

# *Why might it be important to learn more about loon music?*

Jay Mager

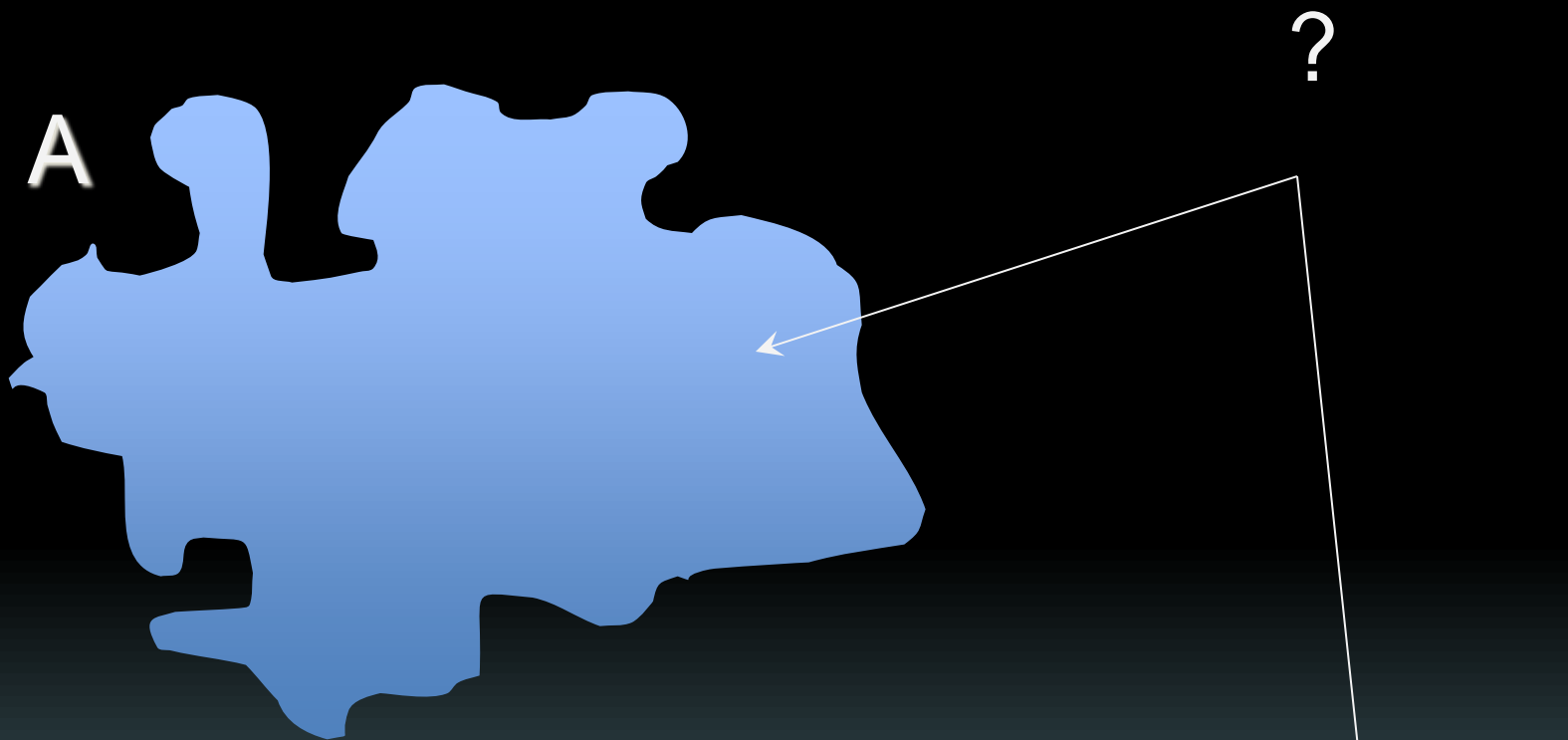
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Charles Walcott

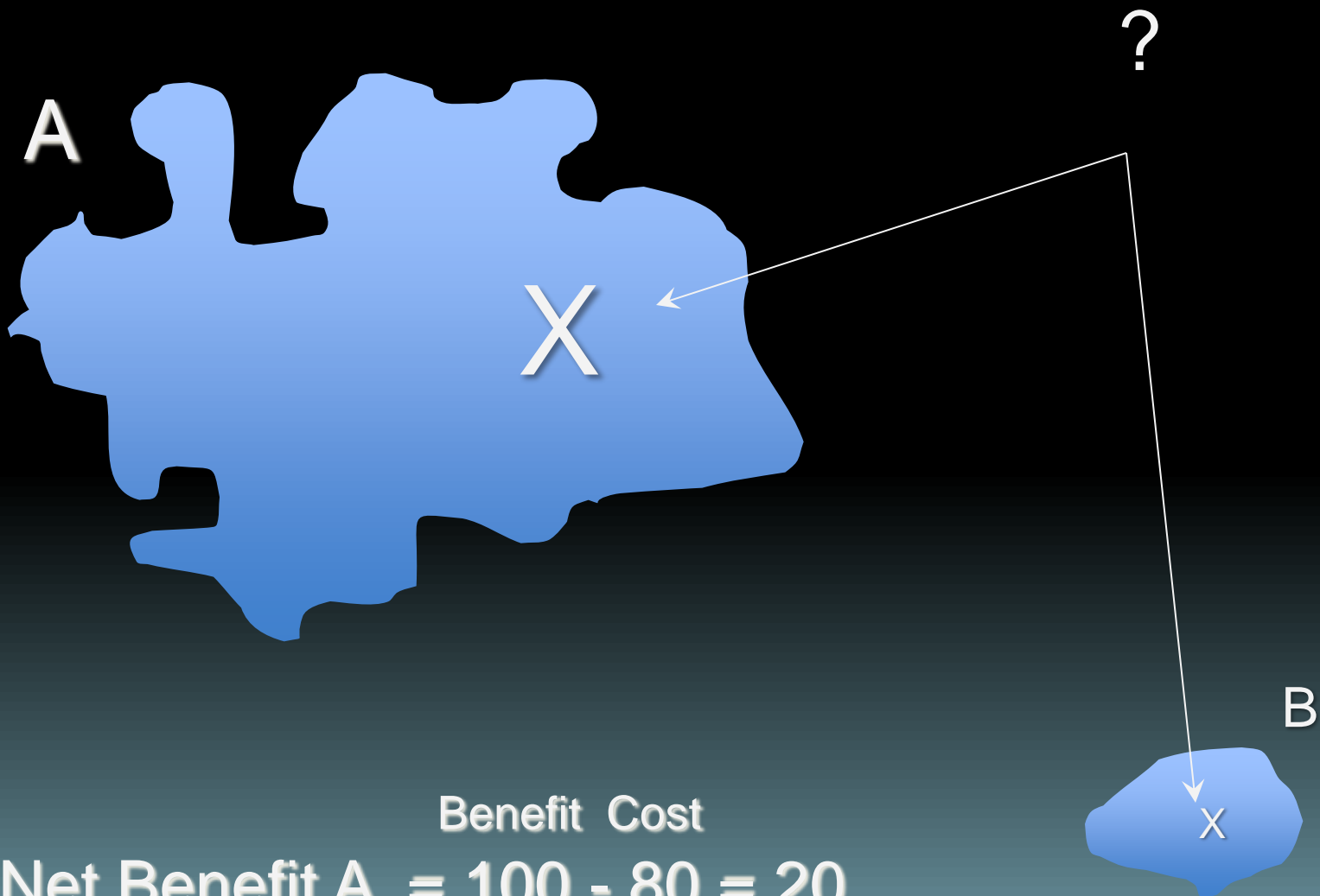
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Benefit  
Net Benefit A = 100  
Net Benefit B = 70



Benefit Cost

$$\text{Net Benefit A} = 100 - 80 = 20$$

$$\text{Net Benefit B} = 70 - 20 = 50$$



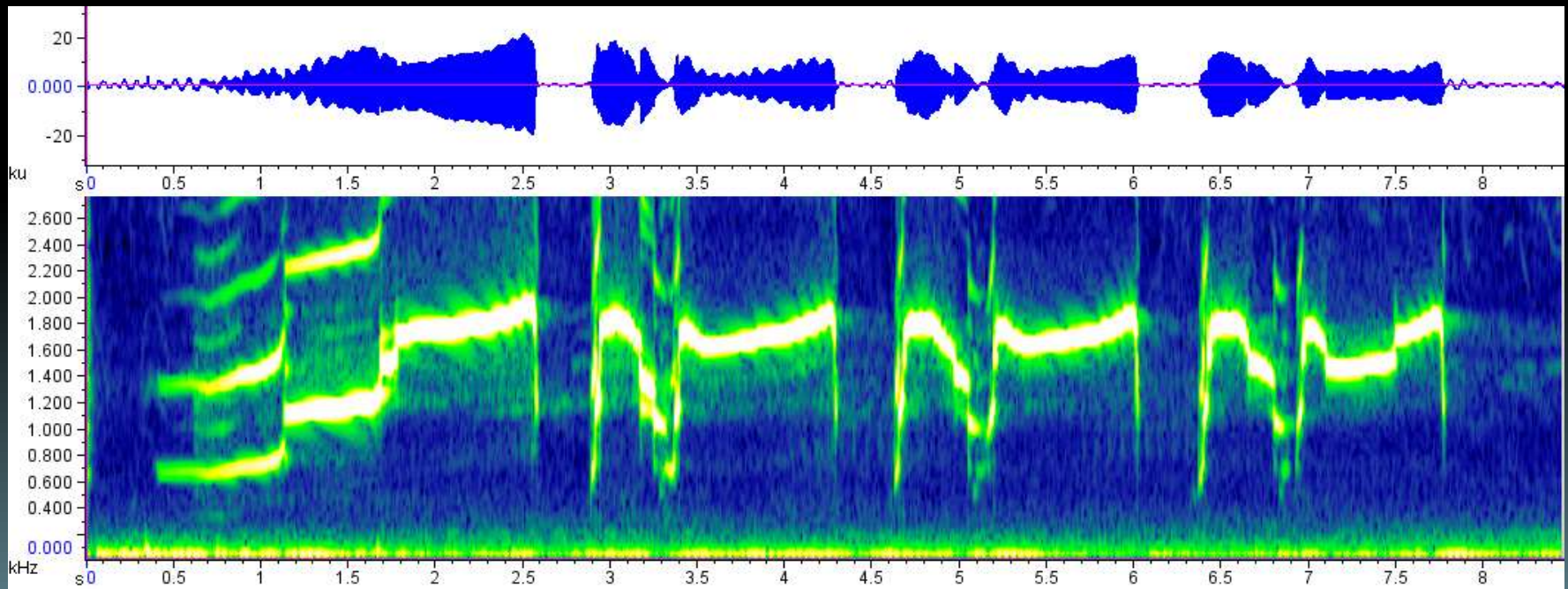


Common Loon  
Pickeral Lake, St. Germain  
Oneida County  
5/17/05





# Yodel Acoustic Structure:



# The yodel as an aggressive threat signal:

Given by only male Great Northern Divers (*Gavia immer*)

Given primarily to conspecific flyovers & intrusions

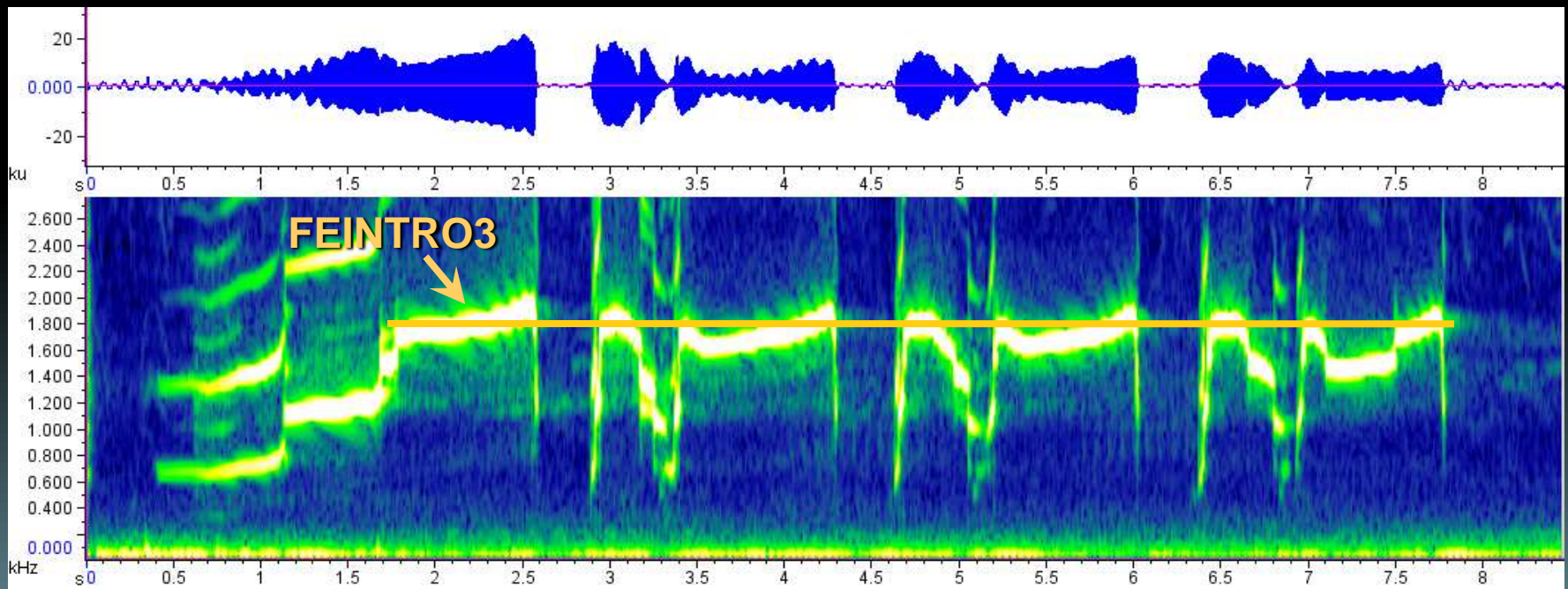
Given when probability of physical confrontation is high, & given in “vulture posture” during close confrontations

Given most frequently upon return to breeding territories & when chicks are about to hatch

