Donkeys or Burros or Tomatoes or Tomatoes… a closer look at a few current studies

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Background

- Donkeys came with settlers west
- Helped with mining and transport of people and goods
- Harsh environment few equids are equipped to survive
  - 20 Team Borax Mules
  - Donkeys
- *Burros*- Spanish word for donkey
- Complete removal of donkeys from Death Valley
  - Considered Invasive species
  - Become a part of the megafauna
  - Donkeys natural habitat desert fauna
  - NGO responsible for removing burros

Outline

- Introduction to donkeys
  - Population, uses terms, burro vs donkey, tomato vs tomato…
- Origin of donkeys and breeds
- Donkey Behavior
- Challenges for donkeys, burros and asses

Domestication of Equine

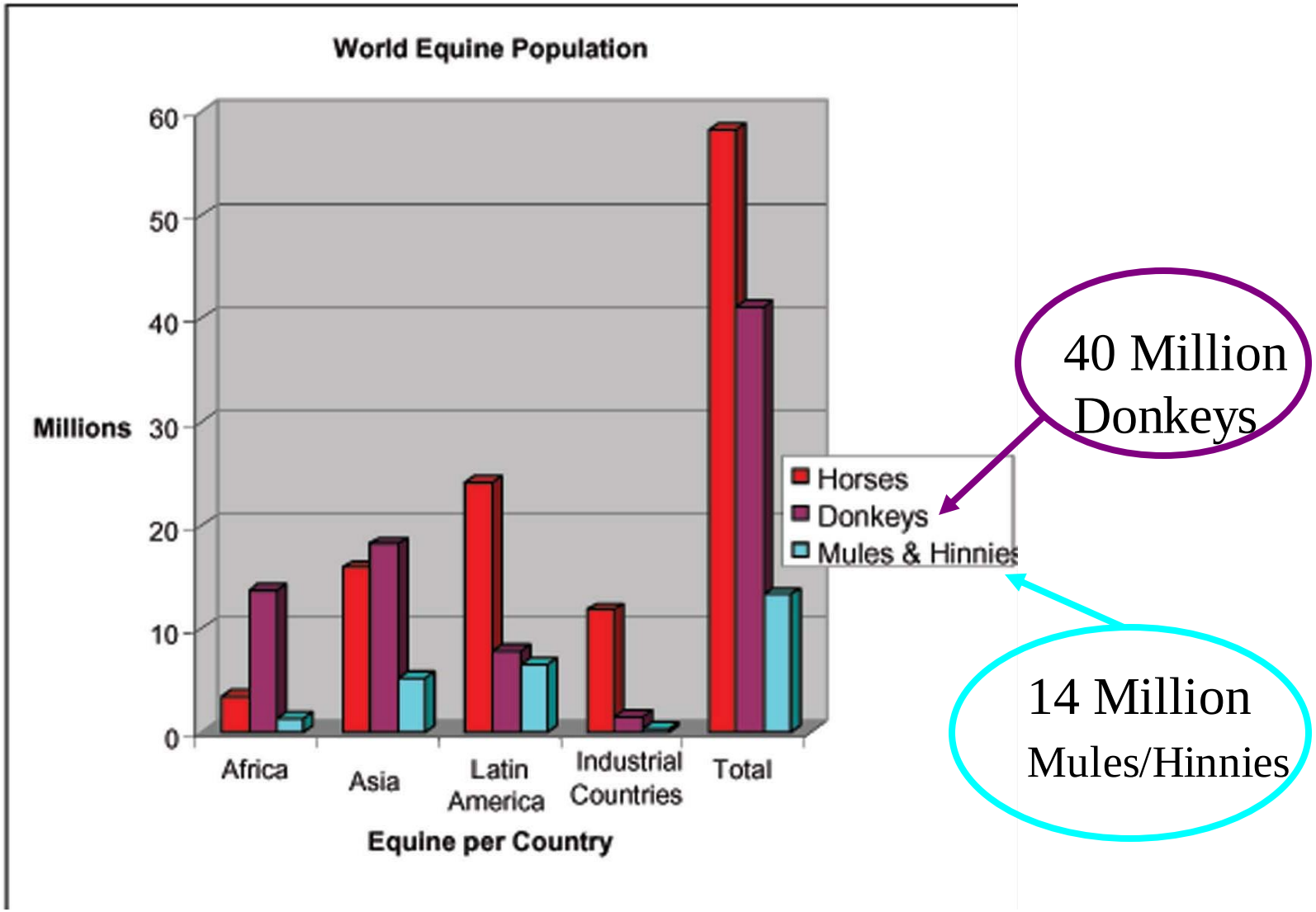
- 1st hunted for food
- Domesticated around 4000-3000 B.C.
- Donkeys' 1st domesticated
- Domesticated in Mesopotamia
- Used for driving/packing
- Spread from Egypt to Asia

Ears are Everywhere!

Worldwide there are approximately

- 55 million horses
- 44 million donkeys
  - **BUT Number is dropping due to consumption of donkeys for meat and skin**
  - **Loss of habitat**
  - **War areas**

Introduction: World Equine Population



(FAO, 2003)

US Feral Donkey Population

	Land Area						Horses Burros				
AZ	2,019,027	3,643,197	0				465	6,205	6,670		1,676
CA	5,170,931	7,021,651	1,425,649				4,007	3,013	7,020		2,200
CO	723,095	851,275	0				1,527	0	1,527		827
ID	420,783	477,300	0				651	0	651		617
MT	103,844	230,073	0				205	0	205		120
NV	19,778,204	23,028,911	437,436				44,786	4,482	49,268		12,811
NM	88,655	126,530	0				385	0	385		83
OR	3,608,660	4,312,356	130,335				4,519	54	4,573		2,700
UT	3,224,891	3,915,687	98,289				3,555	201	3,756		1,956
WY	7,301,975	10,344,424	0				8,828	0	8,828		3,795
TOTAL	42,440,065	53,951,404	2,091,709				68,928	13,955	82,883		26,785

