Photo: Bee & Bloom

Pathogen survey of natural blue orchard bee nests collected from Utah

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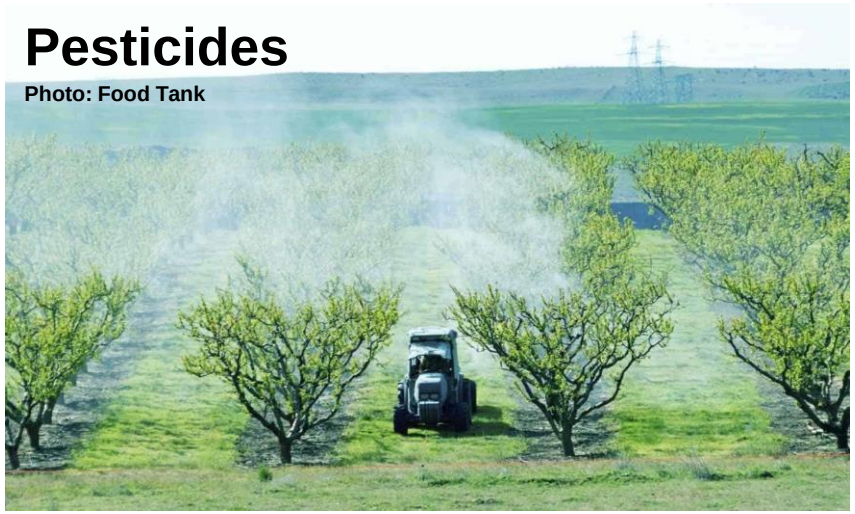
BEE HEALTH STRESSORS

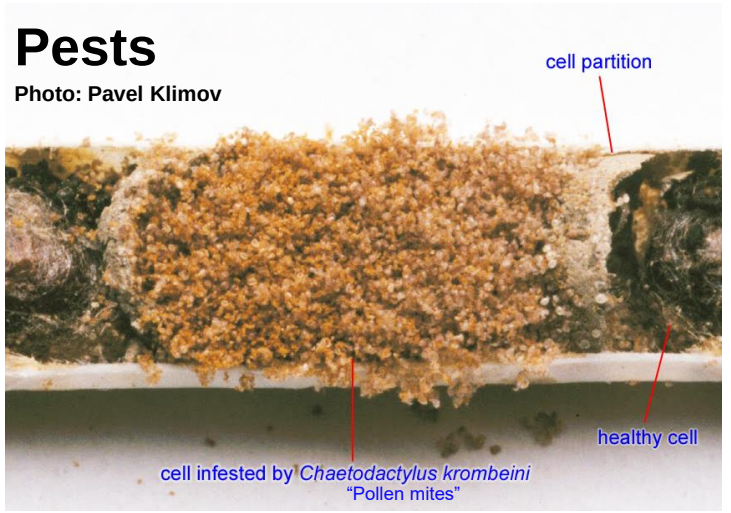
Pesticides

Photo: Food Tank



Pests

Photo: Pavel Klimov



Parasitoids

Photo: Libor Hudik

Management practices

Photo: USDA-ARS

Nutrition

Photo: USDA-ARS

Pathogens

Photo: Klaas de Gelder

WHY PATHOGENS?