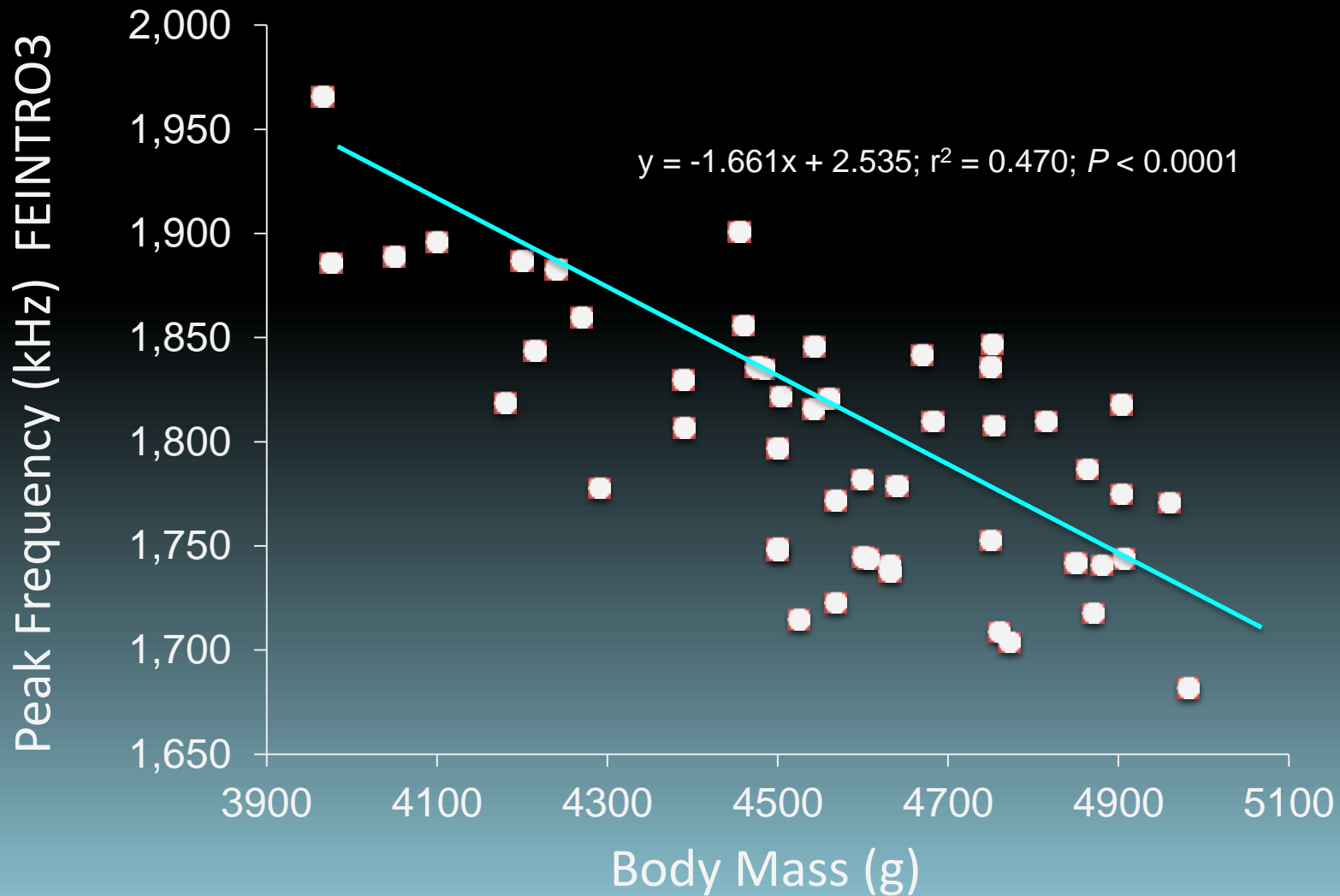


# Yodel Acoustic Structure: Fighting Ability

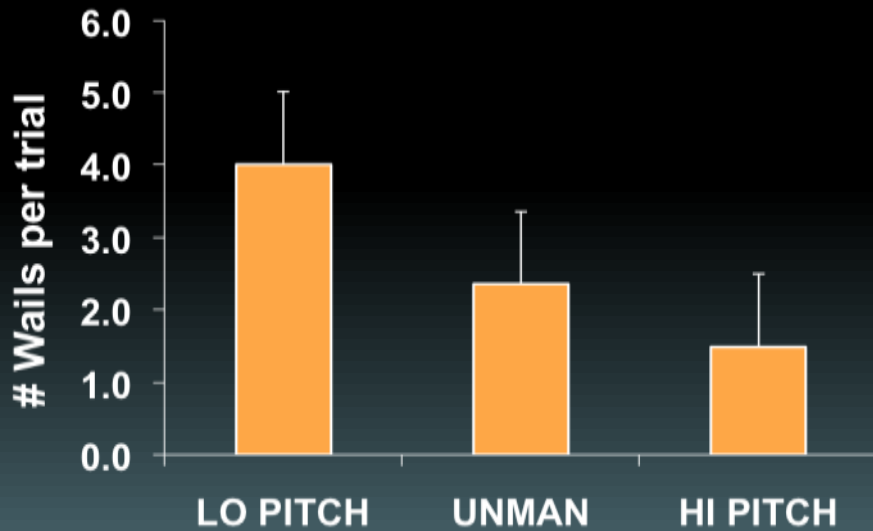
(Mager et al. 2007, in prep)



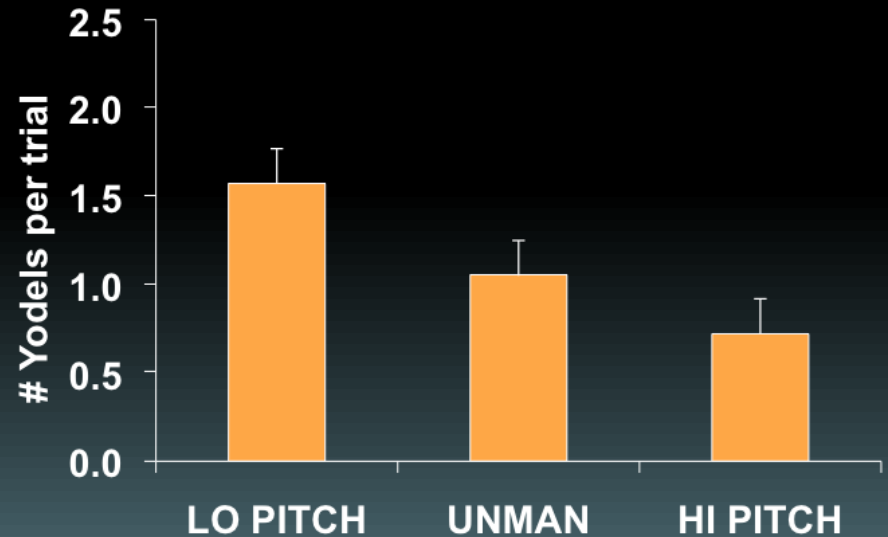
# Dominant frequencies of yodels are related to male body mass



# Pairs respond differently to yodels of lower frequency

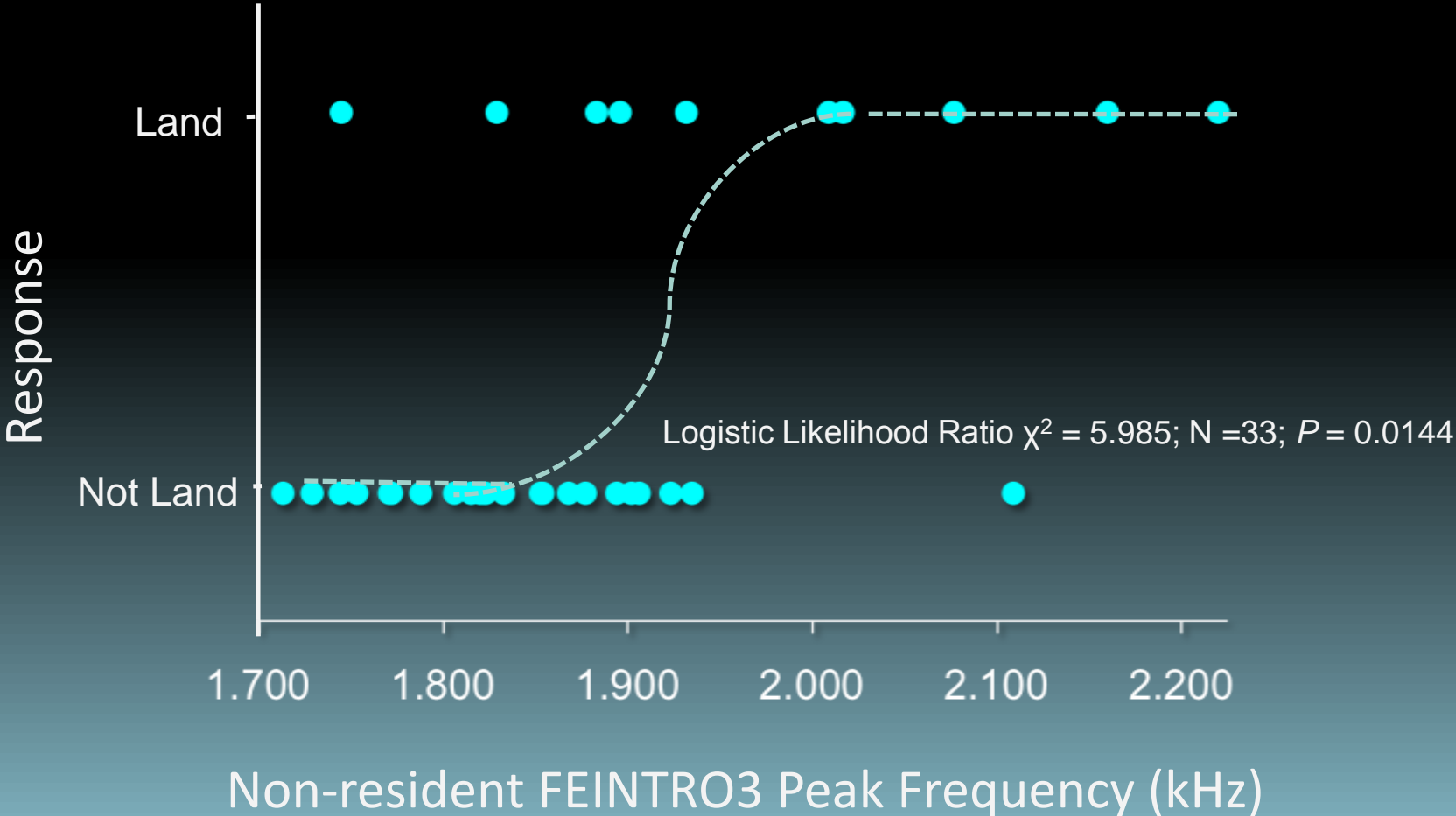


Friedman's  $\chi^2 = 12.78$  N = 42;  $P = 0.0017$

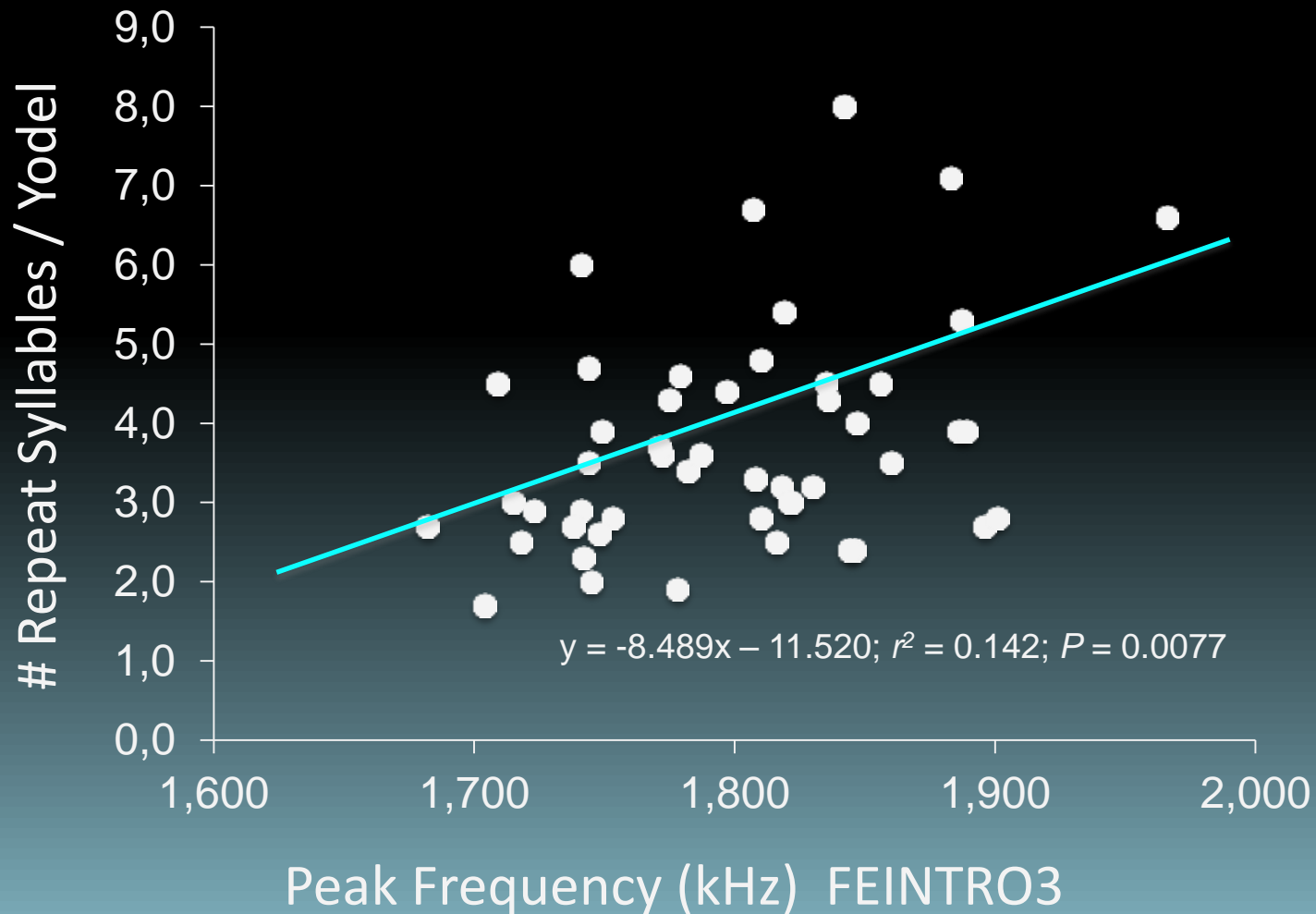


Friedman's  $\chi^2 = 10.20$  ; N = 42;  $P = 0.0061$

# Intruders land to high-frequency non-resident yodels?



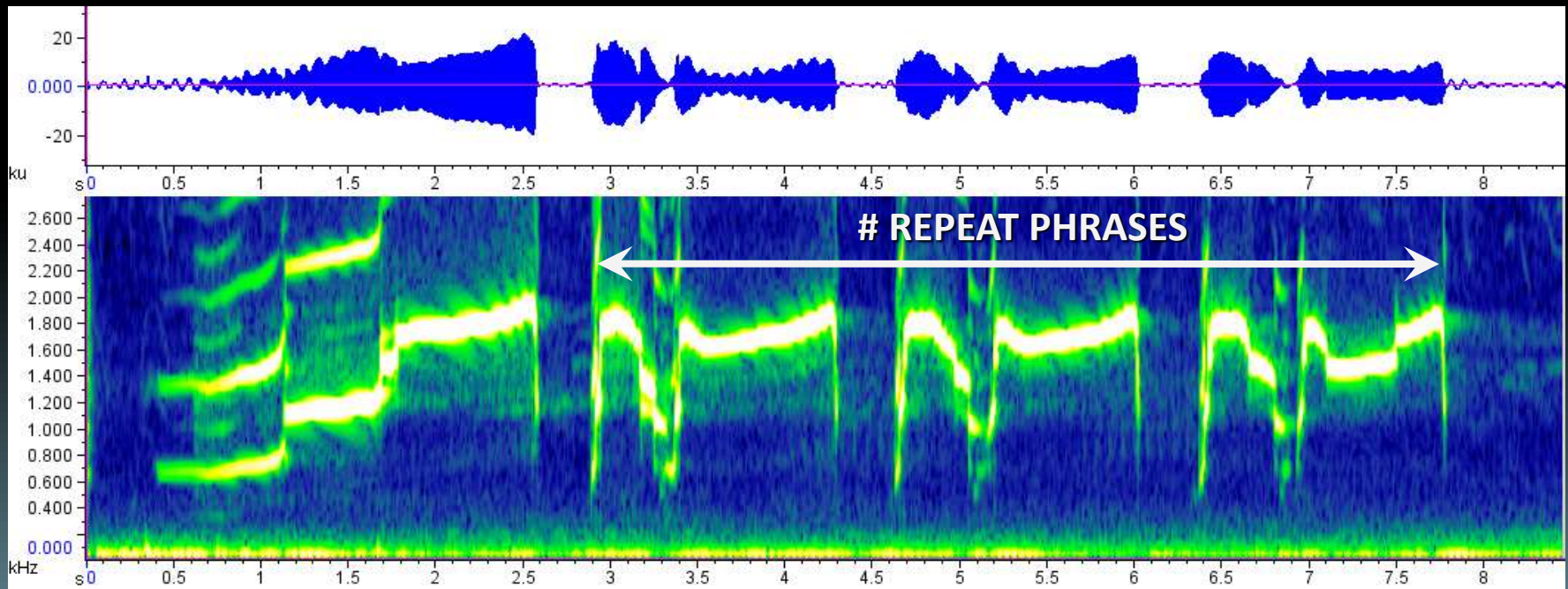
# High-frequency yodelers give more repeat phrases per yodel



