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Behavioral effects of contraception management: the use of porcine zona pellucida on wild horses

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Behavioral effects of contraception management: the use of porcine zona pellucida on wild horses



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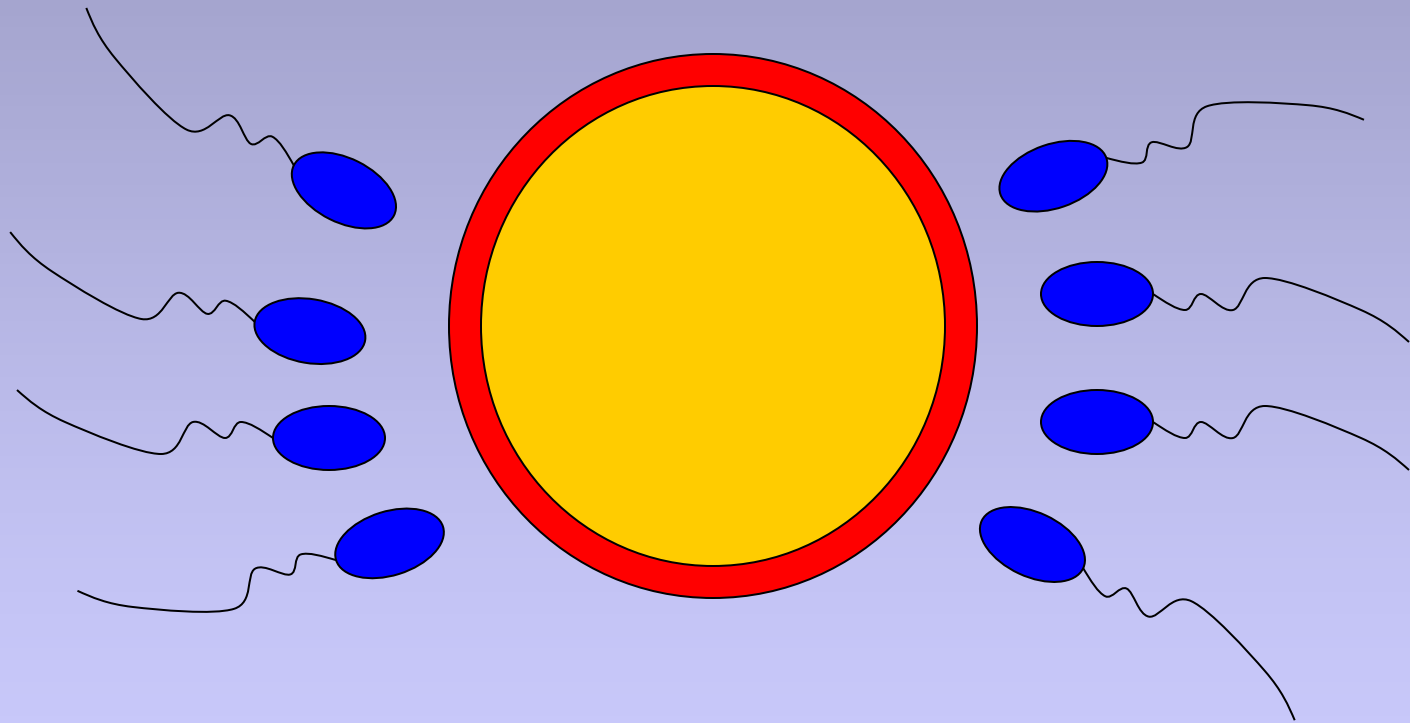
cmvnunez@princeton.edu