Organisms that may produce disease

Little known about how pathogens impact solitary bees

Not always species-specific

Environmental transmission


Photo: Government of Western Australia


Photo: Scientific Beekeeping

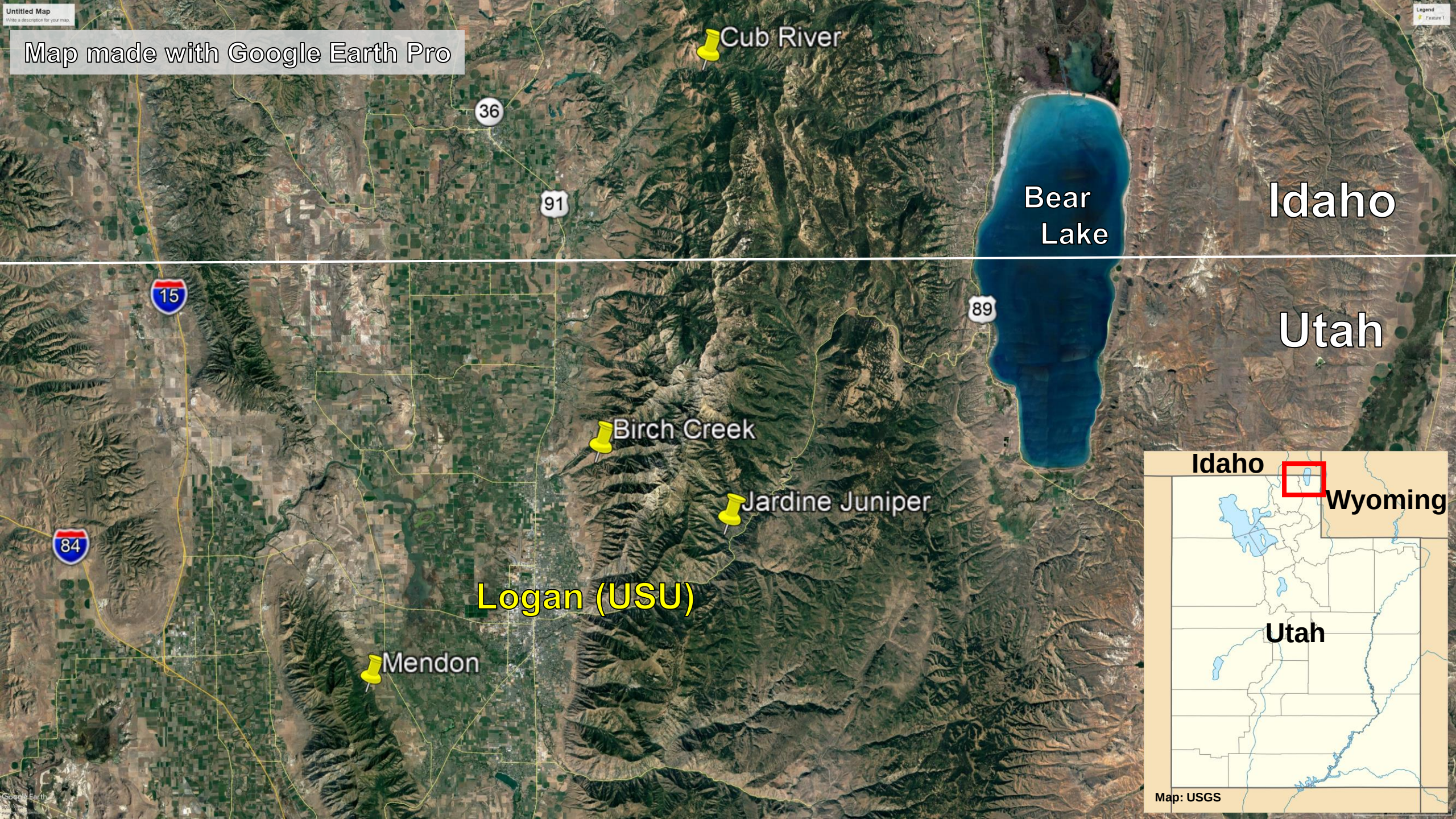

Photo: Klaas de Gelder


Photo: Robert Snyder

OBJECTIVES

1. Can we detect pathogens in blue orchard bees?

2. If present, do pathogens have an impact on blue orchard bee populations?


Untitled Map
Write a description for your map.
Map made with Google Earth Pro
Cub River
36
91
Bear Lake
Idaho
15
89
Utah
Birch Creek
Jardine Juniper
84
Logan (USU)
Mendon
Idaho
Wyoming
Utah
Map: USGS

Untitled Map
Write a description for your map.