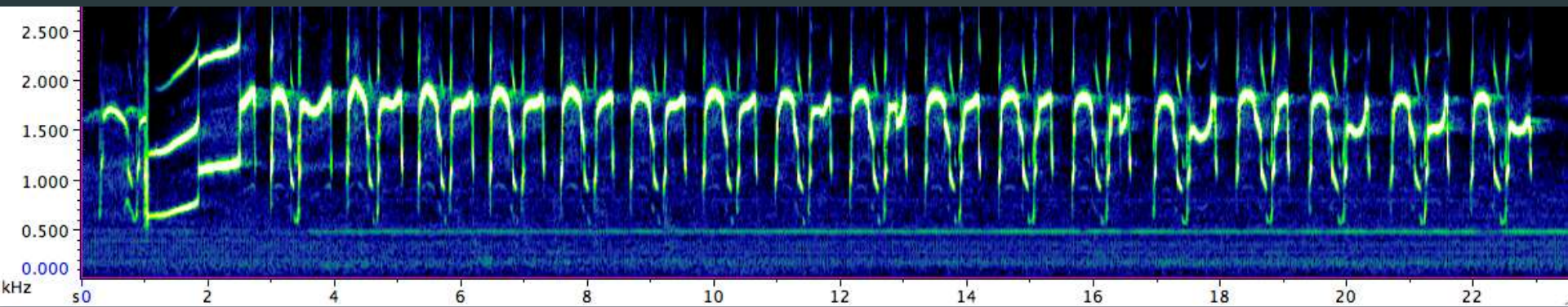
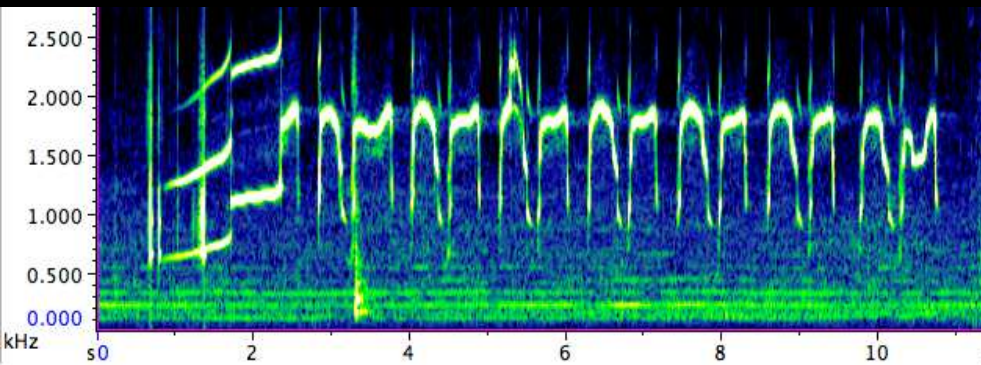


# Yodel Acoustic Structure: Aggressive “Motivation”

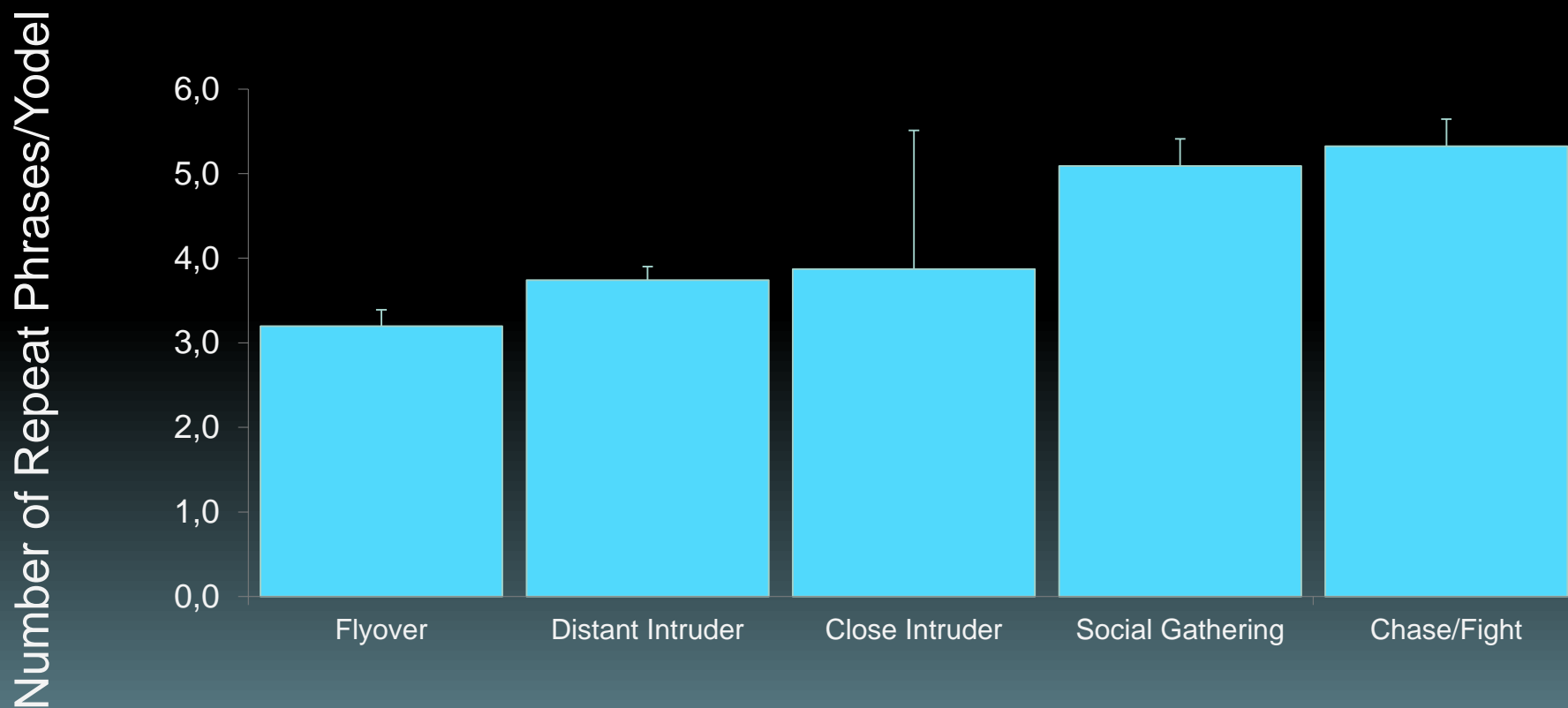
(Barklow 1979, Mager et al. 2012, in prep)



Variability in # repeat phrases:  
Longer yodels = heightened aggressive state



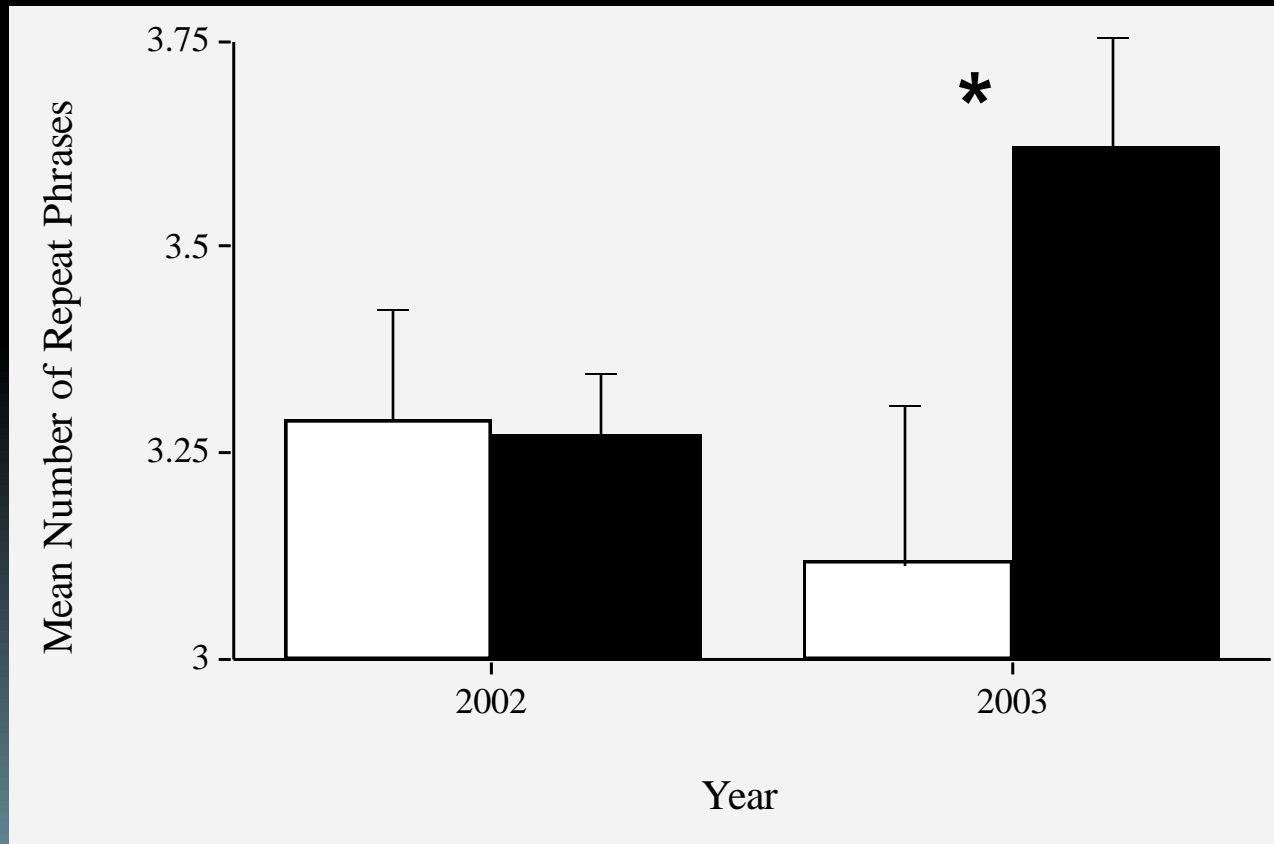
# Males give more repeat phrases when risk of attack is greater



Repeated-measures ANOVA  $F_{4,216} = 6.207$ ;  $P < 0.0001$ ;  $N = 44$  males



# Did the duration of yodels change after adding platforms?



\* Repeated-measures ANOVA  $F_{1,18} = 4.491, P = 0.048$

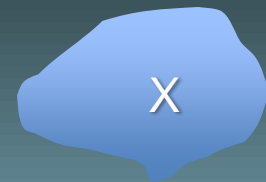
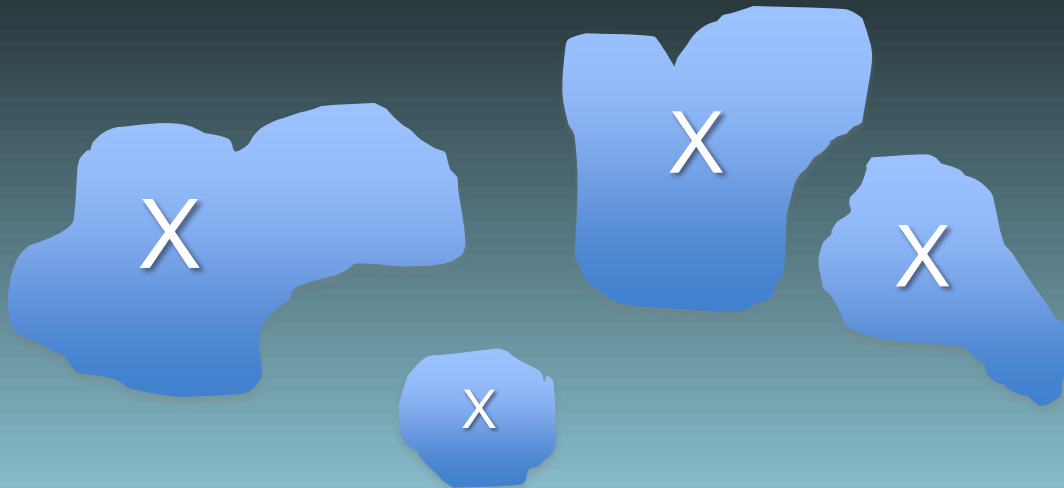
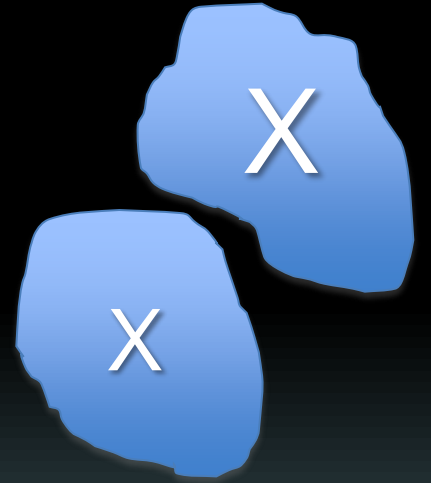
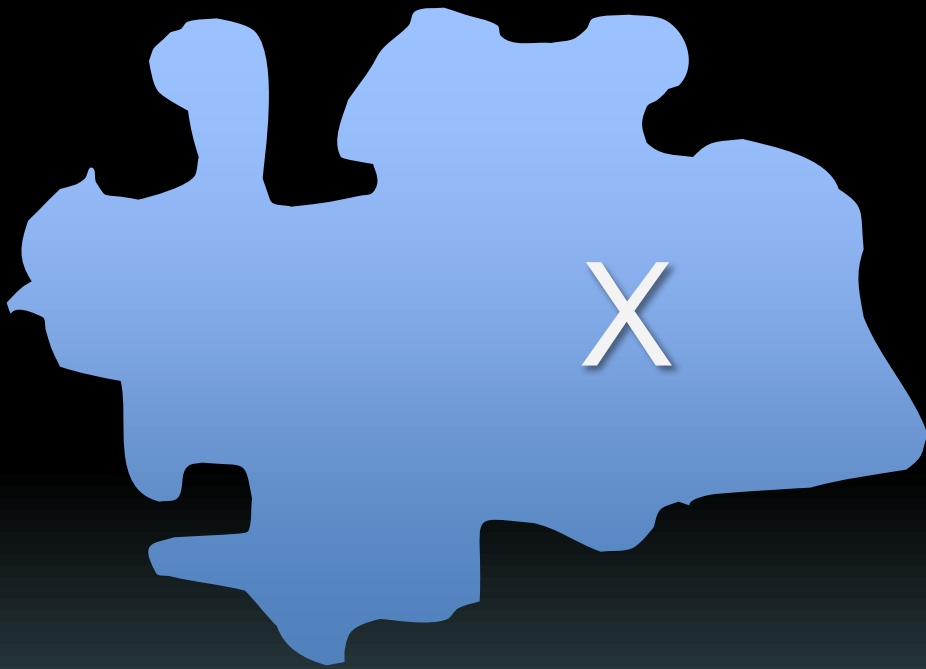
# Information communicated by yodel:

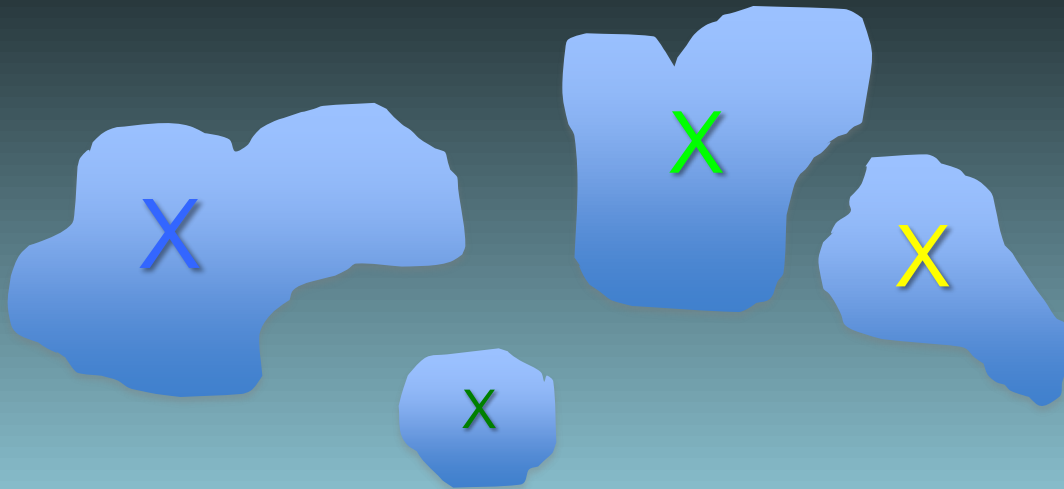
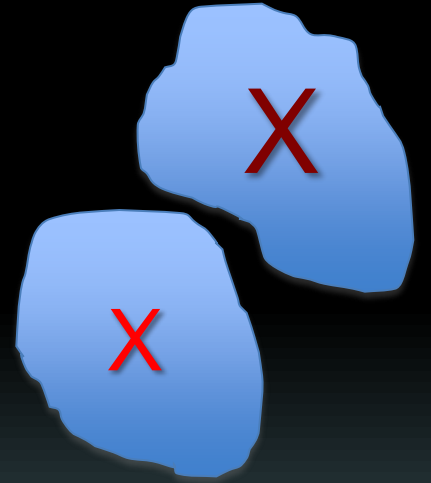
Dominant frequencies communicate body mass/condition

# repeat syllables communicate aggressive “motivation”

Do males of poorer condition compensate by being more “motivated”?

What factors ensure signal reliability, or “honesty”?

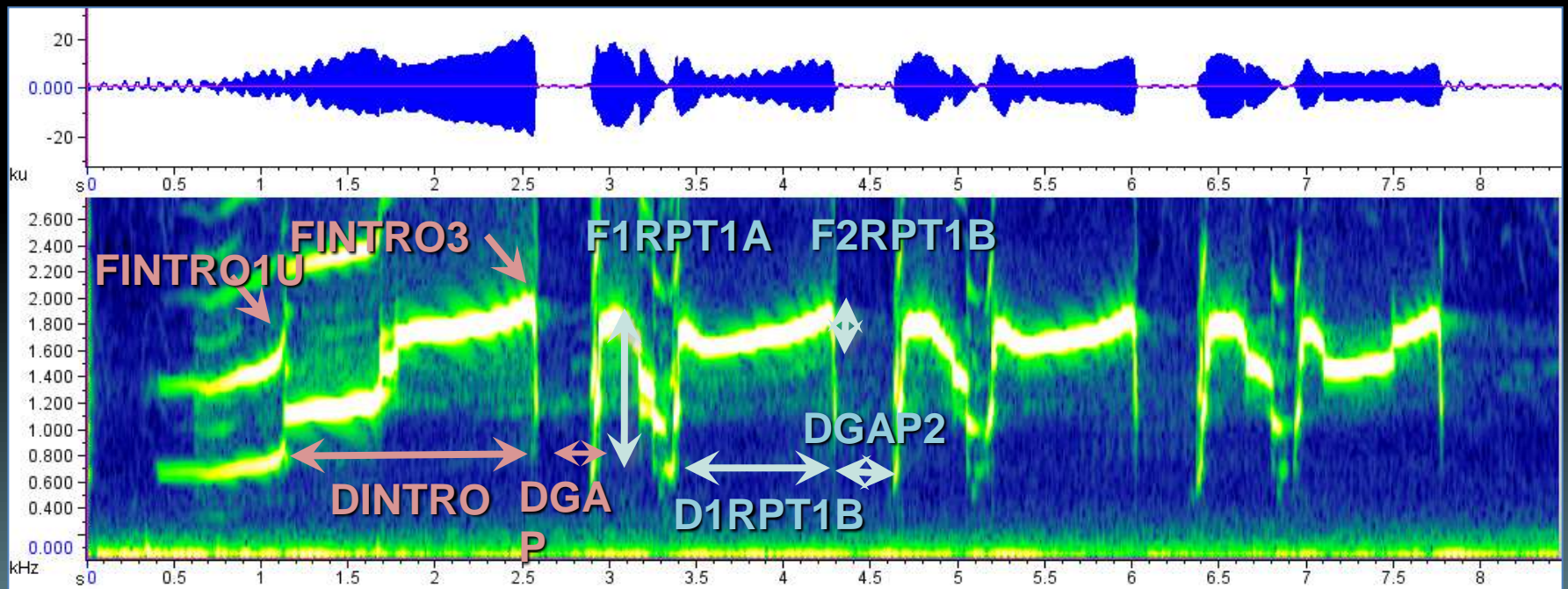






# Yodel Acoustic Structure: Individual Identity

(Walcott et al. 1999, 2006; Lindsay 2000)



# Why would individual recognition be important for divers?

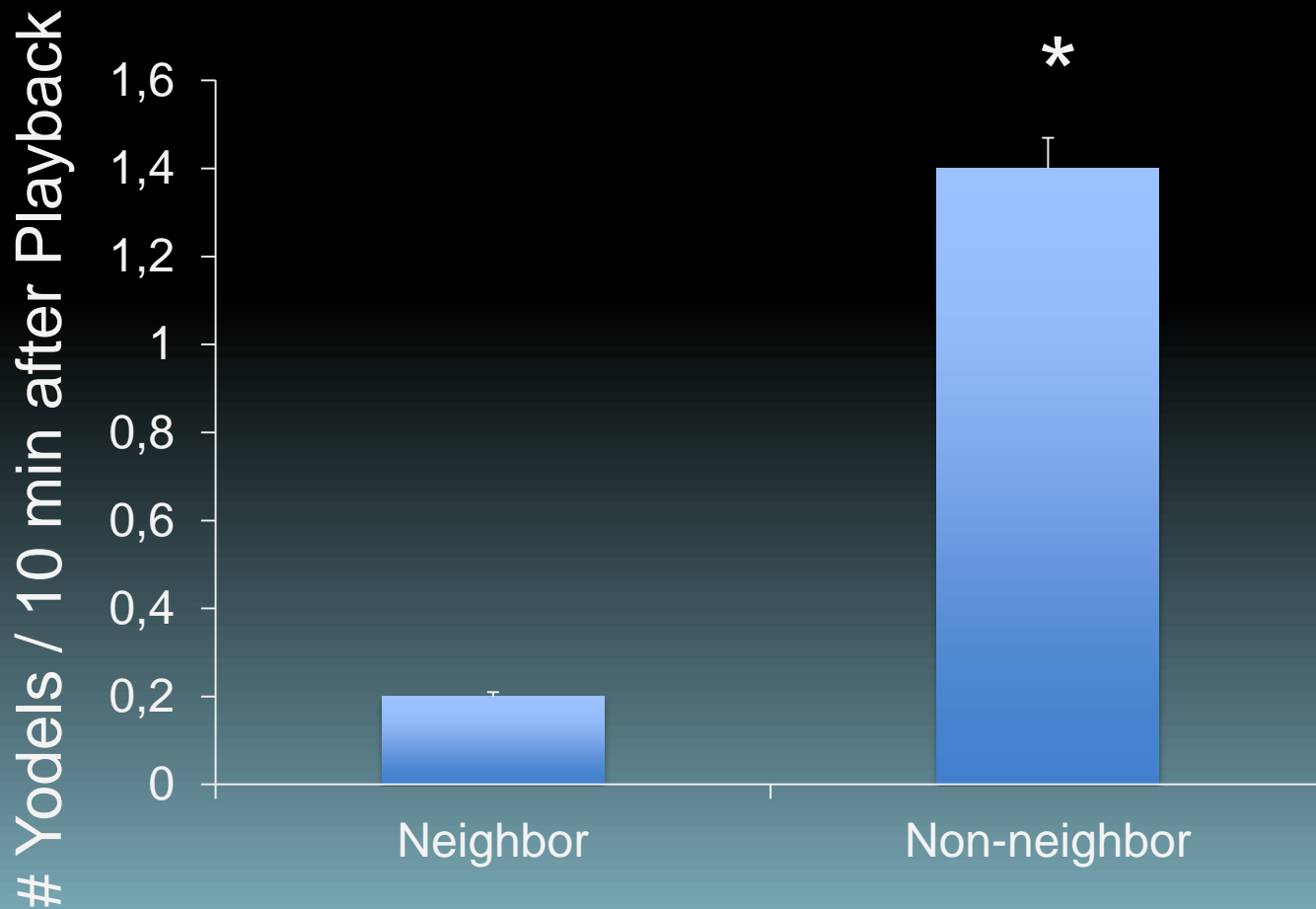
## Recognition of territorial threats:

- Male recognition of territorial rivals (Mager et al. 2010)
- Female recognition of mates (Mager & Walcott, in press)

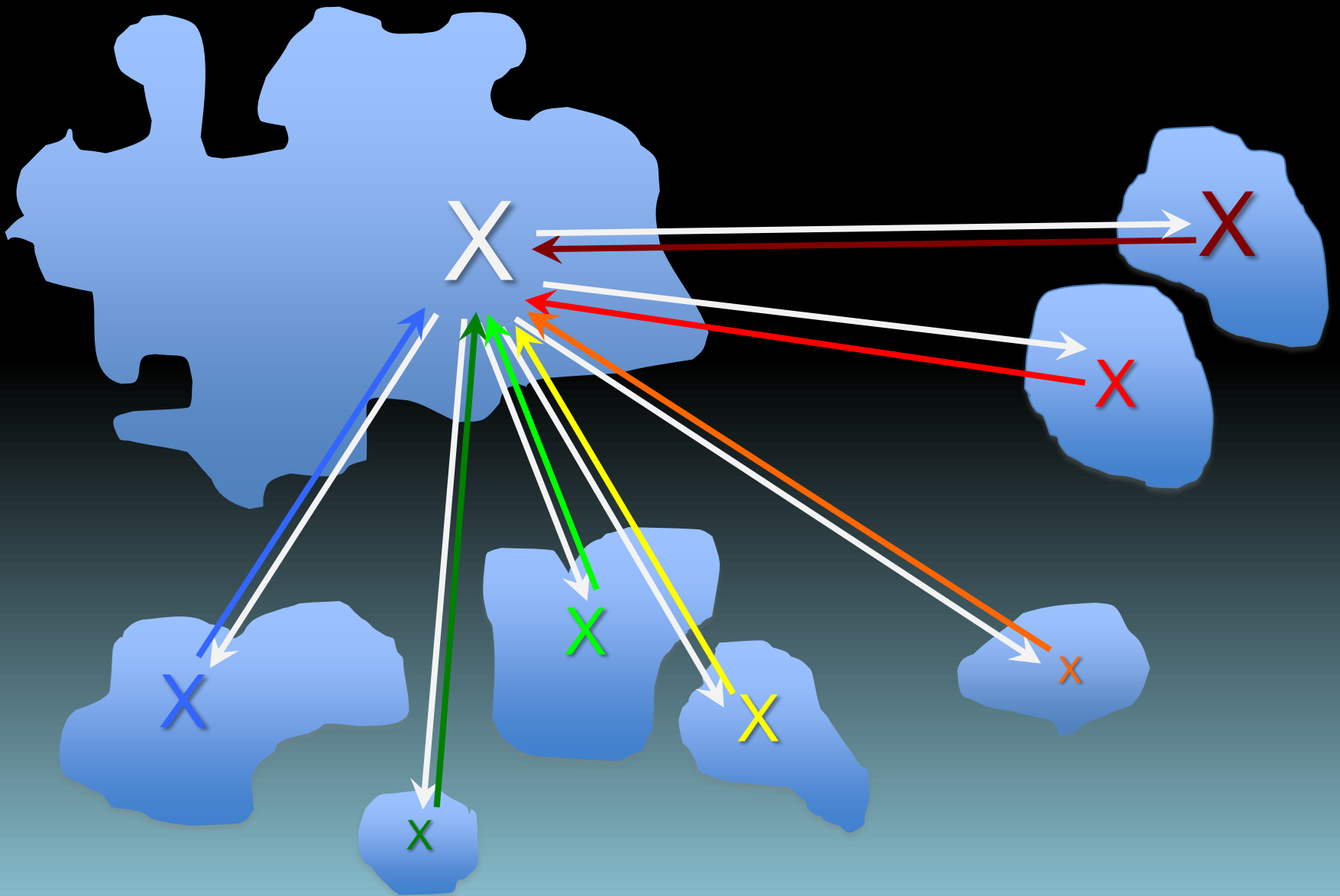
## Recognition of kin:

- Chick recognition of fathers from threats
- Male/female future recognition of sons, fathers, grandfathers, grandsons, etc.