Photo by Sue Stuska

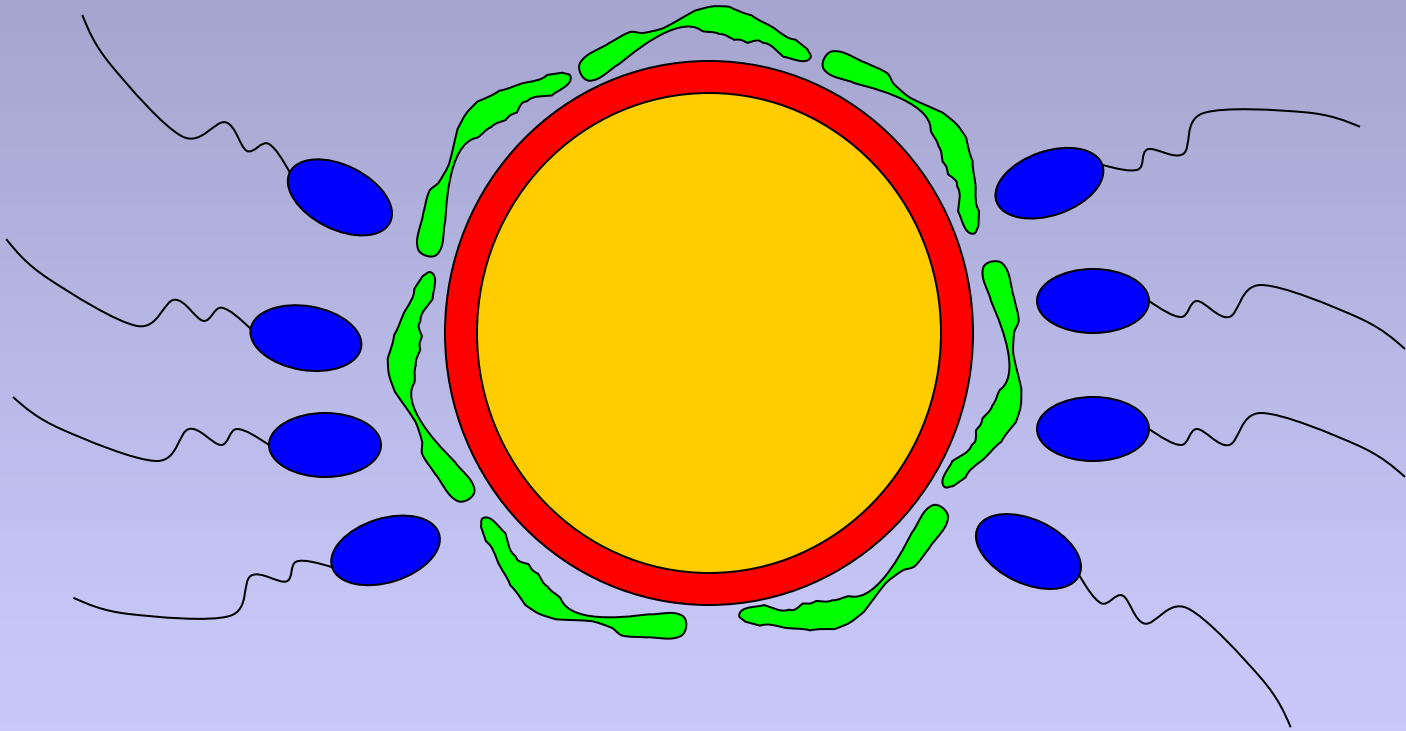
Expansion of ungulate populations



Traditional forms of contraception



PZP contraception



PZP and behavior

- Harem groups
 - Harem male, females, offspring
 - Stable, long lasting
- Non-territorial