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Cub River

36

Photo: Jim Cane

89

Idaho

Utah

15

Birch Creek

84

Logan (USU

Mendon

Jardine Juniper

Photo: Artz et al. 2014

Map: USGS

Google Earth

MOLECULAR PATHOGEN SURVEY

***Osmia lignaria* Say** (Hymenoptera: Megachilidae)

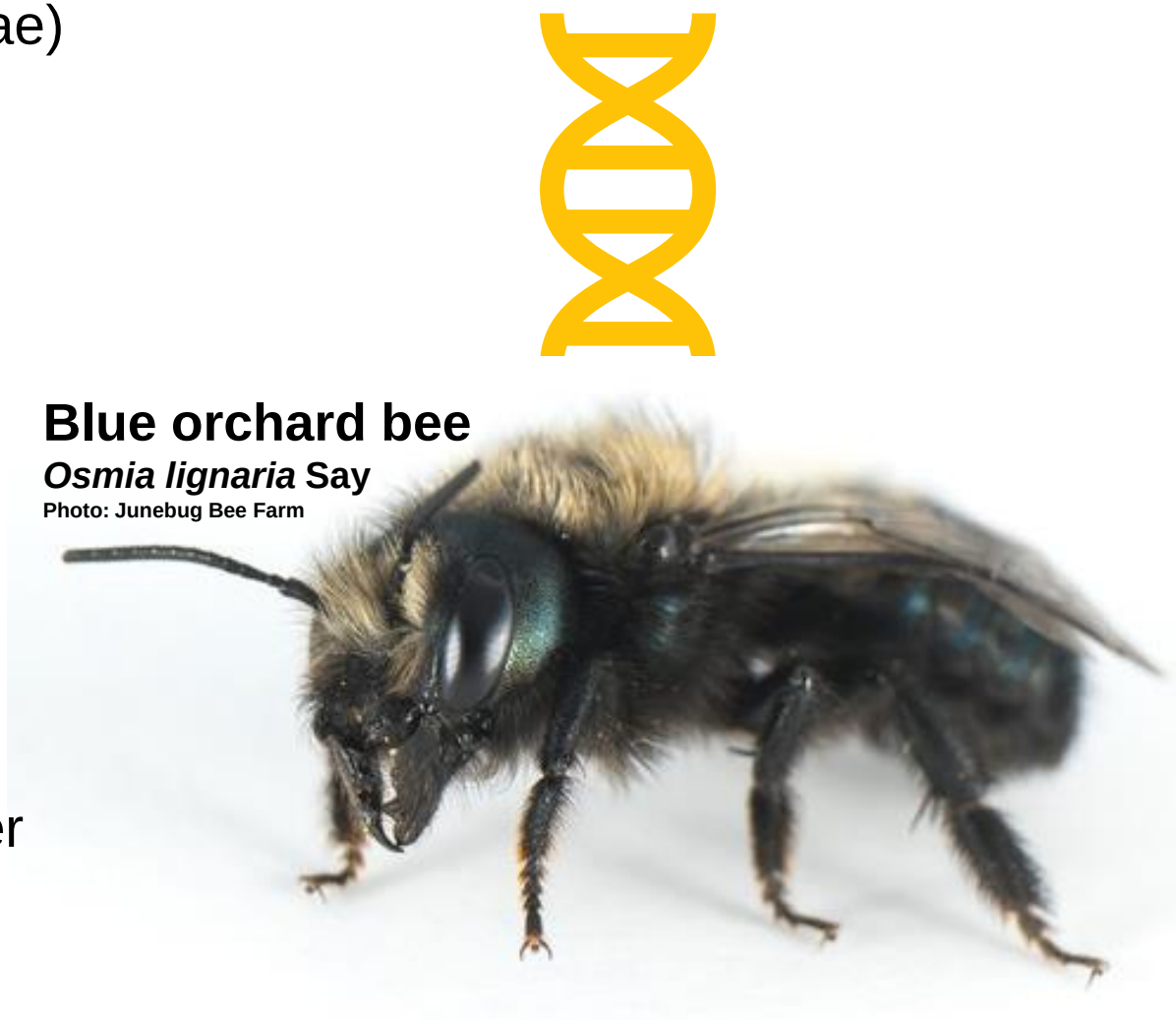
Extract DNA and RNA: TRIzol protocol

87 samples:

Cub River, *n* = 9	Idaho
Birch Creek, *n* = 15	Utah
Jardine Juniper, *n* = 32	Utah
Mendon, *n* = 31	Utah

Screen for pathogens: trypanosomes, *Spiroplasma*, *Ascosphaera*, and Microsporidia

PCR and gel electrophoresis: published primer sets, positive control and negative control, presence or absence