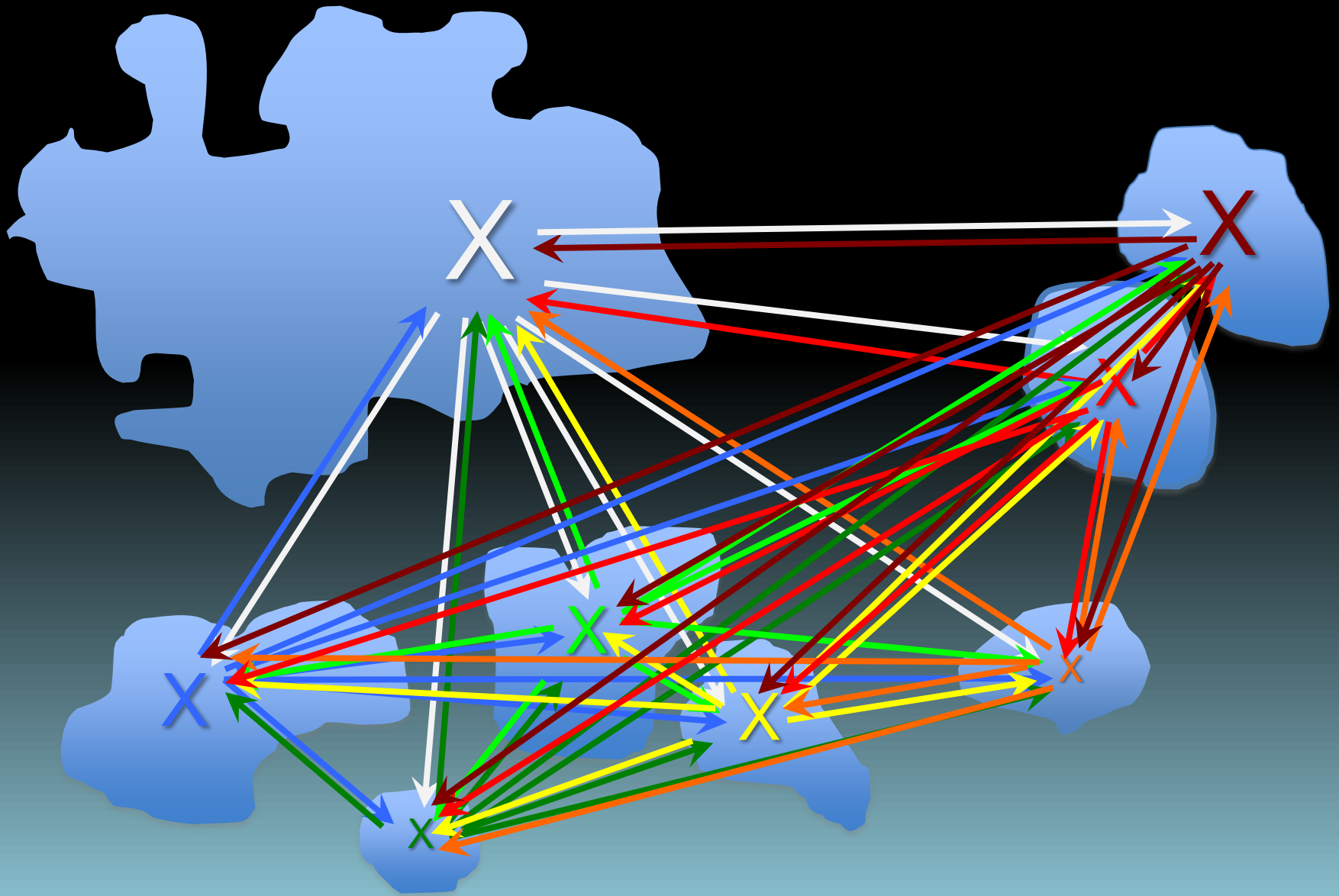
# Resident Males respond more aggressively to non-neighbor yodels



\*Wilcoxon  $Z = 2.6$ ,  $N = 20$ ,  $P = 0.01$  (Mager, et al. 2010)

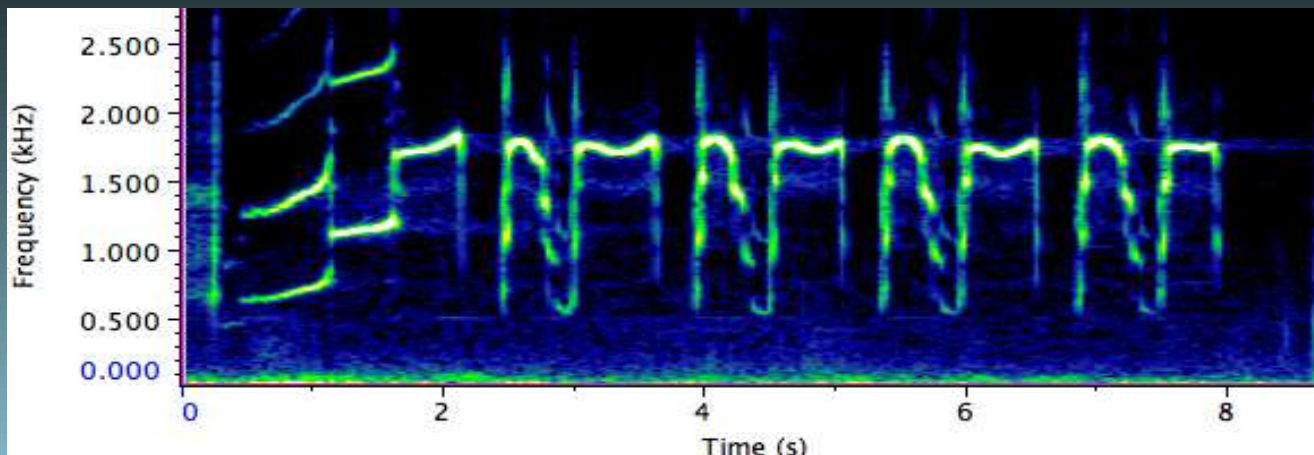
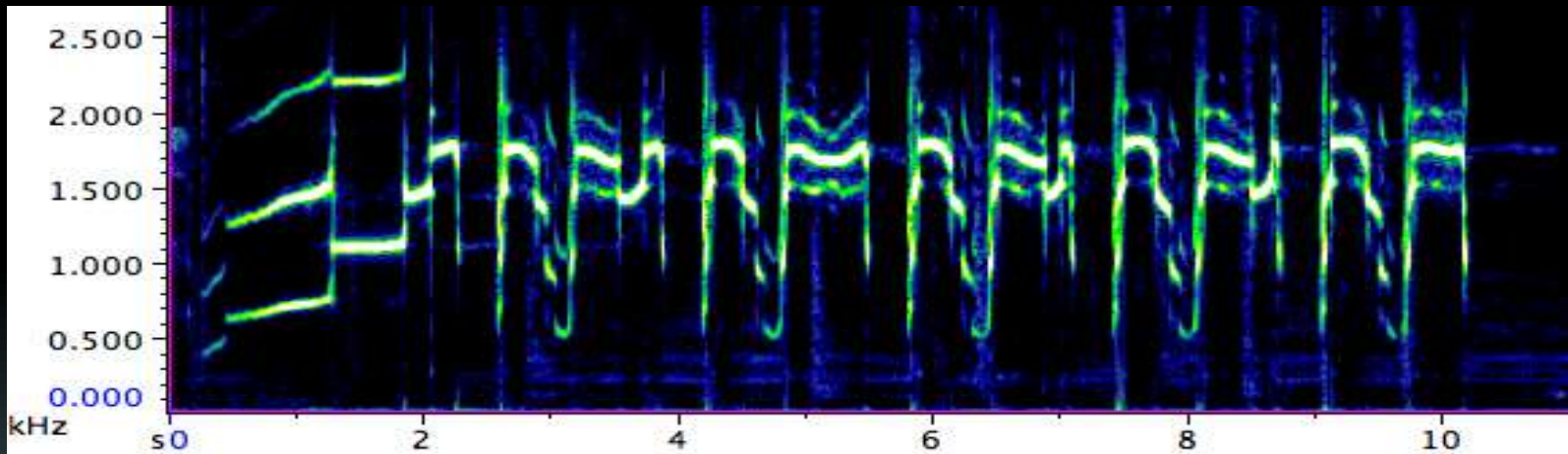


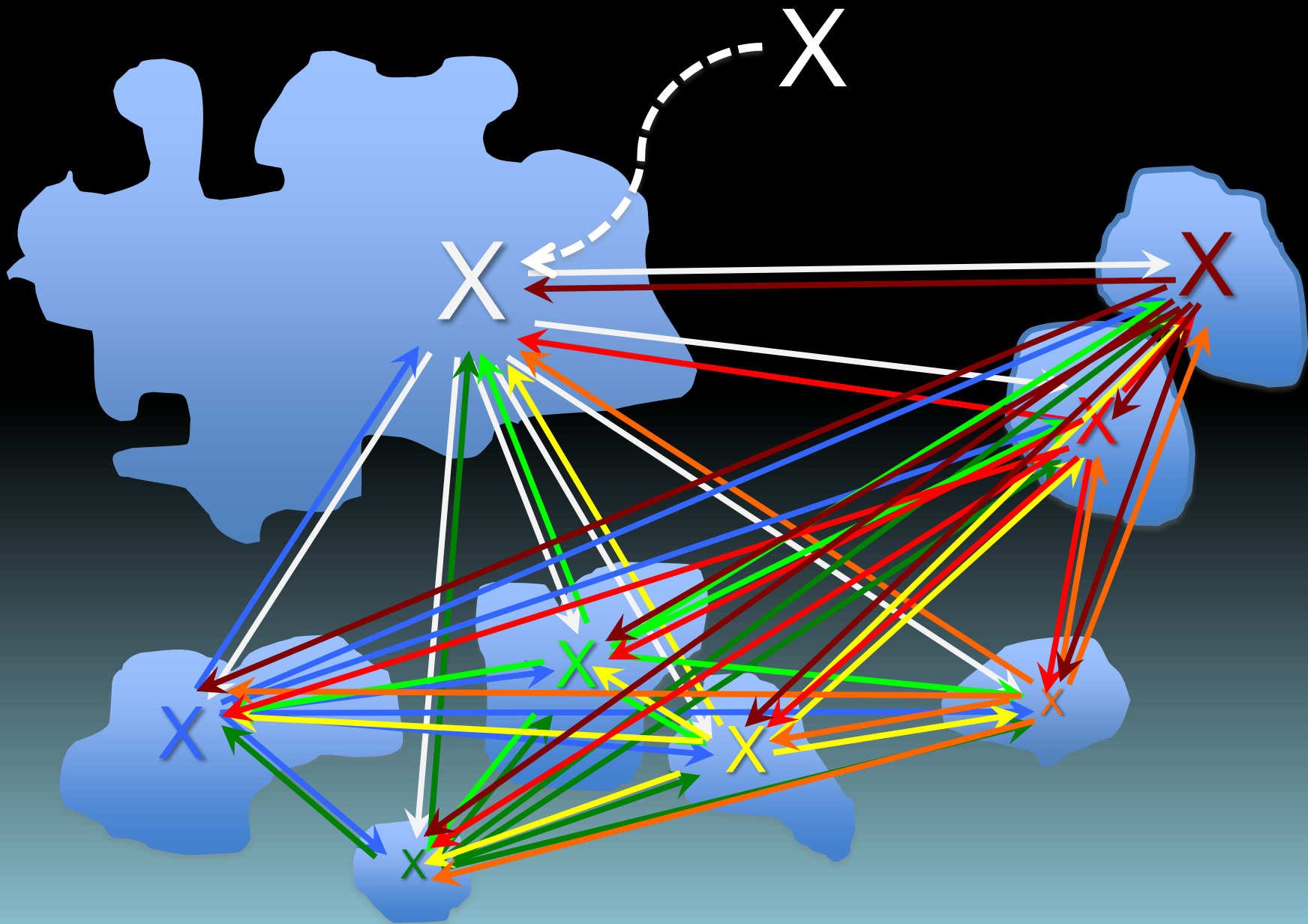
# Diver communication “networks”