PZP and behavior

- On few populations
- During the breeding season
- Without true controls

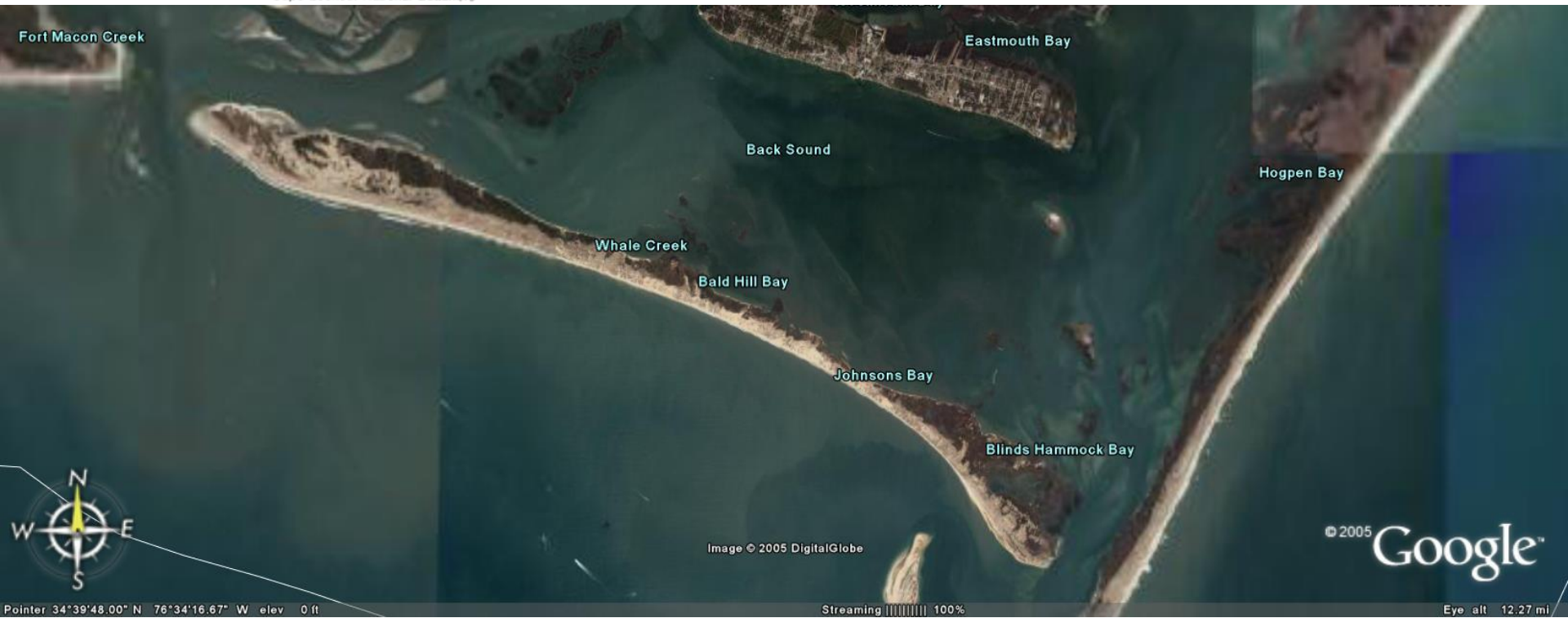


Wild Horses of Shackleford Banks website



Shackleford Banks, North Carolina

Cape Lookout National Seashore,
National Park Service



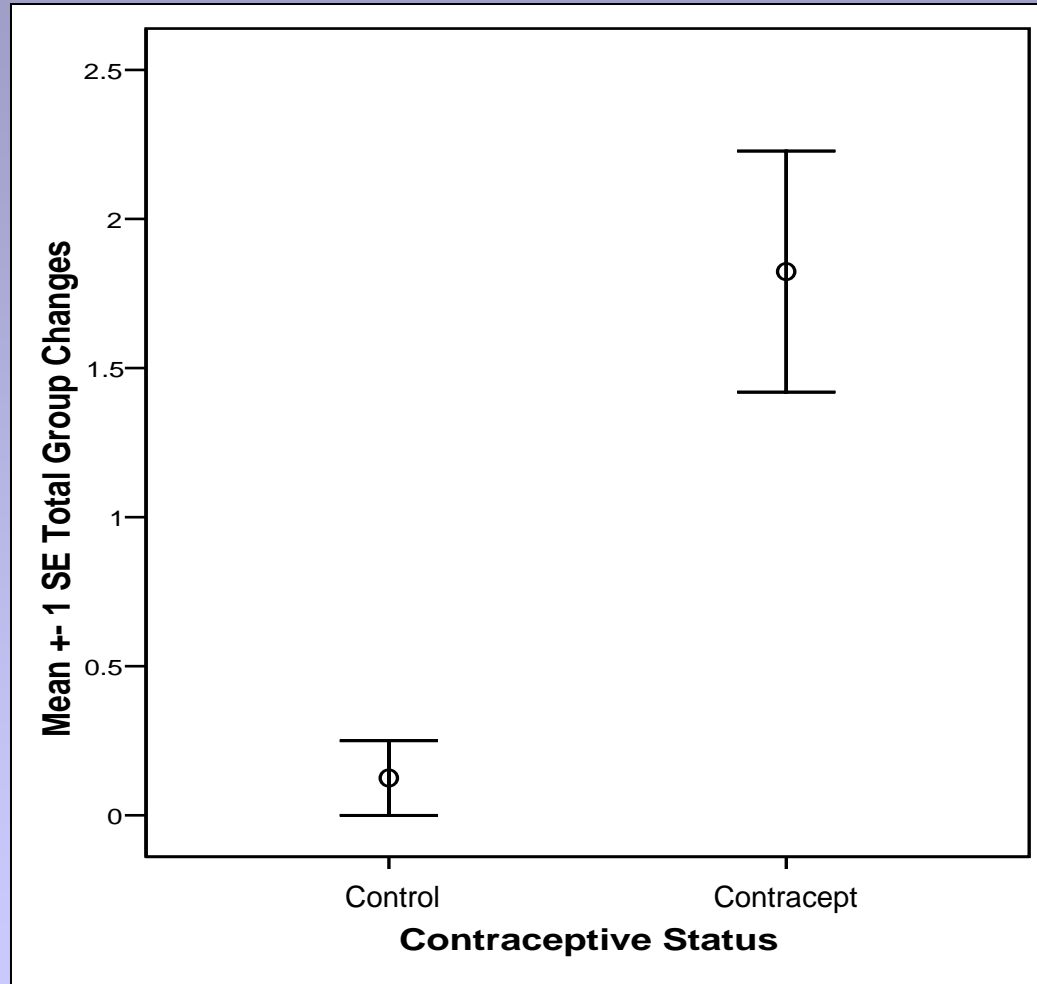
- Contracepted ♀(n=18); Control ♀(n=8)
- December 2005- February 2006
- 102.2 hours of observation