Donkey Uses:
Dairy/Meat Production

Donkey Uses: Emerging Issue-Skin Production

https://www.thedonkeysanctuary.org.uk/under-the-skin

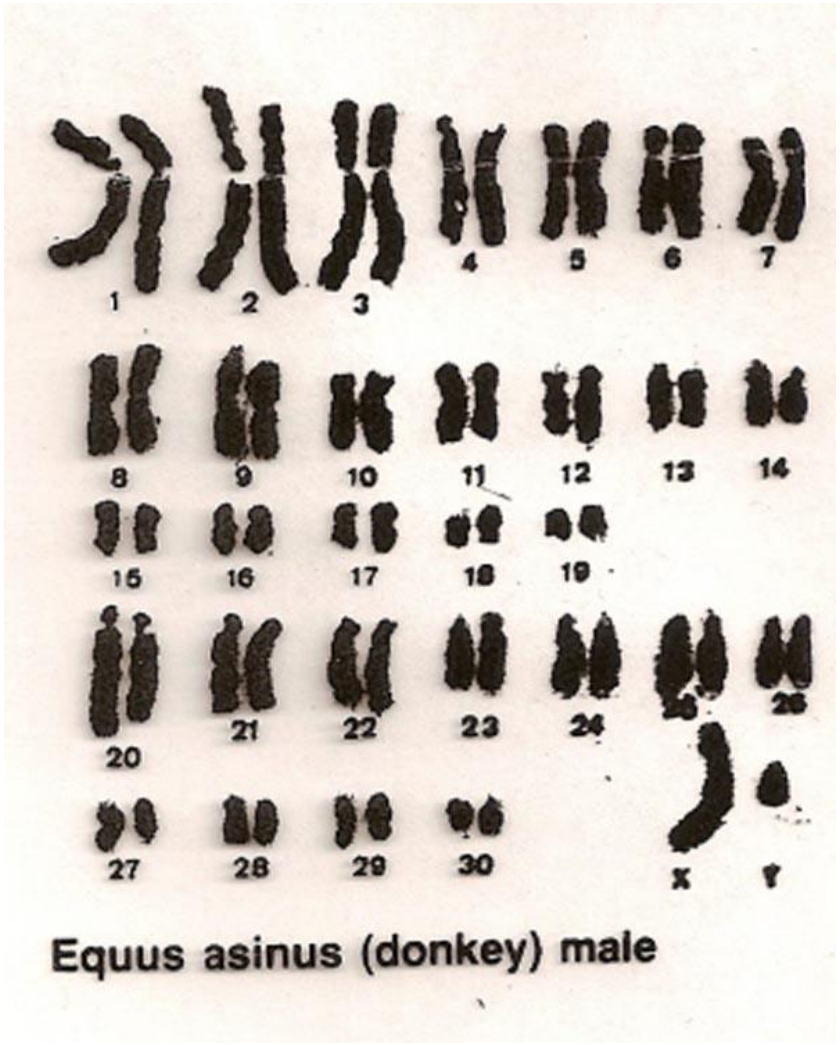
Donkey Uses: Work/Traction

Donkey Uses: Companion & Show

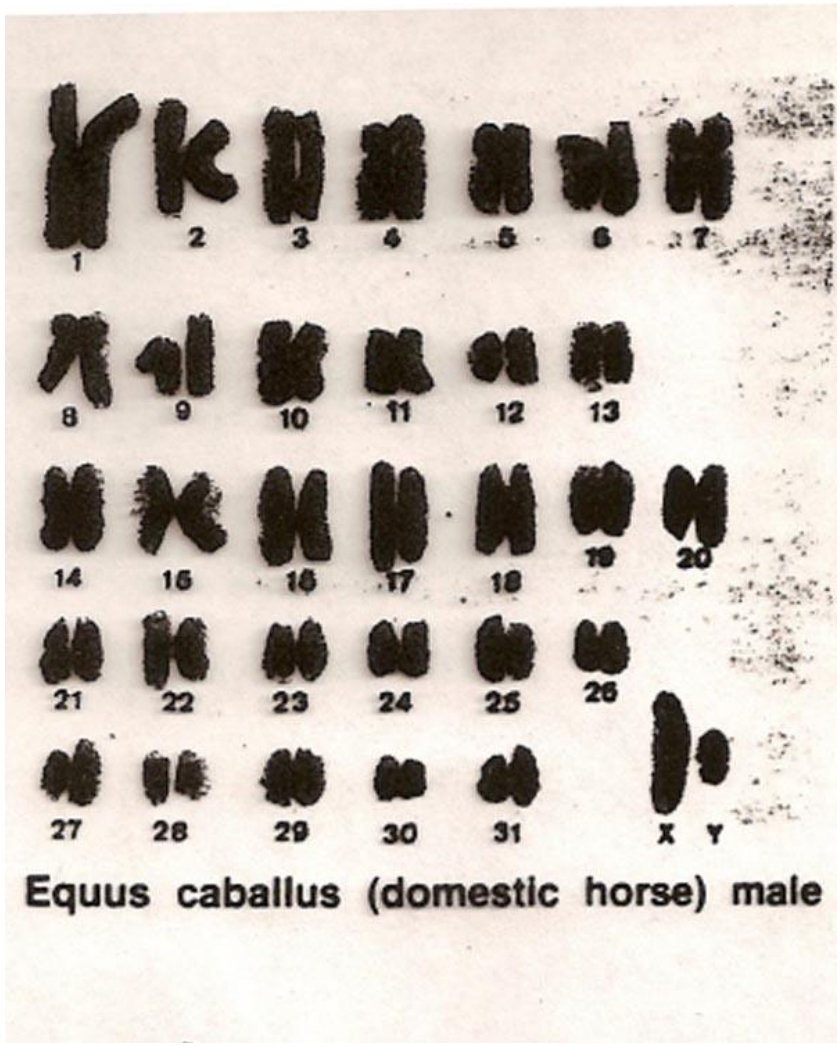
Longear Lingo

- Donkey (Equus asinus)
  - Burro- Spanish word for donkey
- Female donkey
  - Jenny or Jennet or Mare
- Male donkey (not castrated)
  - Jack or Stallion
- Male donkey (castrated)
  - a cut jack or gelding