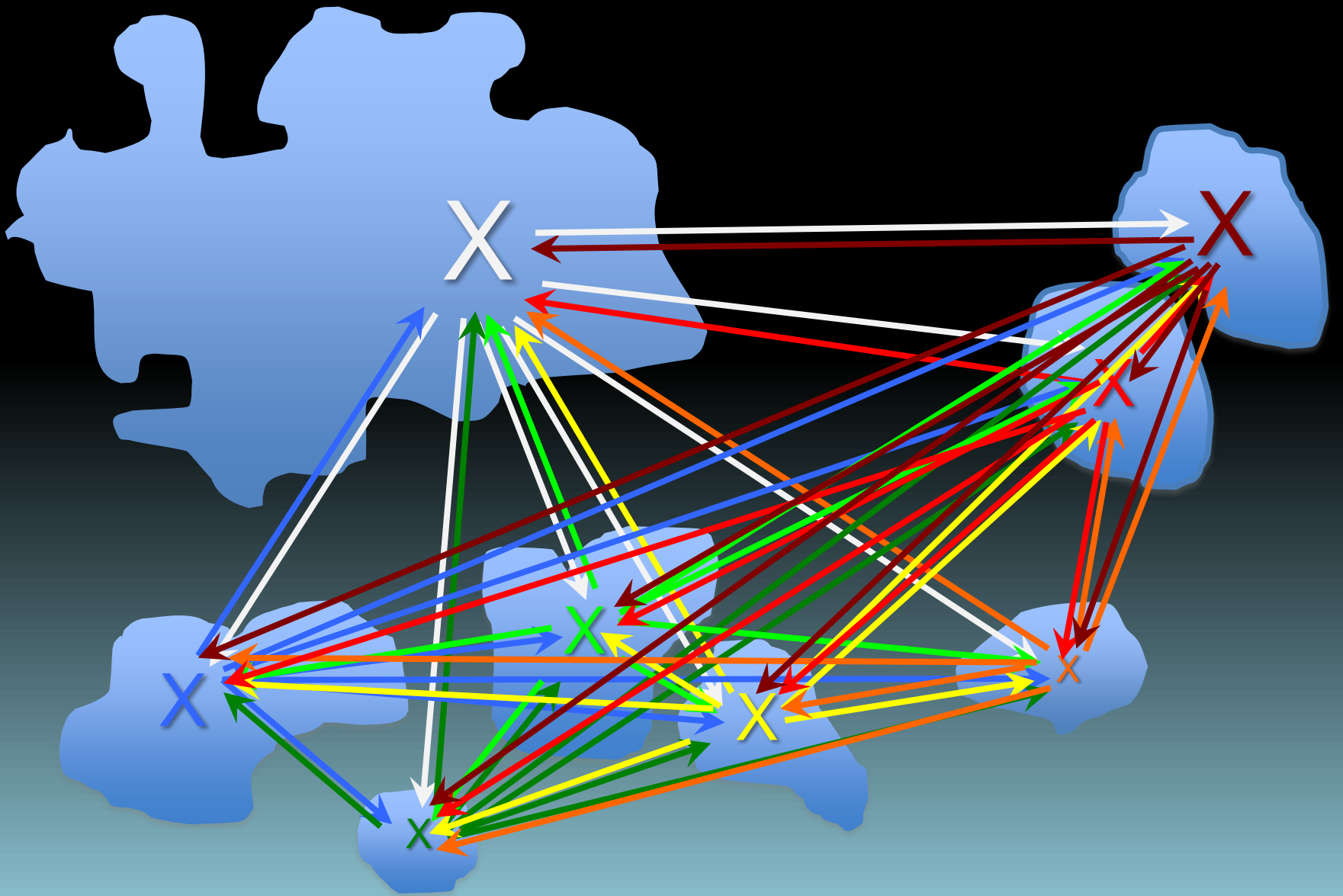


# Great Northern Divers change their yodels when they change territories

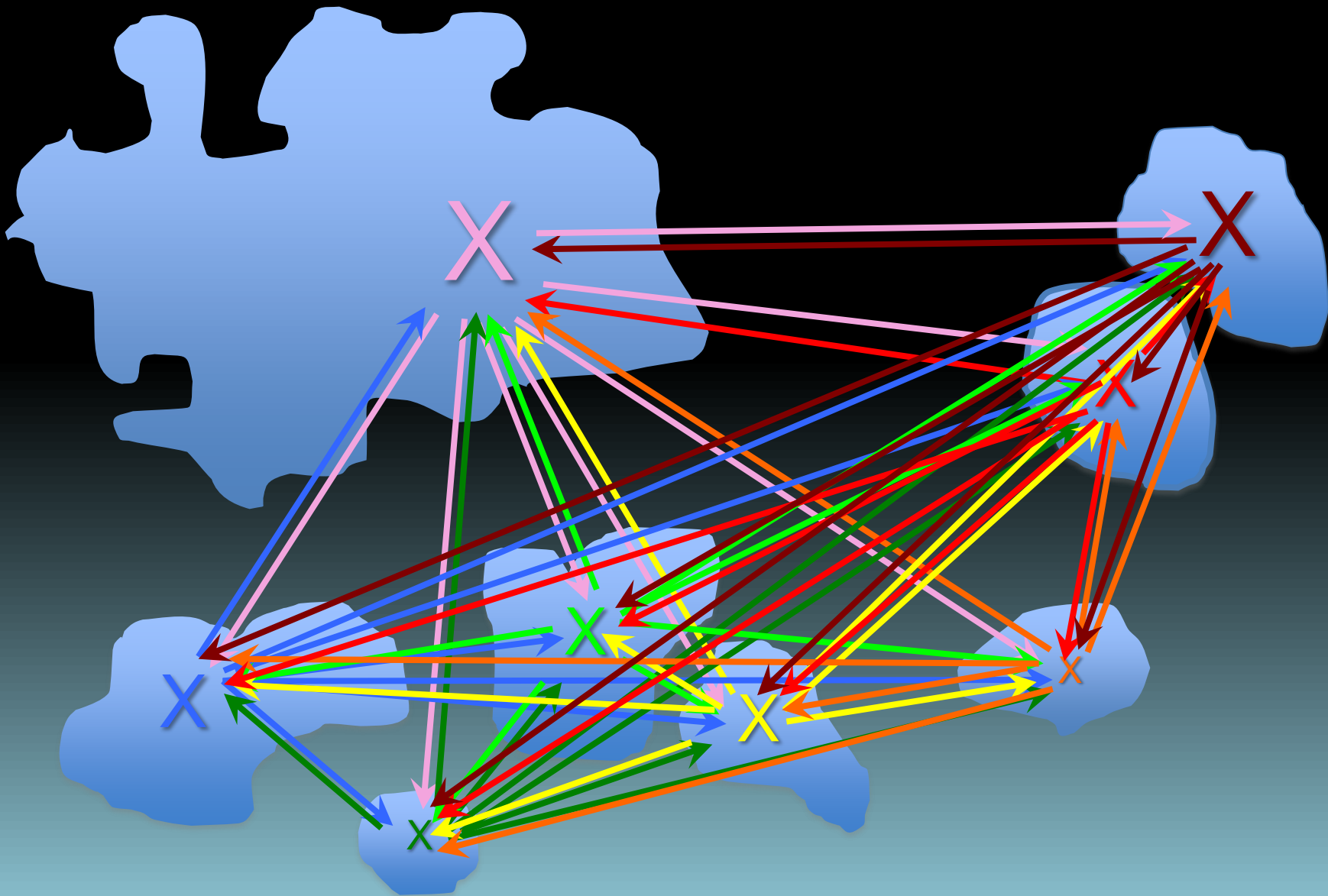
(Walcott et al. 2006)