- Number of group changes
- Number of groups visited

Number of group changes

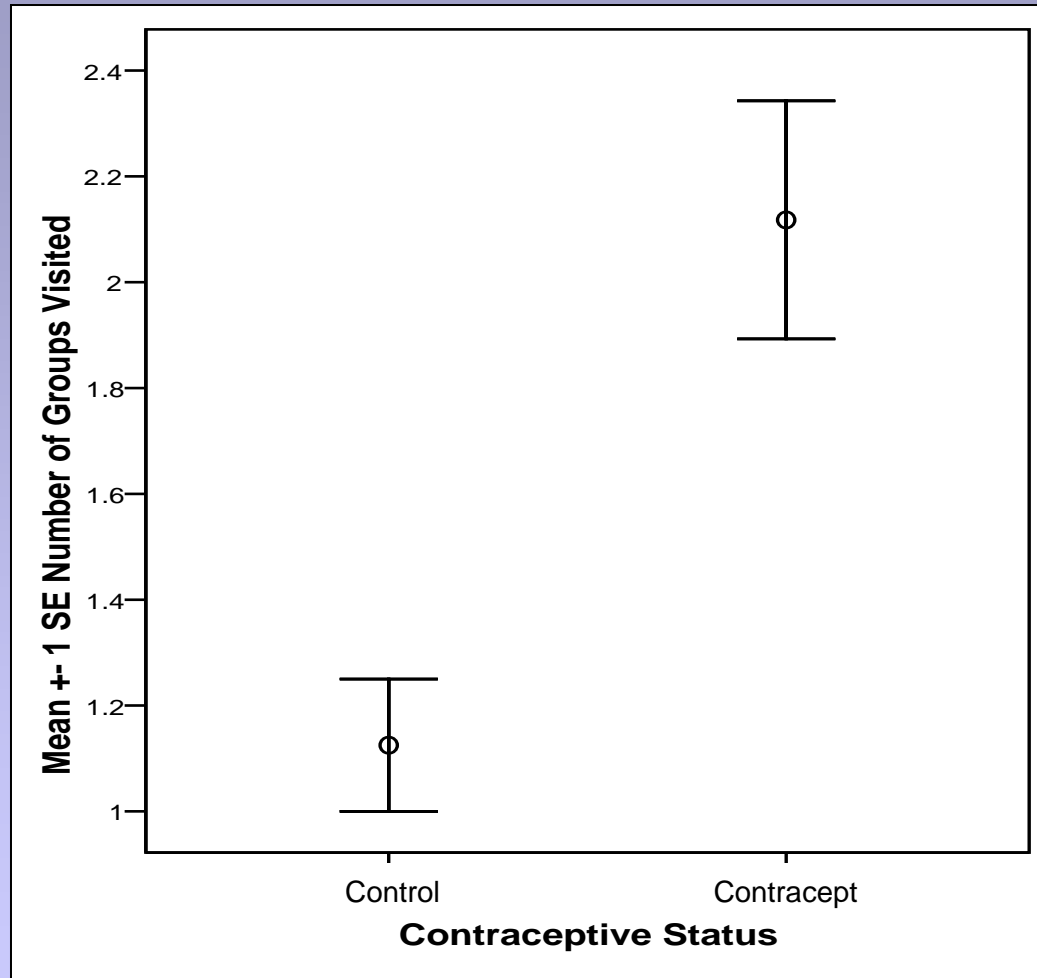


Generalized Linear Model; $F_{2,23} = 8.47$, $p = 0.002$

- PZP treatment, $t = 2.34$, $p = 0.03$

- mare age, $t = -1.81$, $p = 0.08$

Number of groups visited