Donkey vs. Horse

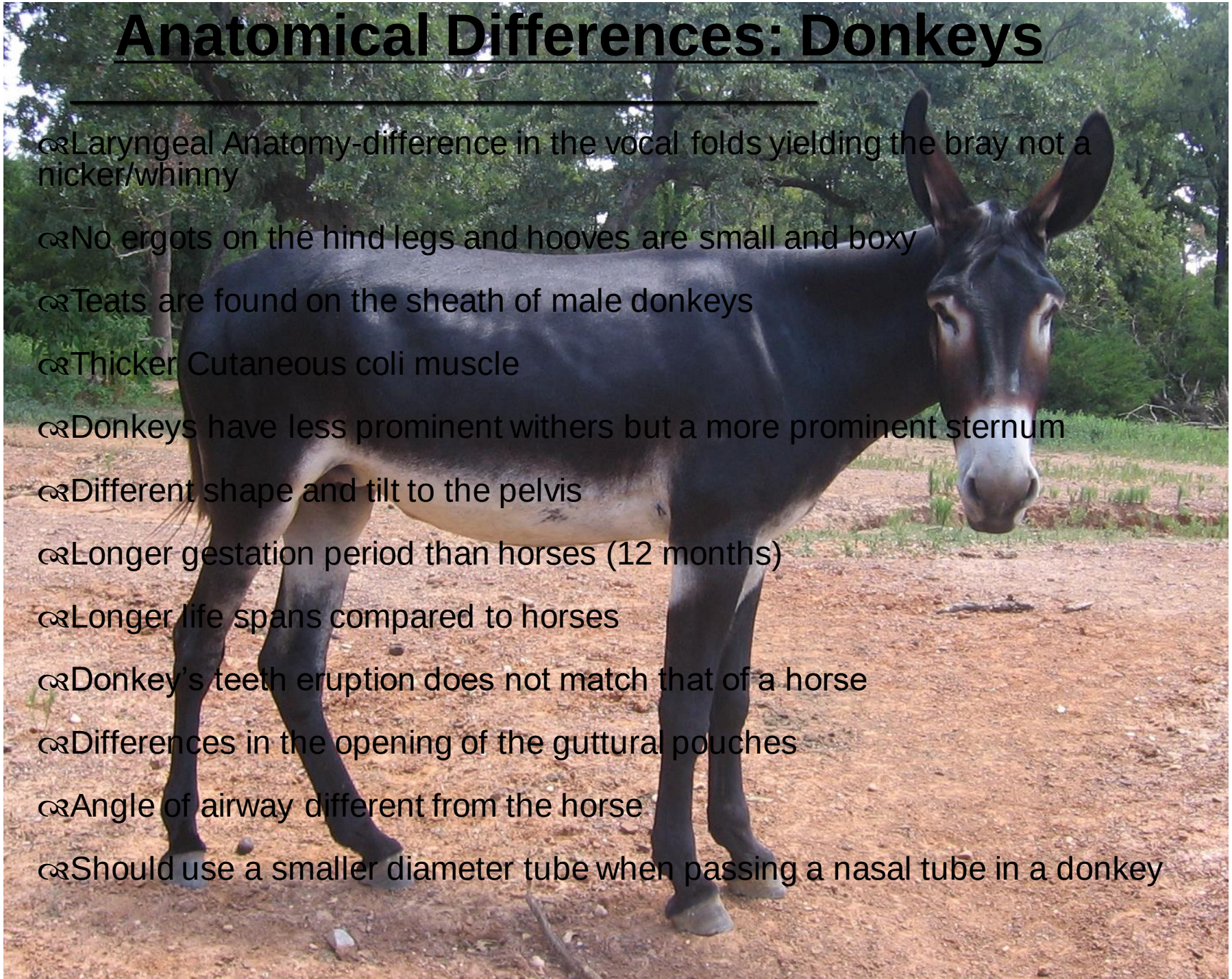


31 Chromosomes



32 Chromosomes

Anatomical Differences: Donkeys



- Laryngeal Anatomy-difference in the vocal folds yielding the bray not a nicker/whinny
- No ergots on the hind legs and hooves are small and boxy
- Teats are found on the sheath of male donkeys
- Thicker Cutaneous coli muscle
- Donkeys have less prominent withers but a more prominent sternum
- Different shape and tilt to the pelvis
- Longer gestation period than horses (12 months)
- Longer life spans compared to horses
- Donkey's teeth eruption does not match that of a horse
- Differences in the opening of the guttural pouches
- Angle of airway different from the horse
- Should use a smaller diameter tube when passing a nasal tube in a donkey

Body Condition Scoring Donkeys

#1= Thin

#2= Moderate

#3= Ideal

#4 Fat/ #5 Obese

Donkey Breeds

- 189 listed breeds of donkeys (Domestic Animal Diversity System) (https://web.archive.org/web/20090902110918/http://www.save-foundation.net/pdf/donkey.pdf)

- 3 main types of wild asses

- Burro has been listed as a specie of donkey or to refer to the “feral” or ”free roaming” donkeys in the US

Wild donkeys/burros- origin

- Donkeys first came to the Americas in late 1400's on second voyage of Columbus
- Later donkeys reintroduced to produce mules
  - Gift to George Washington from King of Spain
    - Andalusian-Royal Gift
    - Maltese Jack
- Wild donkeys/burros
  - Loss of habitat
  - Adoptions
  - Descendants of donkeys coming west/packing and mining industry
  - Farming industry in Central and South America

Wild vs domesticated asses

- Domestication dates back over 5,000 years from remains of donkey skeletons in Egyptian tombs (https://phys.org/news/2008-03-domestication-donkey.html#nRlv)
- African lineage- Somalian and Nubian
  - Claimed to be domesticated donkeys
  - Nubian wild ass now extinct
- Eurasian lineage-Kiang and Onager
  - Claim was never domesticated
  - Critically endangered due to limited water supplies and war

Wild Equid- Onager

Equus hemionus

Wild Equid- Kiang (Tibetan Wild Ass)

Equus kiang

Wild Equid- Somalian Wild Ass

Equus africanus

Donkeys and desert eco-system

- Evolved from the desert
- Many adaptive traits that make them suitable for the desert
  - Large ears to dissipate heat
  - Shape of nostrils
  - Shape of eyes for sand storms and location of tear ducts
  - Base line temperature is lower than a horse (98.5)
  - Ability to recycle urea and water consumption
  - Thrifty gene/fast or famine situation (mobilization of fat)
- Browsers vs grazers
- Consume poor quality forages commonly found in desert
  - High Fiber, low energy plants
  - Longer Gastrointestinal transit time for digestion
  - Possible different Microbiome
- Water consumption
- Benefits for wildlife/Environment
  - Eric Lungdon's research- Dig wells when water is not available https://www.youtube.com/watch?v=9tWNOlJ9yoY

Feeding Behavior

- Donkeys have been compared to small ruminants in their ability to digest poor quality feeds, meaning feeds/forages that are high in fiber
- Tend to think donkeys and mules can survive on less feed when compared to a horse
- Diets in developing countries are very high in fiber and low in protein and energy
- Donkeys often browse on a variety of plants including the bark of trees or wooden fences
- Not uncommon for donkeys to consume plants high in tannins

Feeding Behavior

- Research has shown donkeys to have a slower gastrointestinal tract time, meaning what they eat stays in their digestive track longer compared to a horse, therefore they can maximize digestion and possibly nutrient absorption

- Donkeys continue to eat during times of dehydration

- Donkey and mules ability to dissipate heat aid to their possible need for less water when compared to a horse in drought type climates

Grazing Behavior

- Grazing- preferred means of ingestion in adult equine
- Browsing- seeking out specific plants (more common in donkeys) adopted when grass or grazing source is scarce
- Donkeys tend to select (browse) for coarse grasses
  - *Will readily consume plants with tannins*
  - *Greater danger of selecting poisonous plants due to consuming a larger variety of plants*
- Horses prefer legumes (clover or alfalfa) and grasses
  - *Young plants (short grass) vs. more mature plants with greater fiber (steams)*
  - *Young plants or plants with increased leaf % increases intake/bite*
  - *Timothy and White Clover favorites*
  - *Bark, root, soil, acorns and aquatic plants*

Donkey Communication

- More limited repertoire of vocalizations than horses
- 5 types of vocalization in donkeys
  1. Grunts
  2. Growls
  3. Sorts
  4. Whuffles
  5. Bray- used to attract other donkeys, stay in touch with 1 another and anticipating food

http://www.youtube.com/watch?v=hMndb7eQDp8&feature=related

Social Behavior

- Donkeys prefer companions
  - Will mourn the death of a mate
- Become very attached to one another
- Will bond for life
- Socially territorial creatures versus harems
- Jacks are very vicious when fighting

Grooming Behavior: Rolling

- Horses prefer to roll in bare or sandy spots or spots where others have rolled
- Very common in mules, zebras and donkeys
- May spread dirt on backs to decrease biting insects
- Almost always roll in a new place
- Could have a territorial reference

Survey of serum amyloid a and pathogen frequency in recently captured feral donkeys

Sara Jerele [1], Lauren Brizgys[2], Samantha Mapes[3], Francisco Javier Navas Gonzalez[4], Eric Davis[1], Nicola Pusterla[3], **Amy McLean[2]**

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[2] *Animal Science, University of California Davis, Davis, USA*

[3] *Equine Viral Disease Laboratory, Department of Pathology, Microbiology, and Immunology, School of Veterinary Medicine, Davis, USA*