Blue orchard bee
***Osmia lignaria* Say**
Photo: Junebug Bee Farm

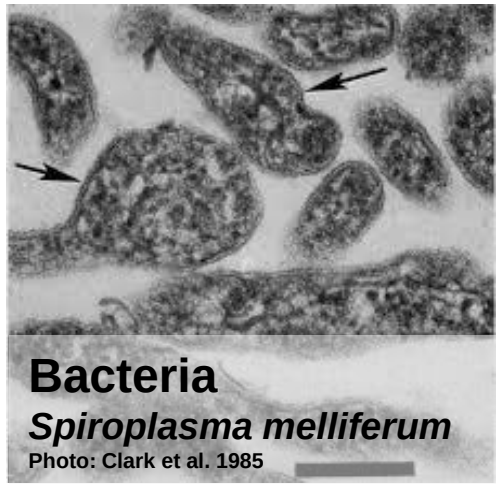
MOLECULAR SURVEY RESULTS

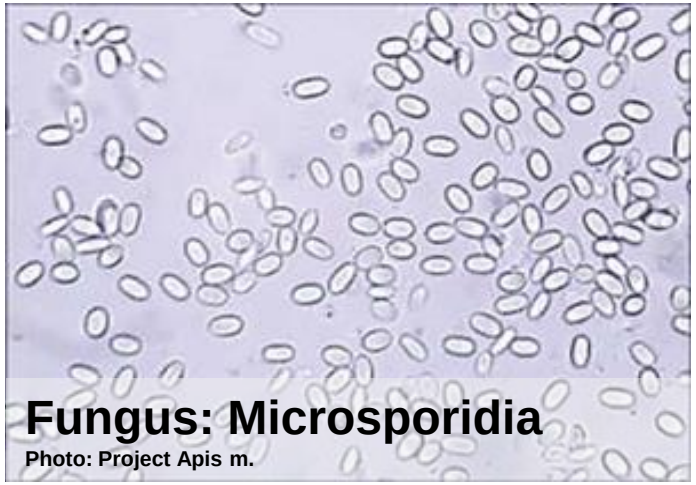
Trypanosomes: none

***Spiroplasma*:** limited amplification, confirm amplification with sequencing

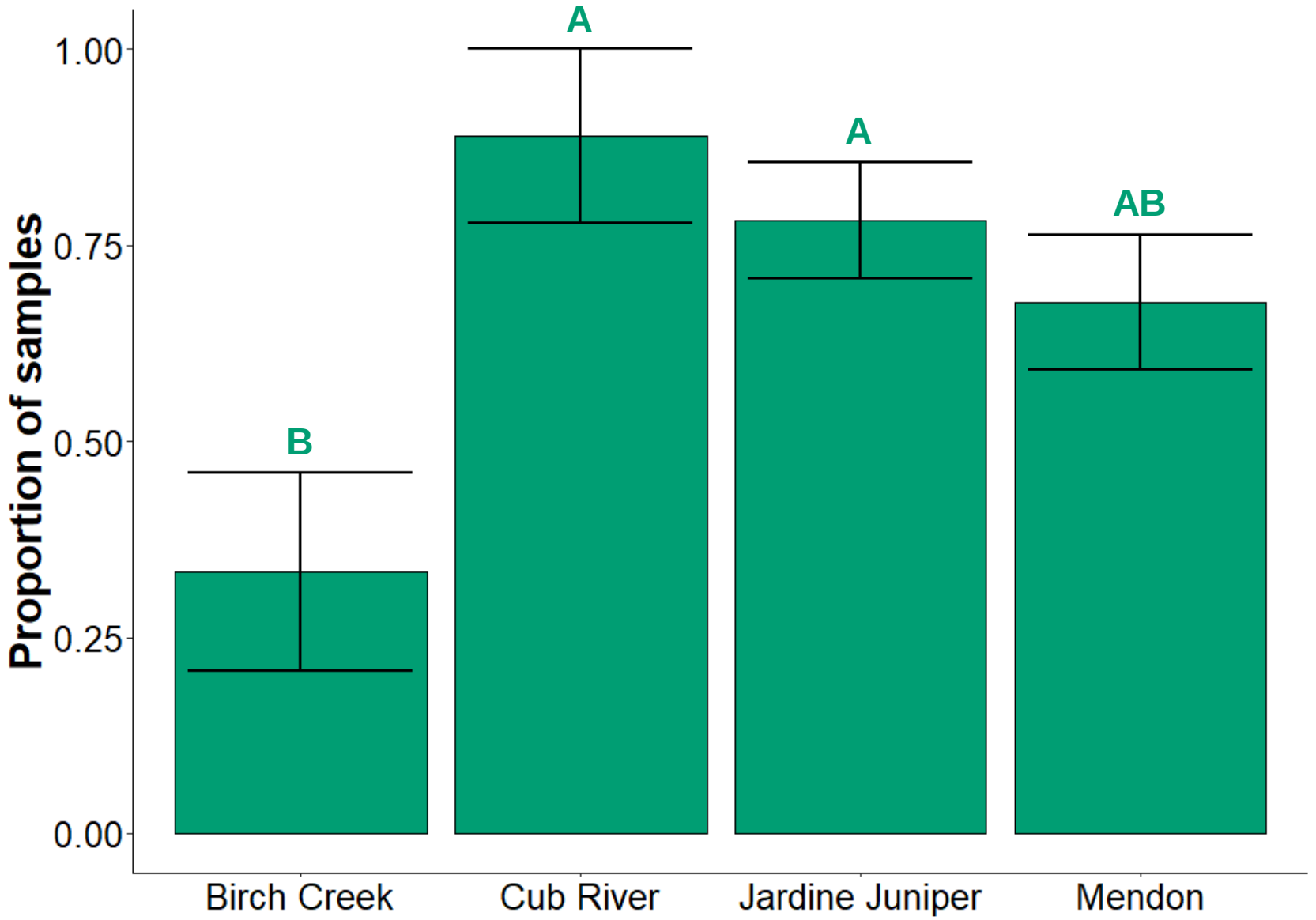
***Ascosphaera*:** two out of 87 samples were positive, determine species identity with sequencing