Generalized Linear Model; $F_{2,23} = 7.18$, $p = 0.001$

- PZP treatment, $t = 2.52$, $p = 0.02$

- mare age, $t = -1.87$, $p = 0.07$

Why do we care?



What can we do?

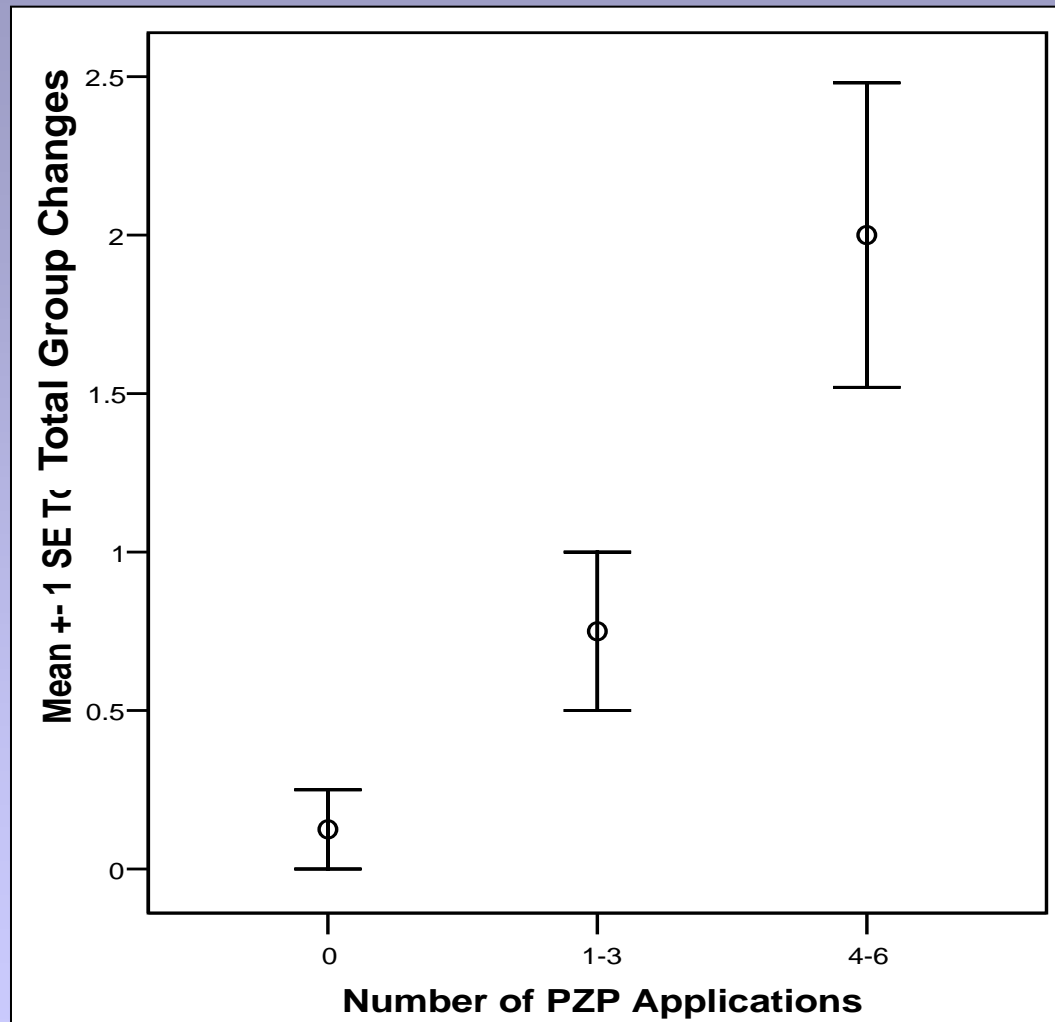


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PZP is effective over multiple years