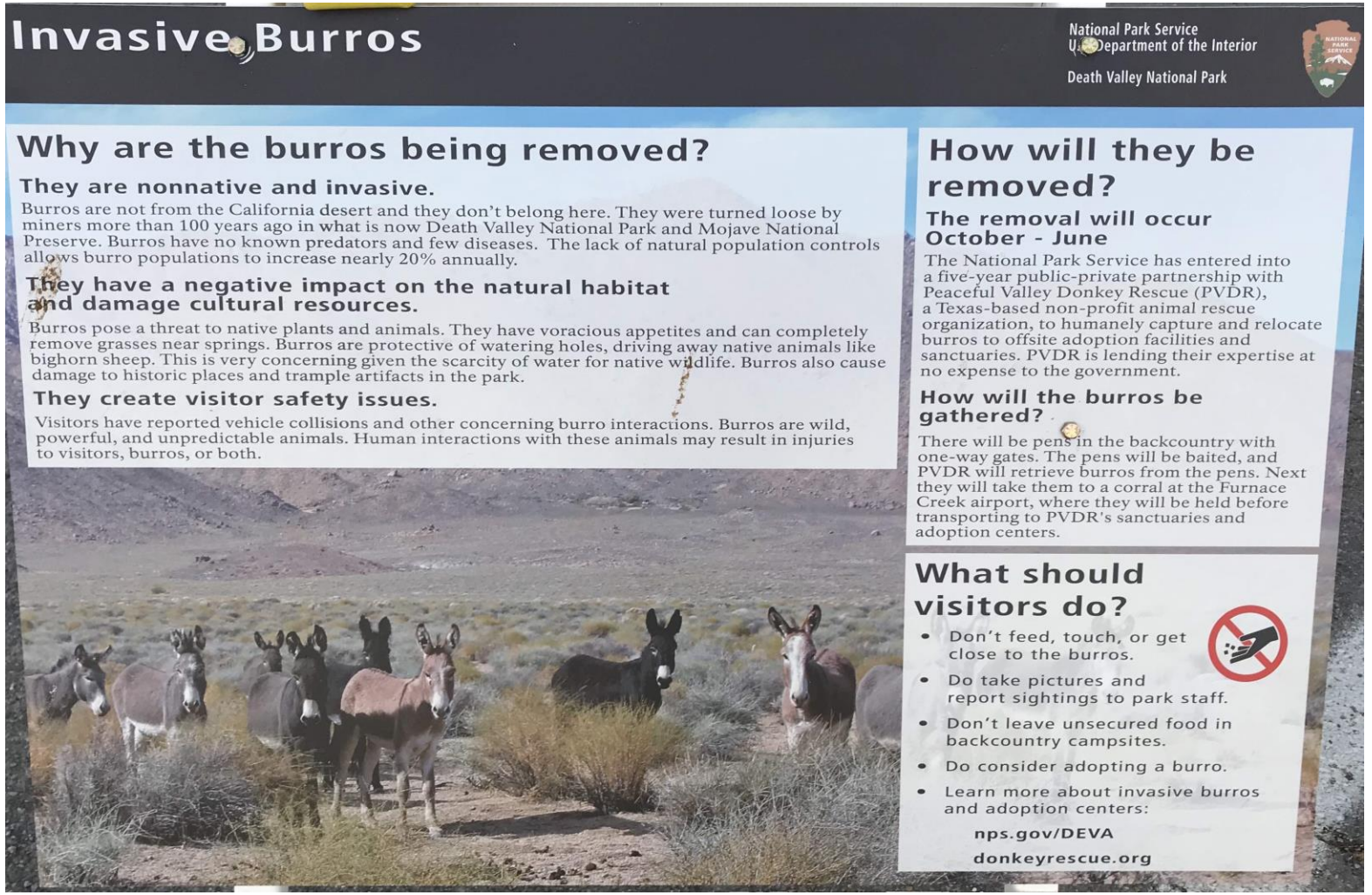
[4] *Faculty of Veterinary Sciences, Genetics Department, University of Córdoba, Córdoba, USA*

Emerging concern- Feral donkey populations:

How to control the numbers?

Impact on the ecosystem

Impact of domestication- welfare and management




www.freeworldmaps.net


Oregon
Idaho
Nevada
California
San Francisco
DEATH VALLEY NATIONAL PARK
Los Angeles
North Pacific Ocean
U.S.
MEXICO
Nevada
Ubehebe Crater
Scotty's Castle
Rhyolite (Ruins)
Beatty
DEATH VALLEY NATIONAL PARK
Bullfrog (Ruins)
Amargosa Range
Panamint Mountains
Devils Hole
Skidoo (Ruins)
Visitor Center
Badwater
Telescope Peak
Dantes View
DEATH VALLEY
California
40 Miles
0
0
40 Kilometers


Death Valley National Park
Airport Elevation -211
Furnace Creek Visitor Center
1 mile
Pay Park Entrance Fee
at Visitor Center

Closer look at the Donkeys of Death Valley

Introduction

- Recent removal of feral donkeys from public land has increased concerns for welfare and disease transmission to other equids

- Relocation process to new environments and introduction to other equids may cause disease outbreaks

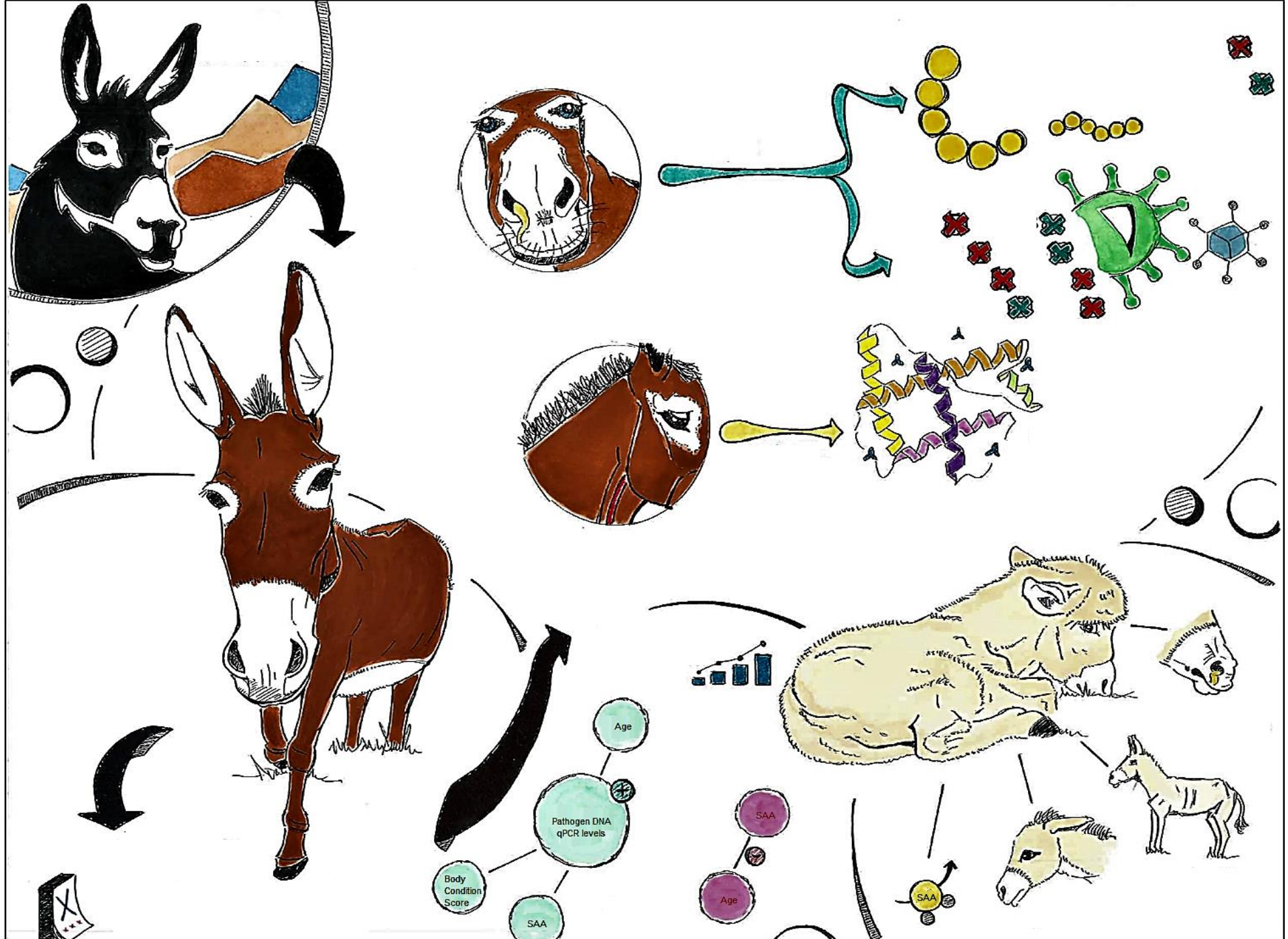
- Little is known about the health of feral donkeys prior to relocation