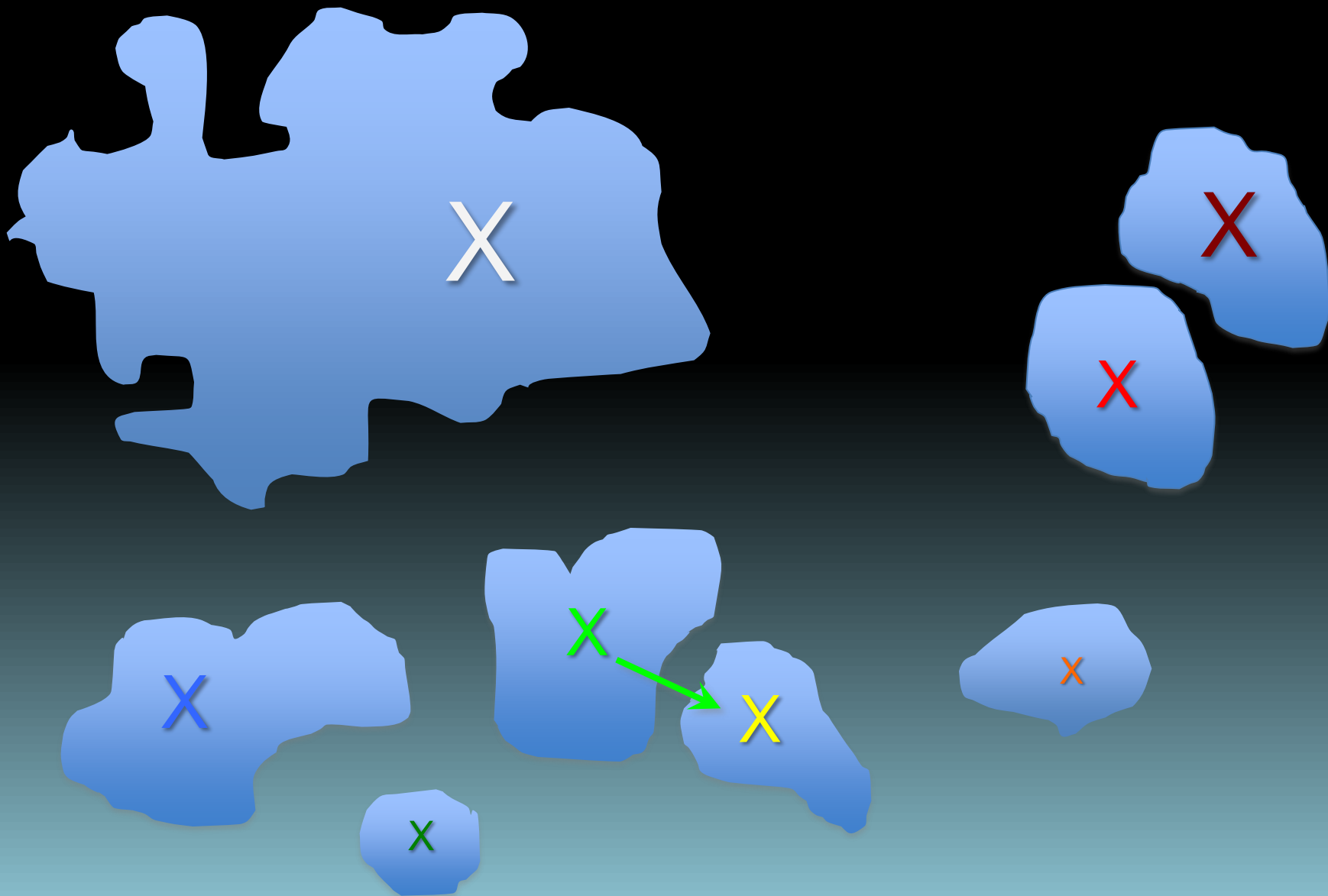




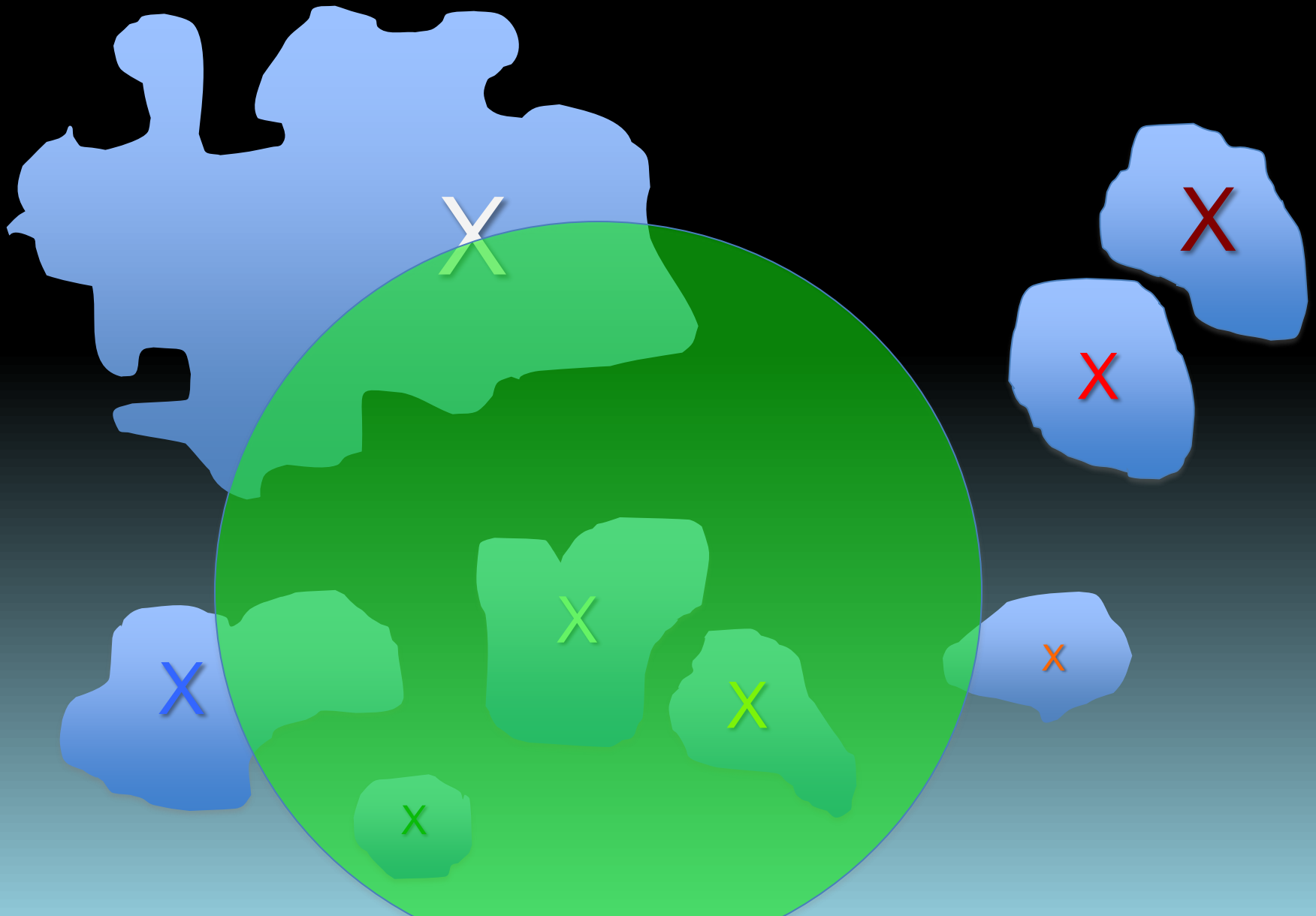


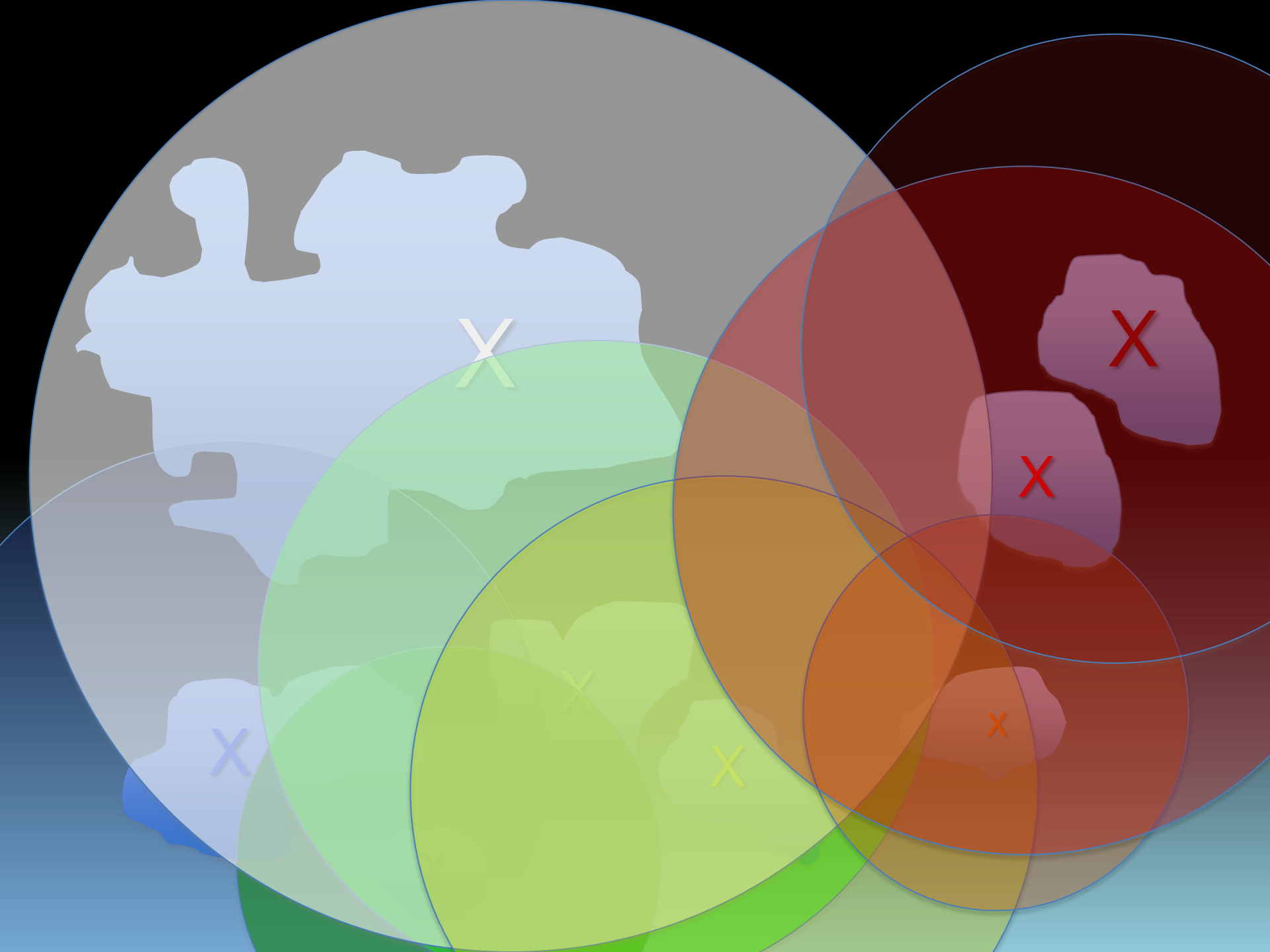






# Network consists of eavesdroppers







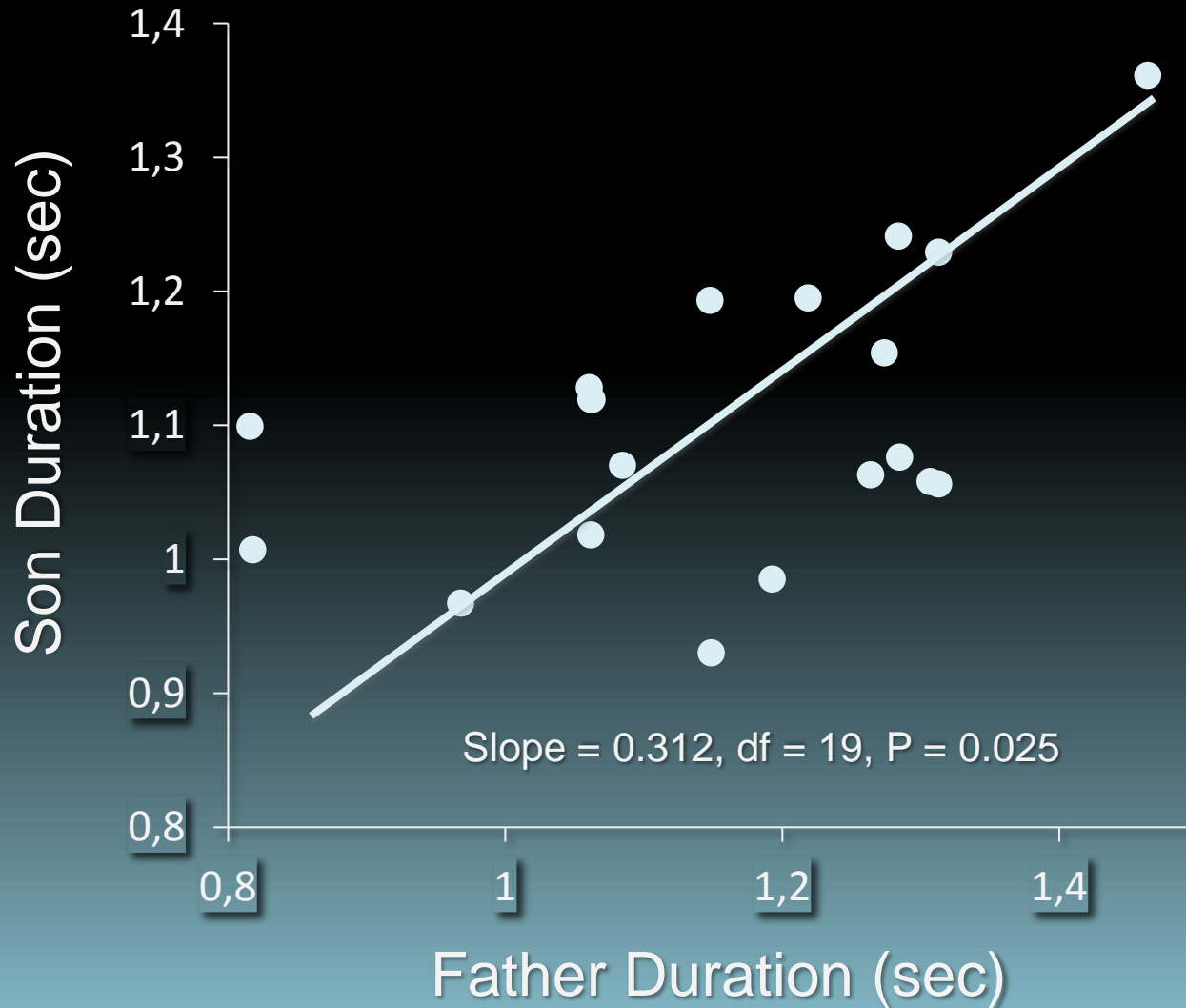




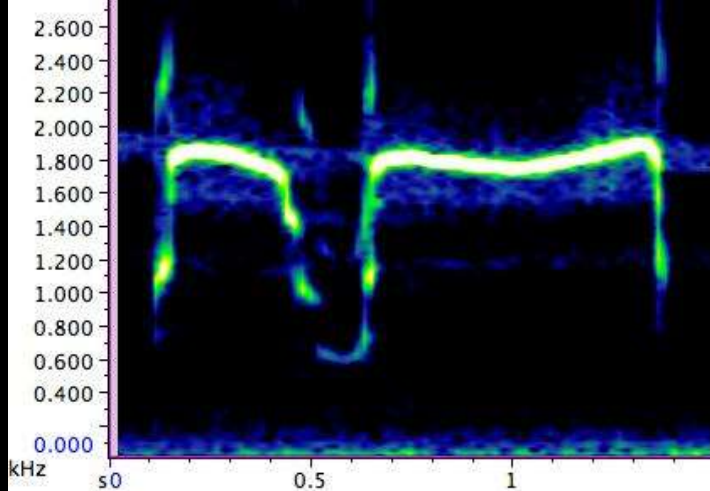




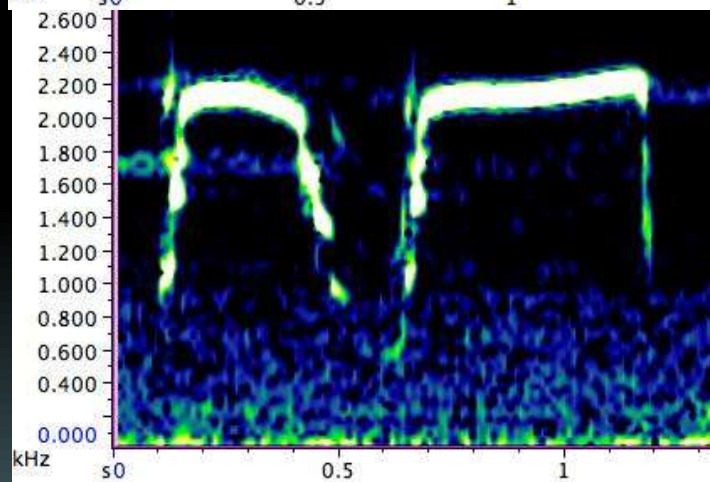
# Possible relationship between duration components of repeat phrases



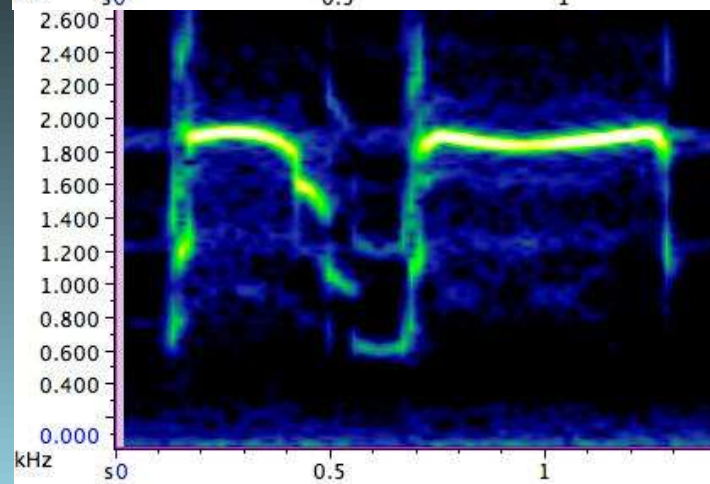
Granddad

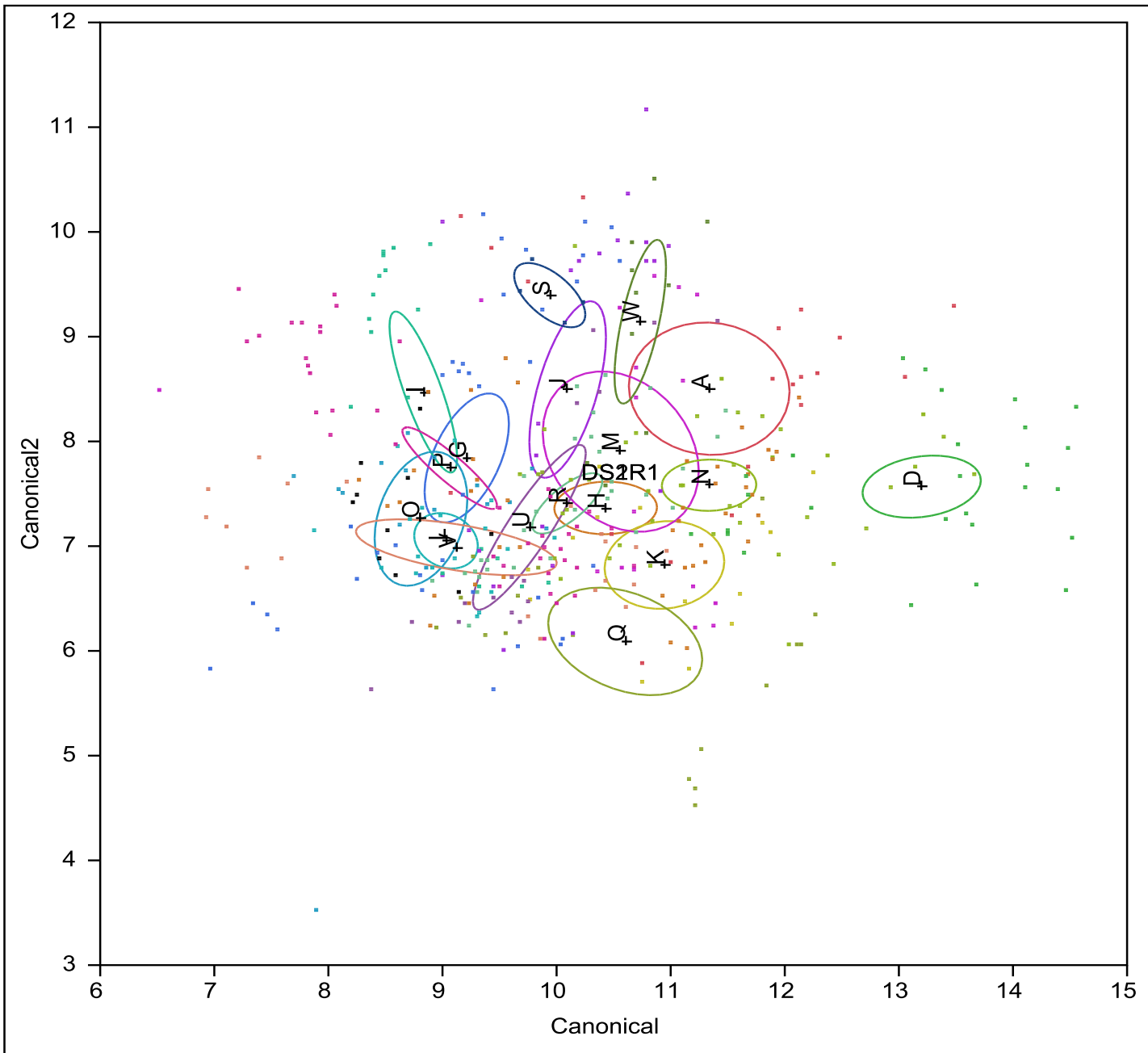


Dad



Son/Grandson





# Value of learning more:

## Diver Conservation & Management:

Acoustic signals are important to habitat selection & defense

Acoustic signals reflect individual condition & resource value

## Vocal Signaling within a Non-Oscine Bird:

Acoustic signals within acoustic “networks” & “neighborhoods”

Acoustic signals within a long-lived species with natal fidelity



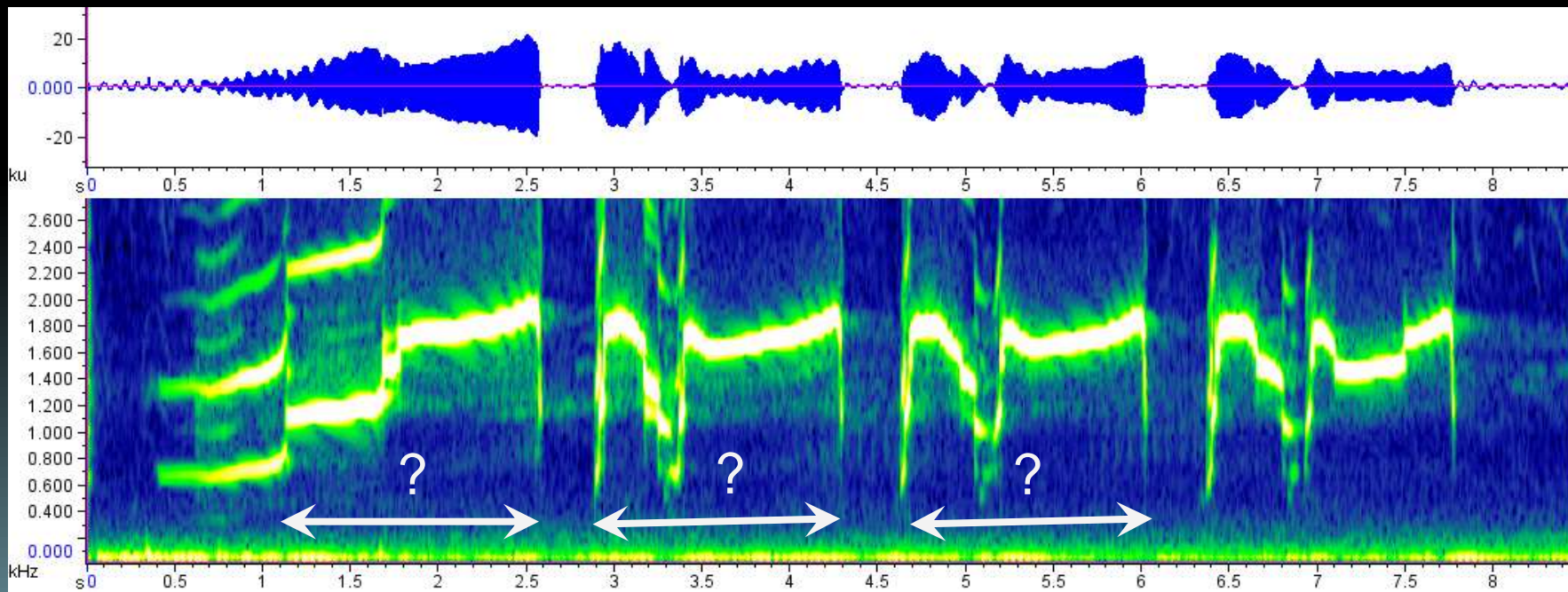
# THANK YOU!!!!