Microsporidia: 59 out of 87 samples were positive, banding patterns suggest presence of multiple species, determine identity with sequencing





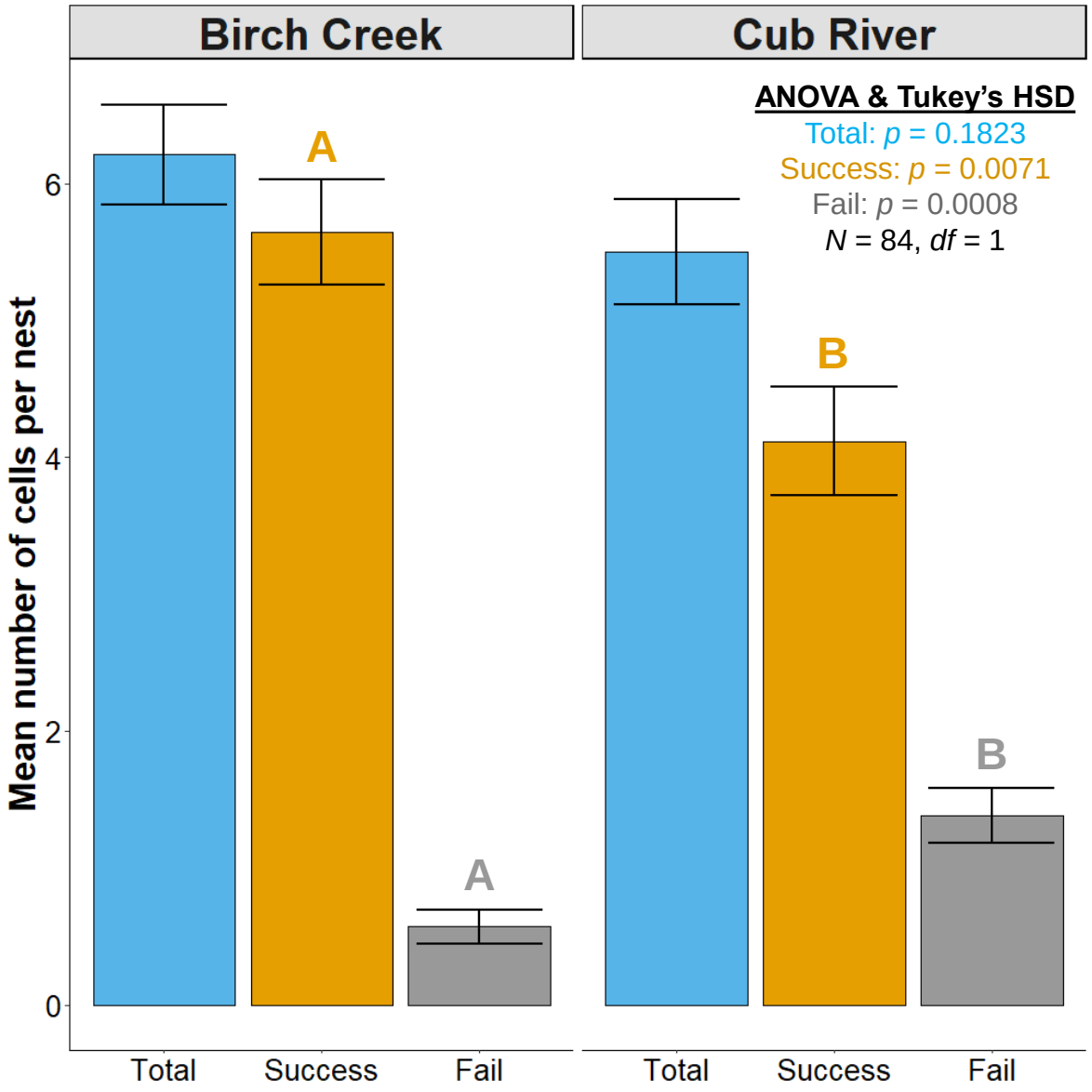
PRESENCE OF MICROSPORIDIA

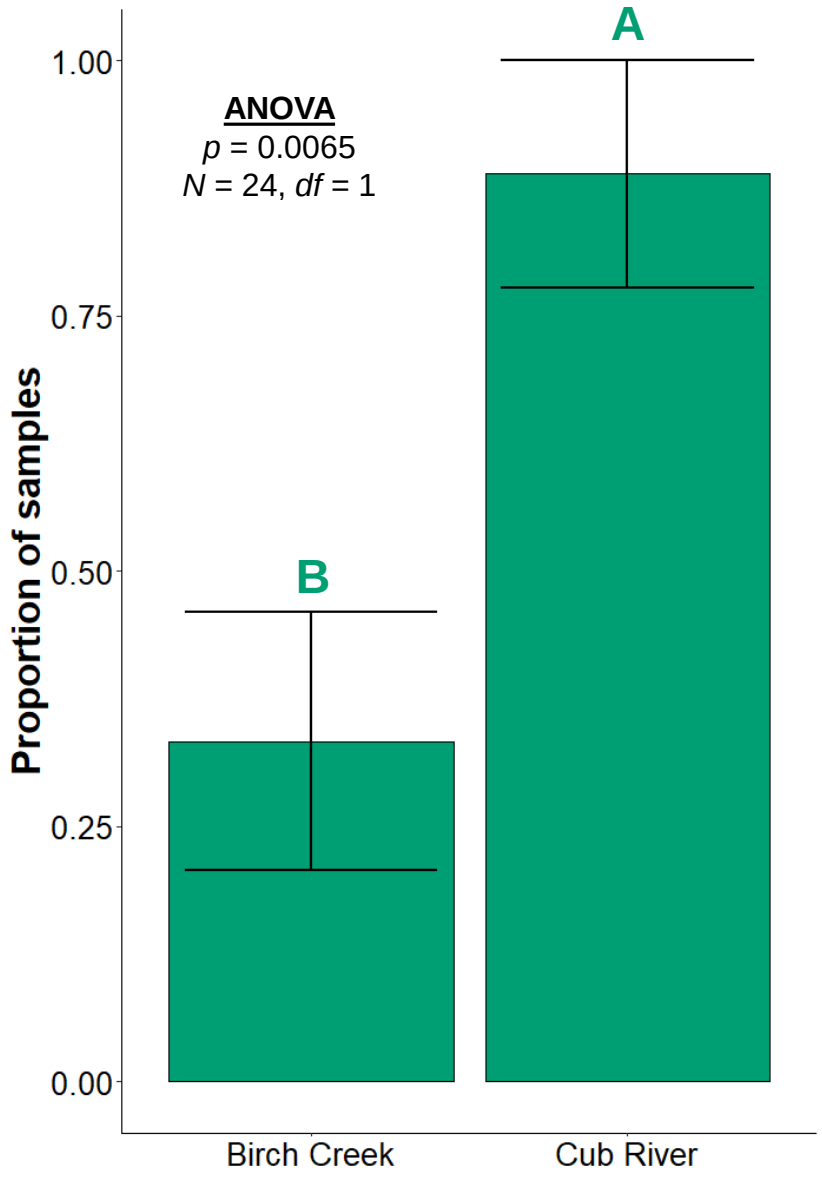


ANOVA
p = 0.0077
N = 87, df = 3

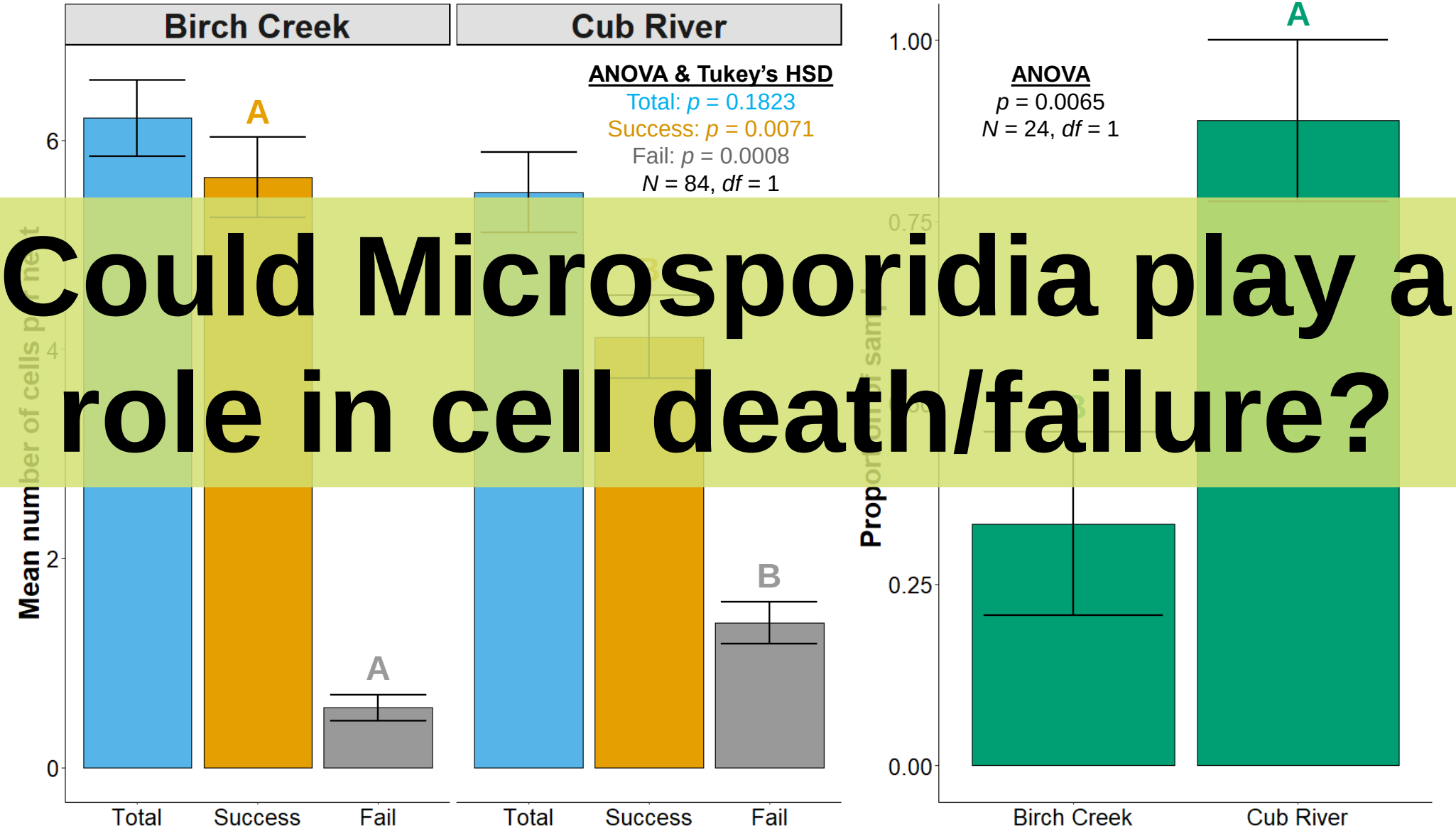
Tukey's HSD
BC-CR: p = 0.0206
BC-JJ: p = 0.0099
BC-M: p = 0.0746
CR-JJ: p = 0.9185
CR-M: p = 0.5946
JJ-M: p = 0.7915
N = 87, df = 3

PRESENCE OF MICROSPORIDIA





PRESENCE OF MICROSPORIDIA



Could Microsporidia play a role in cell death/failure?

SUMMARY AND FUTURE

Presence of pathogens in natural environments

Propagation and sale of blue orchard bees could spread pathogens

Additional sequencing

Screen for other pathogens

What roles do pathogens play in native solitary bee populations?

Photo: Crown Bees

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UtahState University

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USDA ARS Agricultural Research Service

NIFA

WESTERN SARE Sustainable Agriculture Research & Education

Illustration: Steve Buchanan

Questions?

Thank you!

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