Introduction

- Serum Amyloid A (SAA) is an acute phase protein produced by the liver
- Increases or responds (acutely) to inflammation from infection or injury and can be tested on site (StableLab, Sligo, Ireland)
- Can assist in health assessments of feral donkeys
- Stall-side test (10 mins) can correlate with the presence of viral infections
- Results can inform biosecurity measures for handling these animals
- Developing an understanding of pathogens and infectious diseases of feral donkeys:
    1. Improve their welfare
    2. Prevent transmission of pathogens to domestic equid

Objectives:

1. Begin to define base line values for SAA in healthy donkeys
2. Monitoring of disease by testing an inflammatory marker (SAA)
3. Measure frequency of pathogens in recently captured donkeys
4. Can SAA be used as a helpful tool in identifying sick/unhealthy donkeys


Age
Pathogen DNA qPCR levels
Body Condition Score
SAA
SAA
Age
SAA

Burro Radio collar Project: Mojave and Death Valley

Sarah King, Phd[1], Kathryn Schoenecker[2] and Amy McLean, PhD[3]

[1]Colorado State University

[2]United States Geological Services

[3]UC Davis

Peaceful Valley Donkey Rescue


TANK
XING

Introduction

- Objective 1: Improve our understanding of donkey ecology
- Objective 2: Improve our understanding of donkey/burro migration patterns
- Objective 3: Measure disease and affects on migration patterns

Materials and Methods

- N= 100 donkeys/burros
  - Actually n = 23
    - 3 males collared
    - 20 females
- Locations: Fort Irwin and Death Valley, CA
- Seasons: hot dry and cool/wet
- Tested for seasonal burro habitat selection in response to a set of environmental covariates.
- Tested for disease by nasal swab and PCR
- Statistics based on GMLX for donkey area and location
- R stats used for location


RROS to 41444

Results

- **Table 1.** Mean and median home range sizes for burros during the dry (Apr – Oct) and wet (Nov – Mar) season.

Season	Number of Individuals	Mean	Median	SD
Dry	14	159.35	63.89	212.43
Wet	12	318.37	111.40	417.65
Dry2020	9	153.63	39.06	187.37
Dry2021	10	94.90	72.80	74.85
Wet2021	8	186.59	94.93	231.54
Wet2022	5	529.22	480.88	582.37

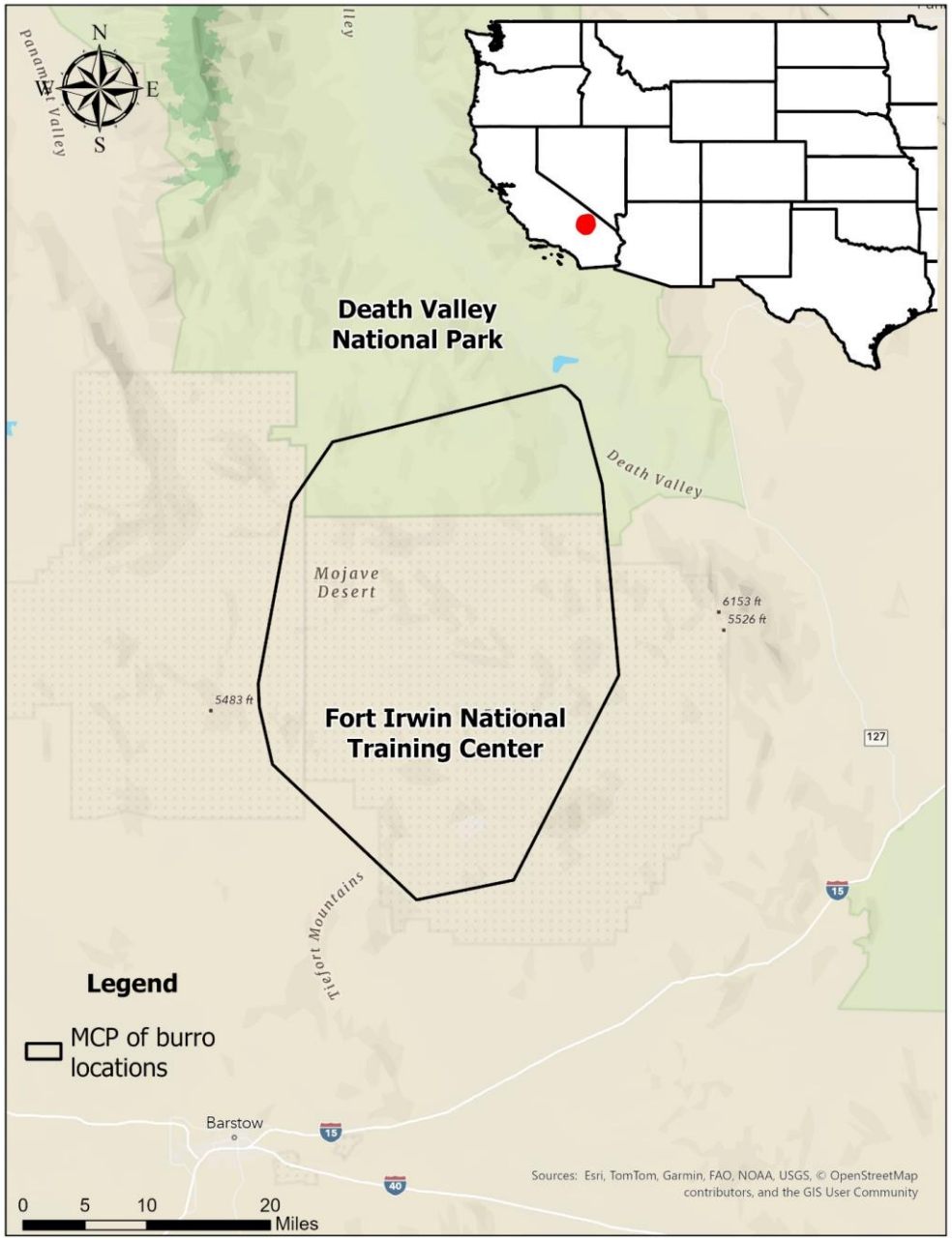
- **Table 2.** Model selection table of home range sizes as a function of strep, AHV5, precipitation, vegetation production (EVI), and season.