- 1st year, 5.9% pregnancy rate
- 2nd year, 14.0% pregnancy rate
- 3rd year, 32.0% pregnancy rate
- 4th year, 47.5% pregnancy rate

Number of PZP applications and group changes



Generalized Linear Model; $F_{2,23} = 10.68$ $p = 0.001$

- number of PZP inoculations, $t = 2.95$, $p = 0.01$

- mare age, $t = -1.80$, $p = 0.09$

Birth rates on Shackleford Banks

Current management strategy

$(8 \text{ controls} \times 0.66 \text{ PR}) + (50 \text{ pzp} \times 0.06 \text{ PR}) =$

8.24 foals

Contraception every 2nd year

$(8 \text{ controls} \times 0.66 \text{ PR}) + (25 \text{ pzp} \times 0.06 \text{ PR}) + (25 \text{ pzp} \times 0.14 \text{ PR}) =$



10.26 foals



Contraception every 3rd year

$(8 \text{ controls} \times 0.66 \text{ PR}) + (13 \text{ pzp} \times 0.06 \text{ PR}) + (13 \text{ pzp} \times 0.014 \text{ PR}) + (13 \text{ pzp} \times 0.32 \text{ PR}) =$



12.03 foals



Birth rates on Shackleford Banks

Current management strategy

$(8 \text{ controls} \times 0.66 \text{ PR}) + (50 \text{ pzp} \times 0.06 \text{ PR}) =$

8.24 foals

Contraception every 2nd year

$(8 \text{ controls} \times 0.66 \text{ PR}) + (25 \text{ pzp} \times 0.06 \text{ PR}) + (25 \text{ pzp} \times 0.14 \text{ PR}) =$



10.26 foals



Contraception every 3rd year

$(8 \text{ controls} \times 0.66 \text{ PR}) + (13 \text{ pzp} \times 0.06 \text{ PR}) + (13 \text{ pzp} \times 0.014 \text{ PR}) + (13 \text{ pzp} \times 0.32 \text{ PR}) =$



12.03 foals



Contraception and removal costs

Current management strategy– remove 60% of newborns

Contraception Removal

$$(50 \times \$25.00) + (5 \times \$500.00) = \$3750.00 / \text{year}$$

Contraception every 2nd year

Contraception Removal

$$(25 \times \$25.00) + (6 \times \$500.00) = \$3625.00 / \text{year}$$

Contraception every 3rd year

Contraception Removal

$$(13 \times \$25.00) + (7 \times \$500.00) = \$3825.00 / \text{year}$$

Contraception and removal costs

Current management strategy– remove 60

Contraception Removal

$$(50 \times \$25.00) + (5 \times \$1000.00) = \$6250.00$$

Contraception every 2nd year

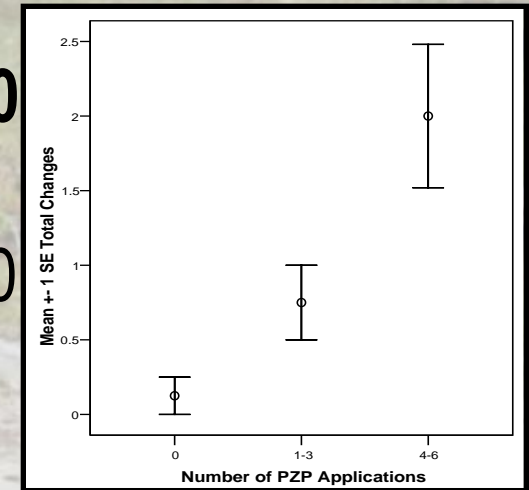
Contraception Removal

$$(25 \times \$25.00) + (6 \times \$1000.00) = \text{\textcolor{red}{\$6625.00 / year}}$$

Contraception every 3rd year

Contraception Removal

$$(13 \times \$25.00) + (7 \times \$1000.00) = \$7325.00 / \text{year}$$



Additional research

- Behavioral
 - Breeding season
 - Inter-harem effects
 - Intra-harem effects
 - Comparison of these behaviors before and after the administration of PZP
- Physiological
 - Hormone profiles of contracepted vs. control females
- Citizen science
 - Digital analysis of photos of harem males before and after the administration of PZP

Behavioral effects on other species???

