* 57: 113 - 121

Dodson, S. 2003. Predicting diel vertical migration of zooplankton. *Limnology and Oceanography* 35: 1195-1200

von Elert, E. and G. Pohnert. 2000. Predator specificity of kairomones in diel vertical migration of *Daphnia*: a chemical approach. *Oikos* 88: 119-128.

Gliwicz, M. Z. 1986. Predation and the evolution of vertical migration in zooplankton. *Nature* 320: 746-748.

Holdo, R. M., R. D. Holt, and J. M. Fryxell. 2009. Opposing rainfall and plant nutritional gradients best explain the wildebeest migration in the Serengeti. *The American Naturalist* 173: 431 – 445.

A large herd of wildebeest and zebras is crossing a river. The wildebeest are in the water, creating a large splash, while the zebras are on the bank. The scene is set in a dry, hilly landscape with sparse vegetation. A semi-transparent white box with the word "Questions?" in a black serif font is overlaid on the right side of the image.

Questions?