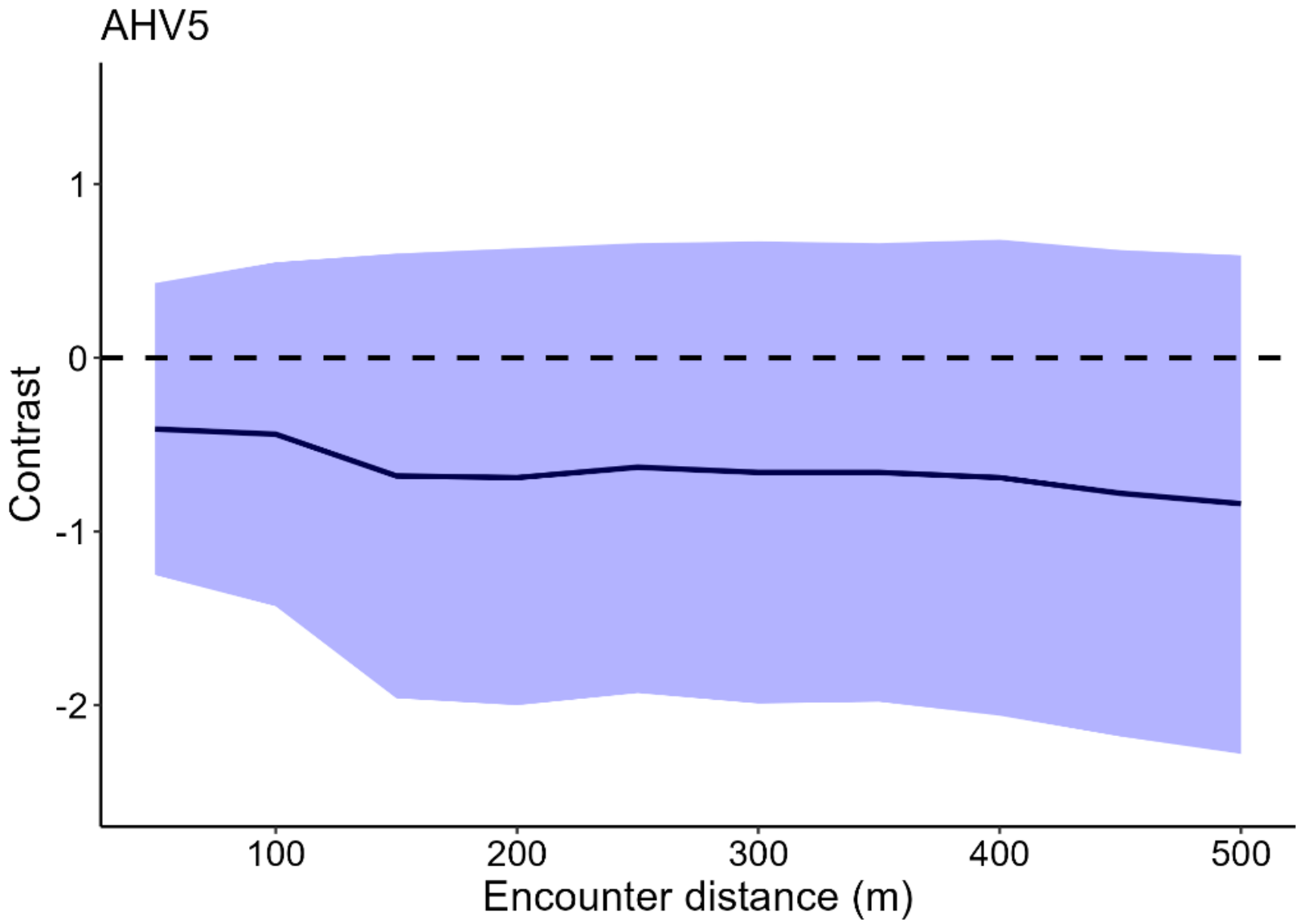
Model	K	AIC_c	ΔAIC_c	w_i
Precip*Season	6	409.2	0.00	0.40
Precip	4	409.8	0.62	0.29
Precip*EVI	6	410.3	1.13	0.22
Precip*Strep	6	413.4	4.25	0.05
Precip*AHV	6	414.0	4.81	0.04
AHV	4	419.7	10.50	0.00
Season	4	420.3	11.09	0.00
Strep*Season	6	421.4	12.21	0.00
EVI	4	421.4	12.25	0.00
Strep	4	421.7	12.49	0.00
EVI*Season	6	422.4	13.21	0.00
AHV*EVI	6	423.9	14.78	0.00
AHV*Season	6	423.9	14.78	0.00
AHV*Strep	6	425.3	16.19	0.00
EVI*Strep	6	425.7	16.53	0.00

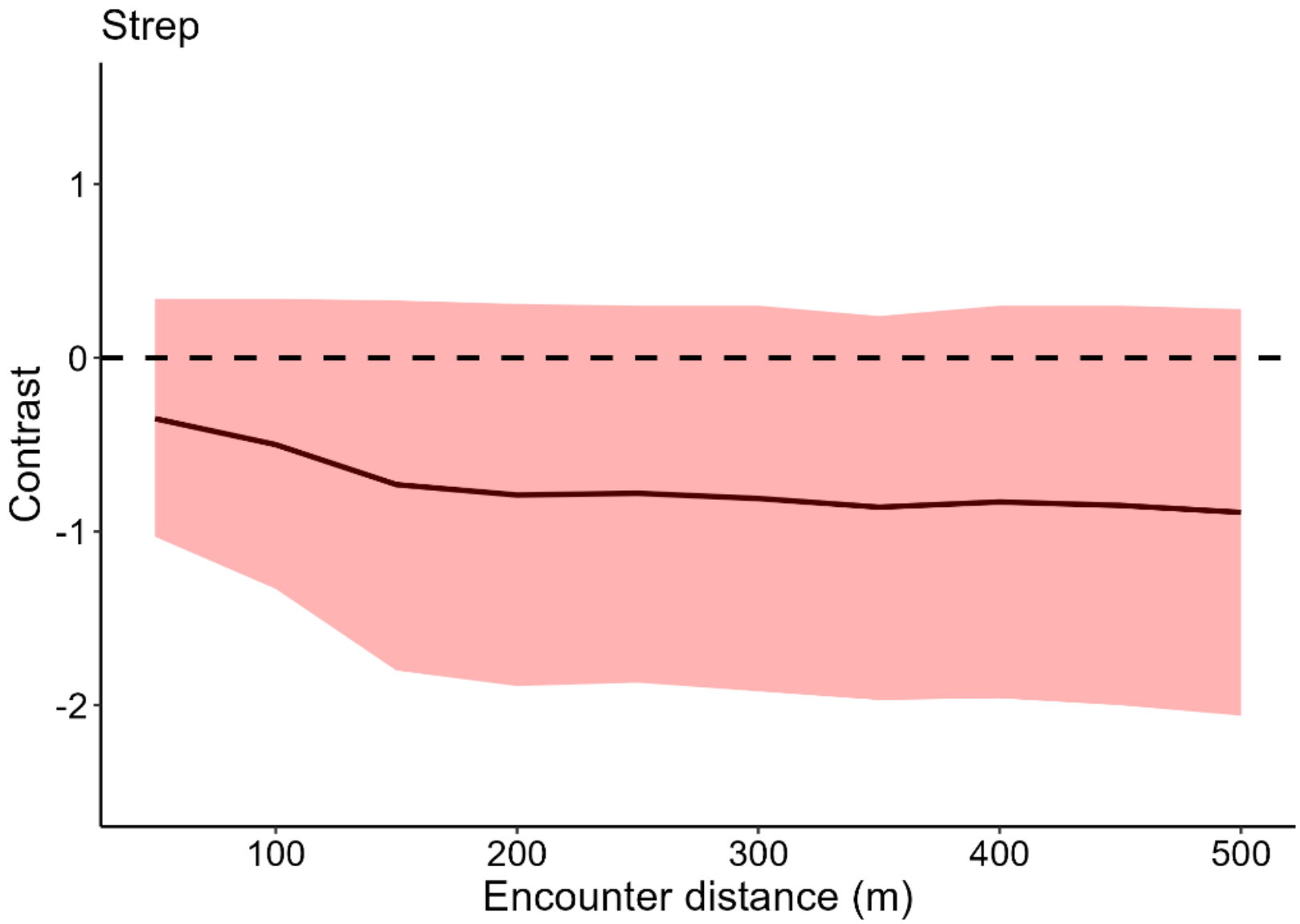
Table 3. Model selection table of hourly step lengths as a function of strep, AHV5, and season.