McShea, Monfort et al. 1997

Cervus canadensis



Heilmann, Garrott et al. 1998

Odocoileus virginianus

Behavioral effects on other species???



Loxodonta africana



Acknowledgements

- Carolyn Mason, Foundation for Shackleford Horses
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- EEB Department, Princeton University

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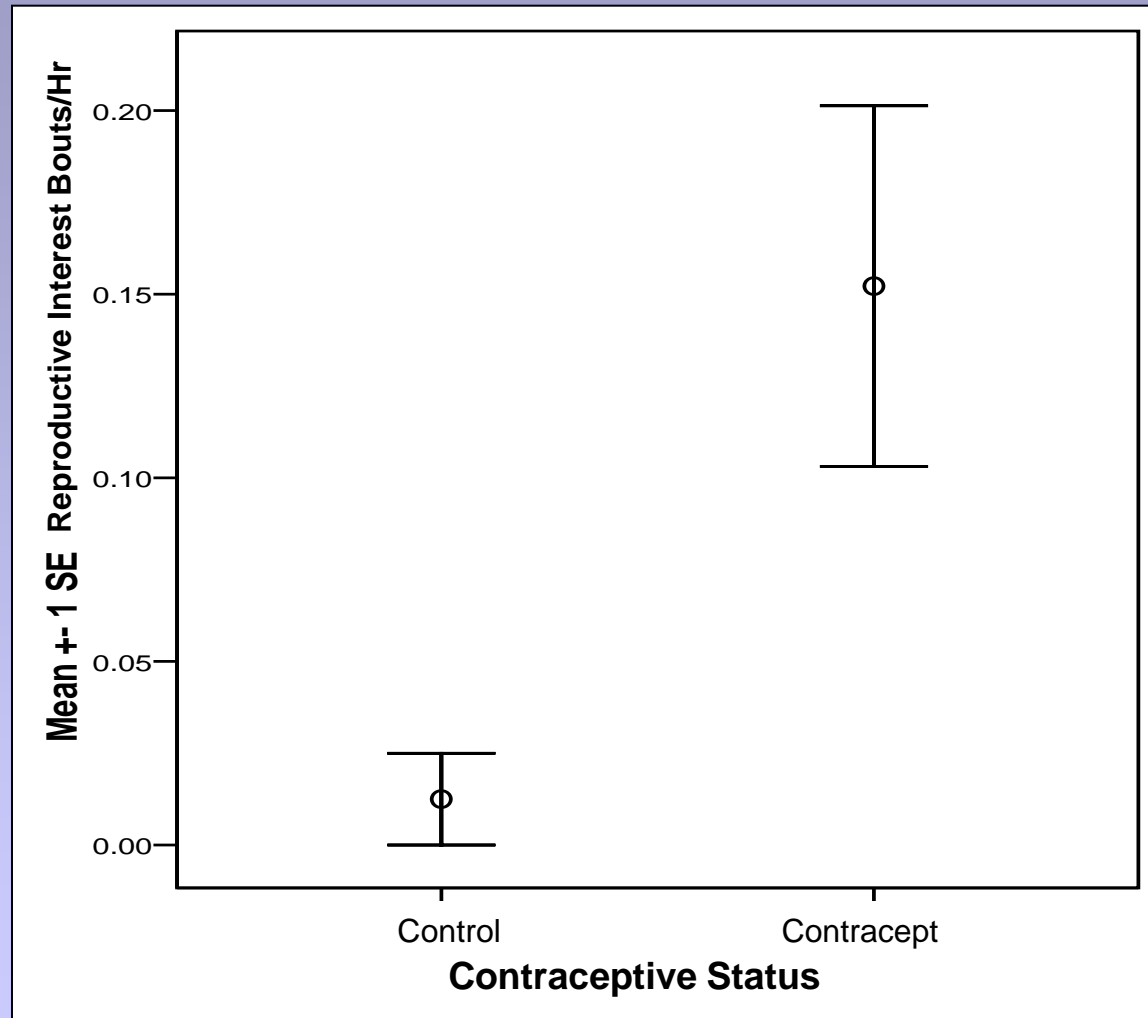
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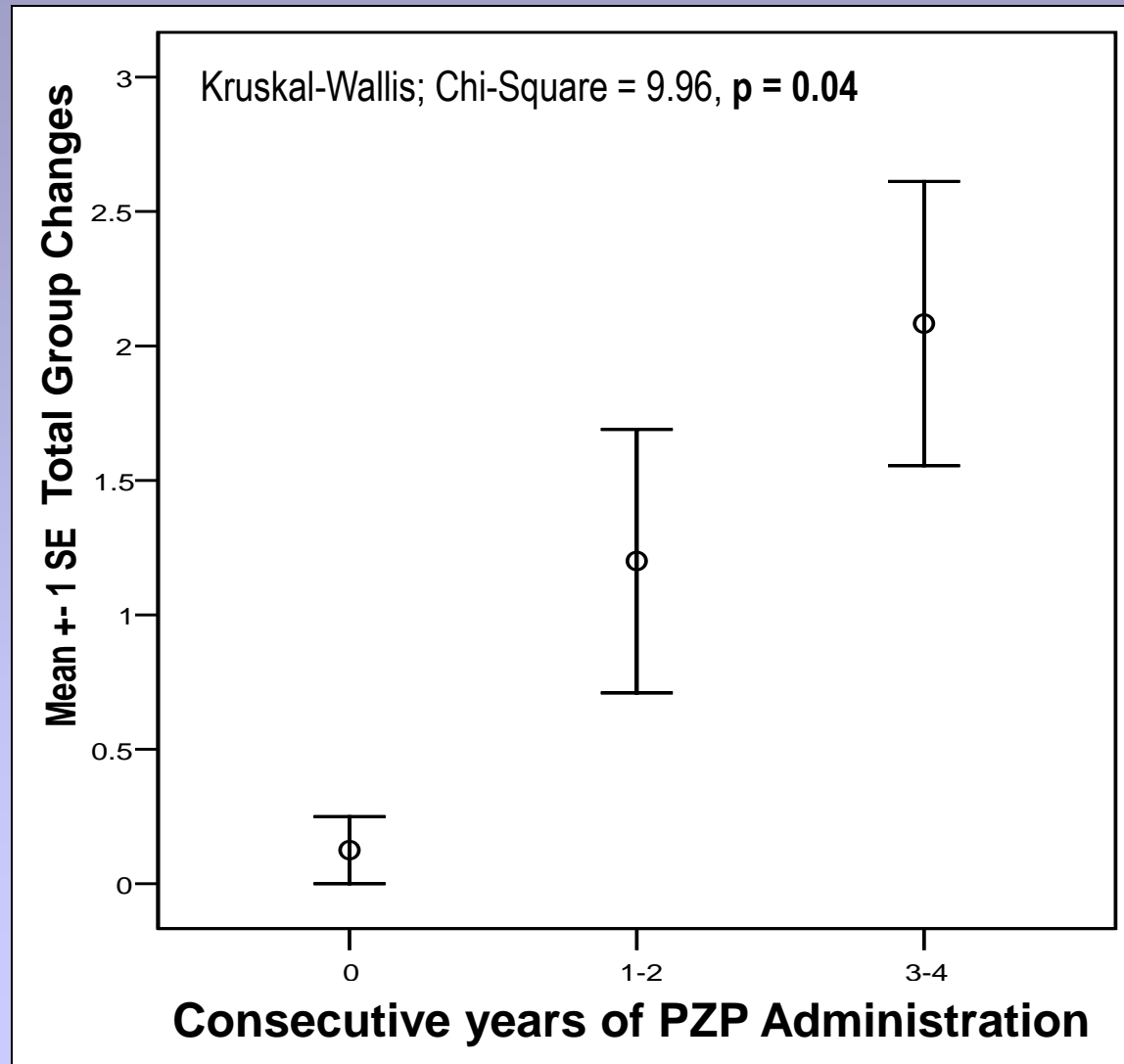
Photo by Sue Stuska

Reproductive interest



Mann Whitney; $U = 14.00$, $Z = -2.37$, $p = 0.04$

Group changes and consecutive years of PZP administration



Number of groups visited and consecutive PZP applications