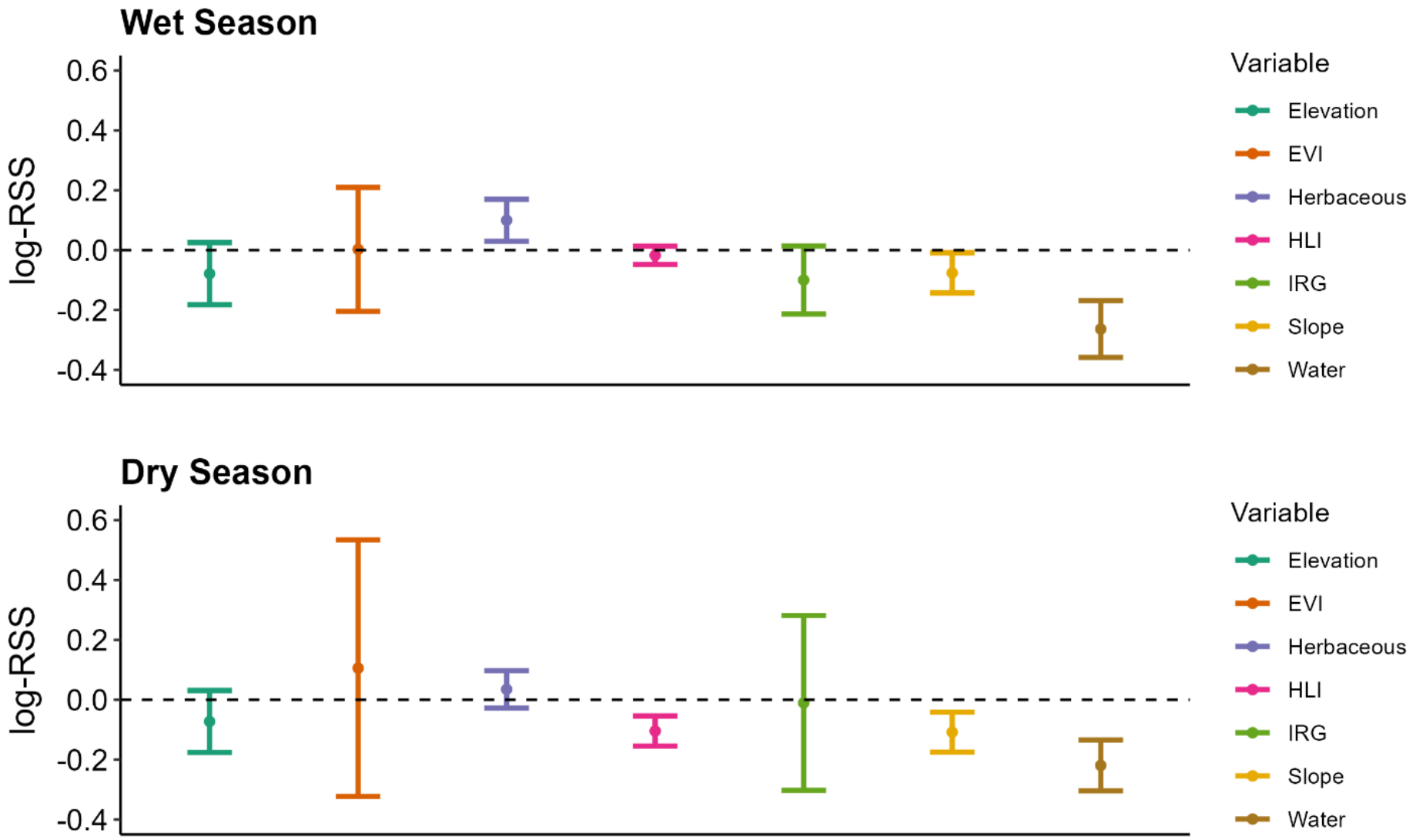
Model	K	AIC_c	ΔAIC_c	w_i
Strep	4	4037273	0.00	0.52
AHV	4	4037275	1.87	0.21
Season	4	4037275	2.24	0.17
Strep*Season	6	4037277	4.00	0.07
AHV*Season	6	4037279	5.87	0.03

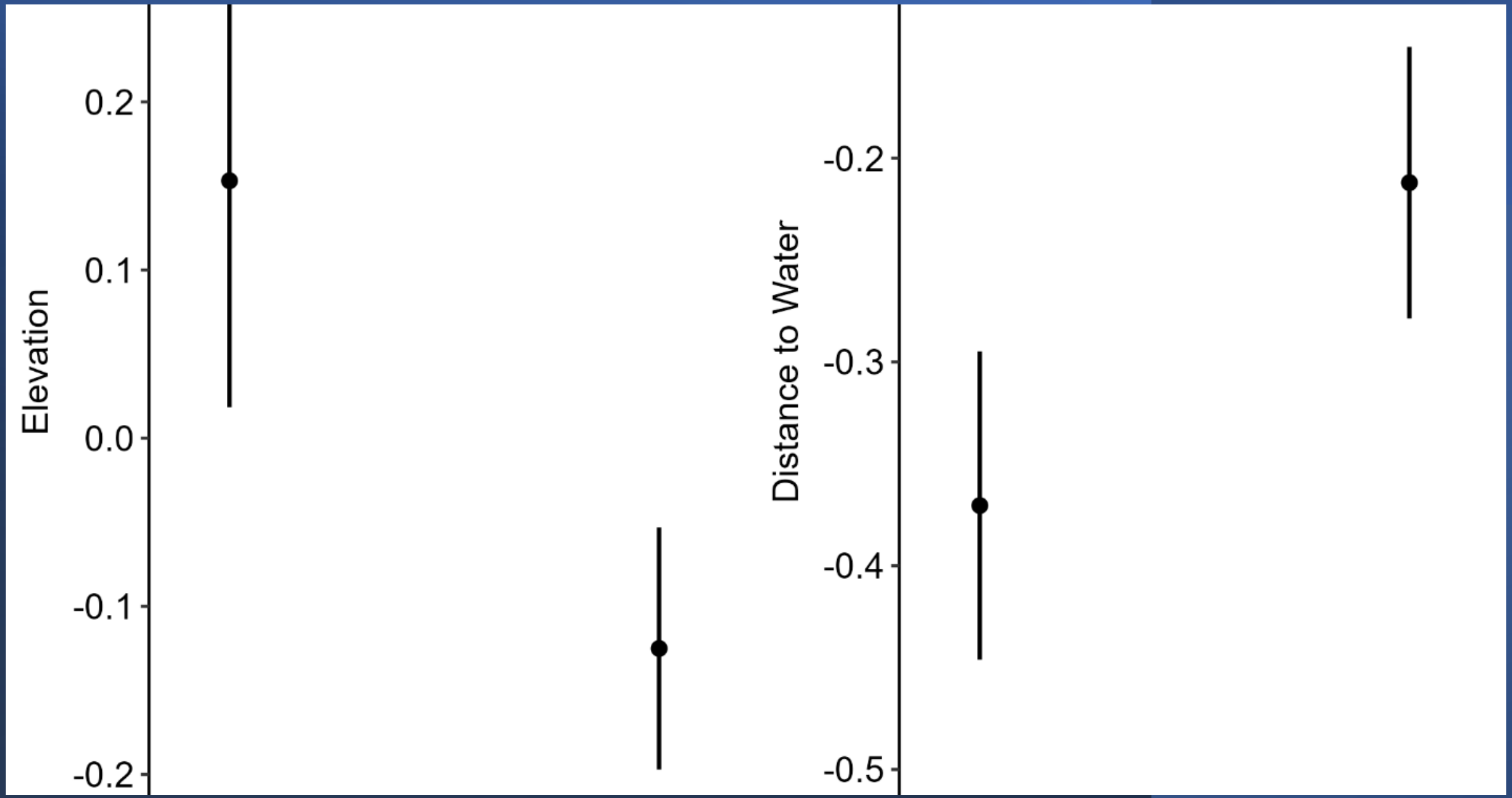
Figure 1. Location of study area, Death Valley National Park and Fort Irwin National Training Center, California, USA.

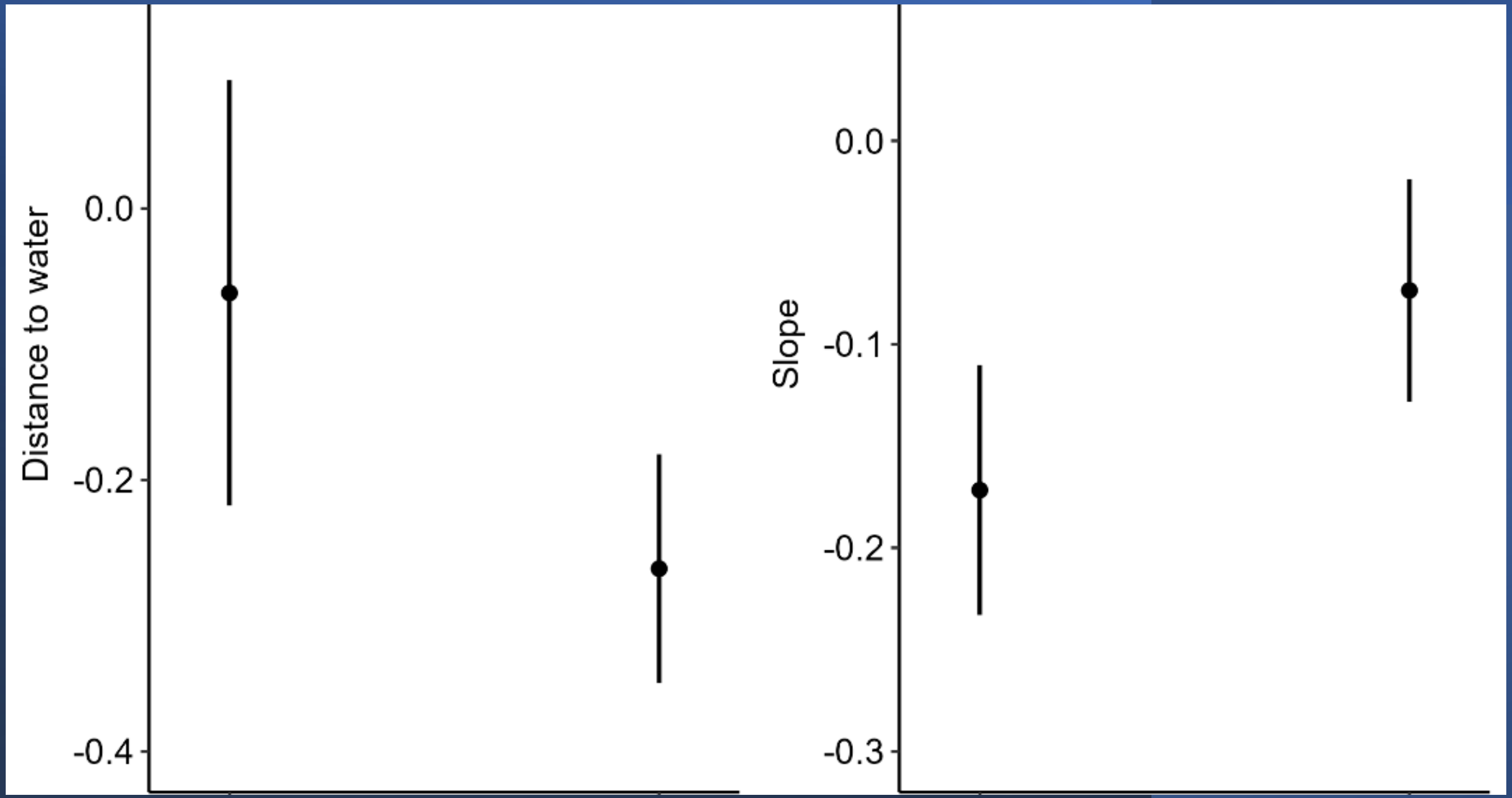



AHV5
Contrast
1
0
-1
-2
100
200
300
400
500
Encounter distance (m)


Strep
Contrast
1
0
-1
-2
100
200
300
400
500
Encounter distance (m)


Wet Season
log-RSS
0.6
0.4
0.2
0.0
-0.2
-0.4
Variable
Elevation
EVI
Herbaceous
HLI
IRG
Slope
Water
Dry Season
log-RSS
0.6
0.4
0.2
0.0
-0.2
-0.4
Variable
Elevation
EVI
Herbaceous
HLI
IRG
Slope
Water


Elevation
0.2
0.1
0.0
-0.1
-0.2
Distance to Water
-0.2
-0.3
-0.4
-0.5


Distance to water
0.0
-0.2
-0.4
Slope
0.0
-0.1
-0.2
-0.3