**Dr. Andre Dhondt, Dr. H. Kern Reeve, and Dr. Sandra Vehrencamp, Cornell University, Dr. Walter Piper, Dr. David Evers, Dr. Mark Pokras, Dr. Amy McMillan, Dr. James Paruk, Dr. Alec Lindsay, Dr. Judith McIntyre**

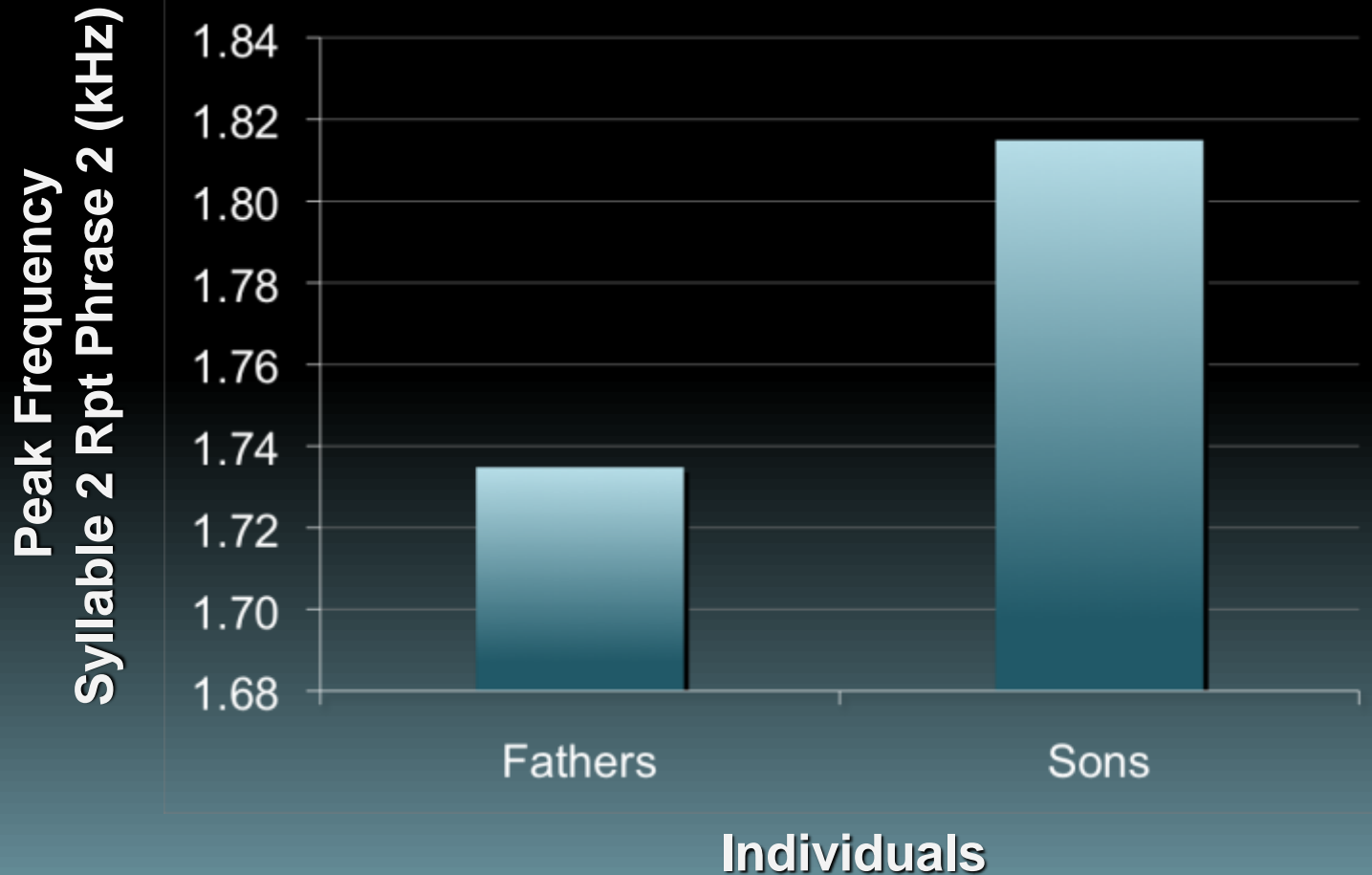
**Numerous Field Assistants: N. Banfield, M. Gibbon, R. Hart, B. Lampe, D. Reid, M. Schwabenlander, A. Webber, A. & J. Reiman, F. Spilker, E. Harrington, C. Ritchie, V. Abernathy, D. Salsbury, J. Backus, E. Nebgen, D. Woods, K. Trinkle, K. Klotz**

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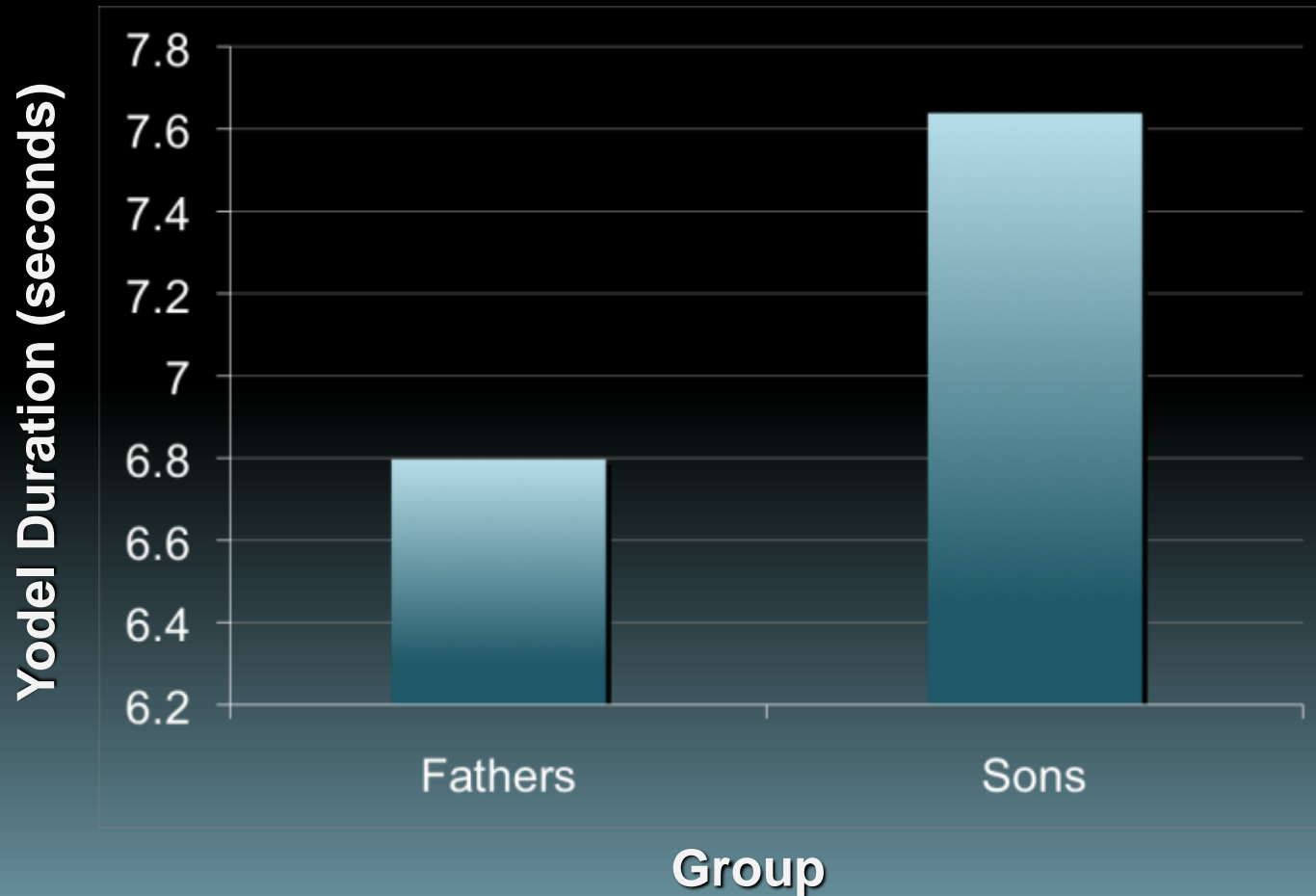
# Sons produce higher frequency yodels



Paired  $t = 2.388$ ,  $df = 19$ ,  $P = 0.0137$

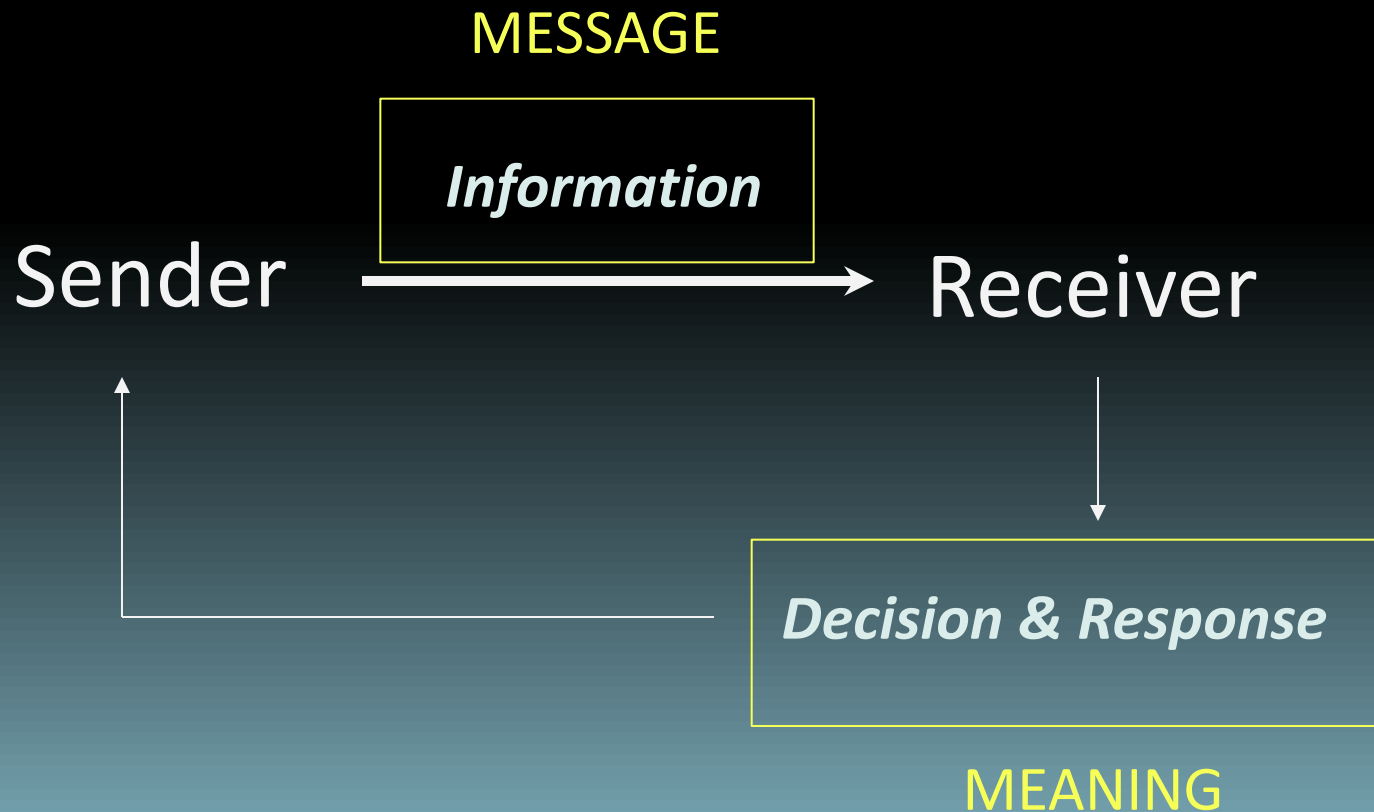


# Sons tend to produce longer yodels

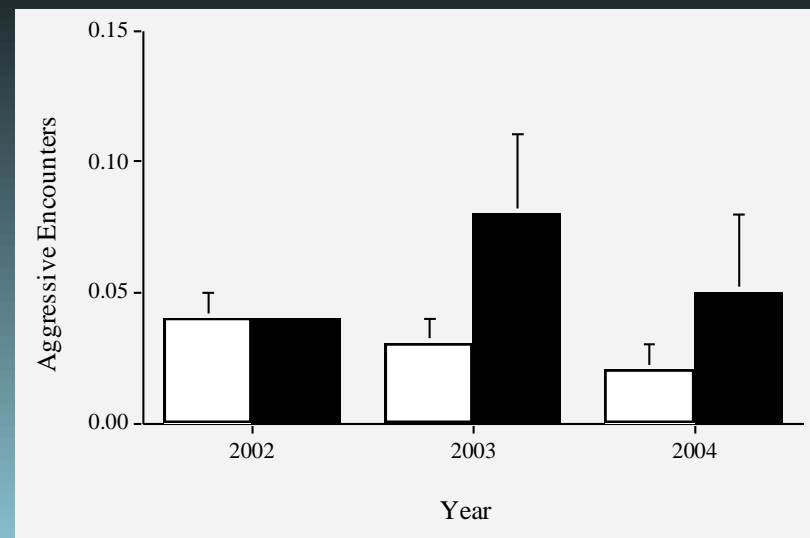
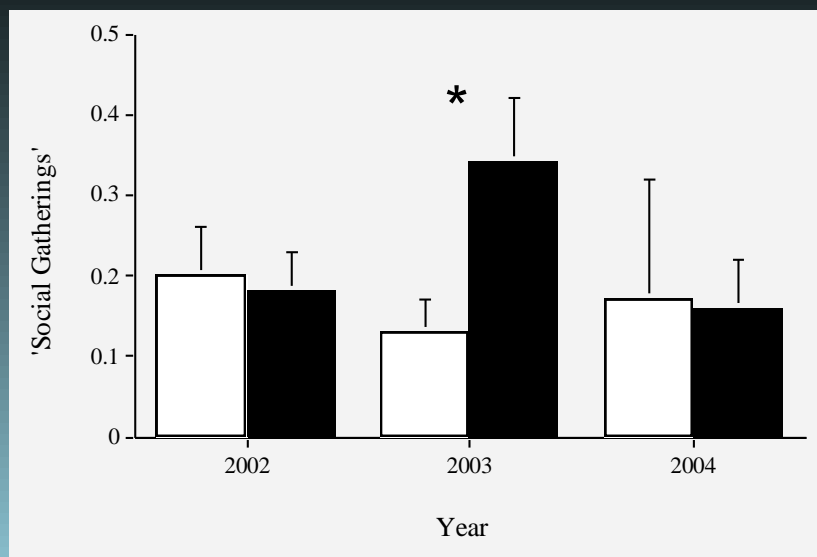
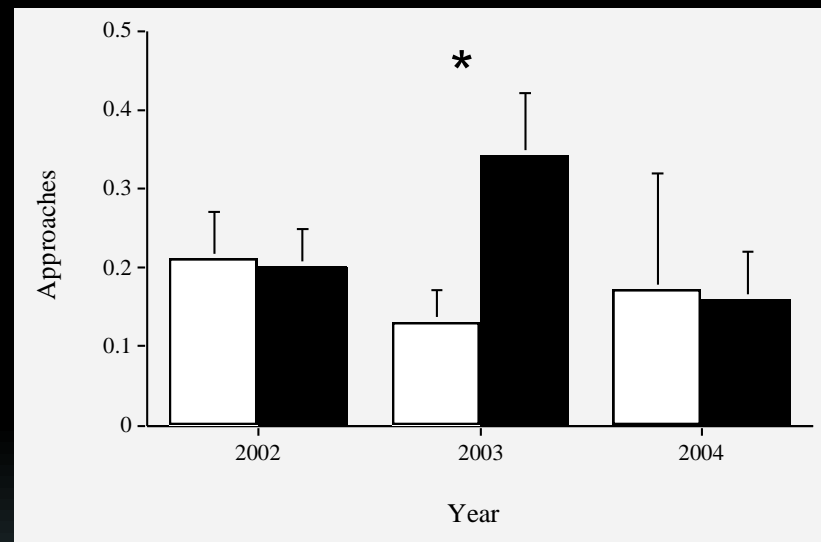
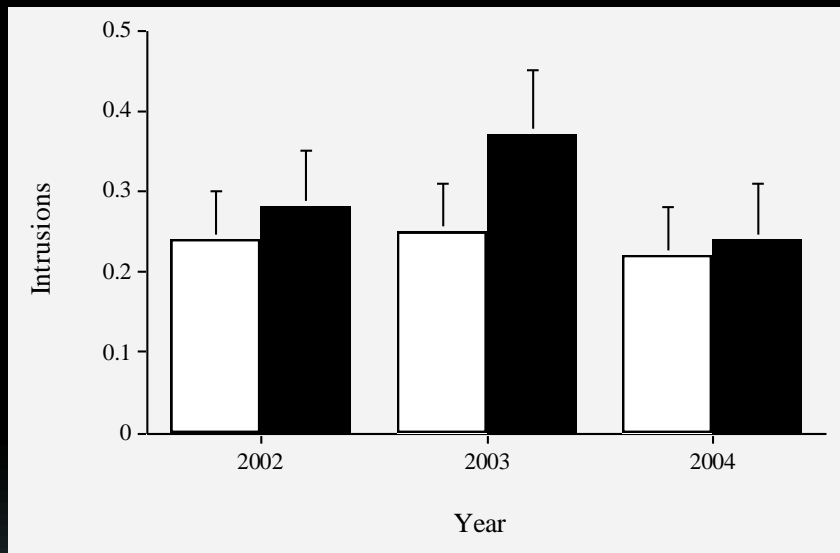


Paired  $t = 1.901$ ,  $df = 19$ ,  $P = 0.0367$

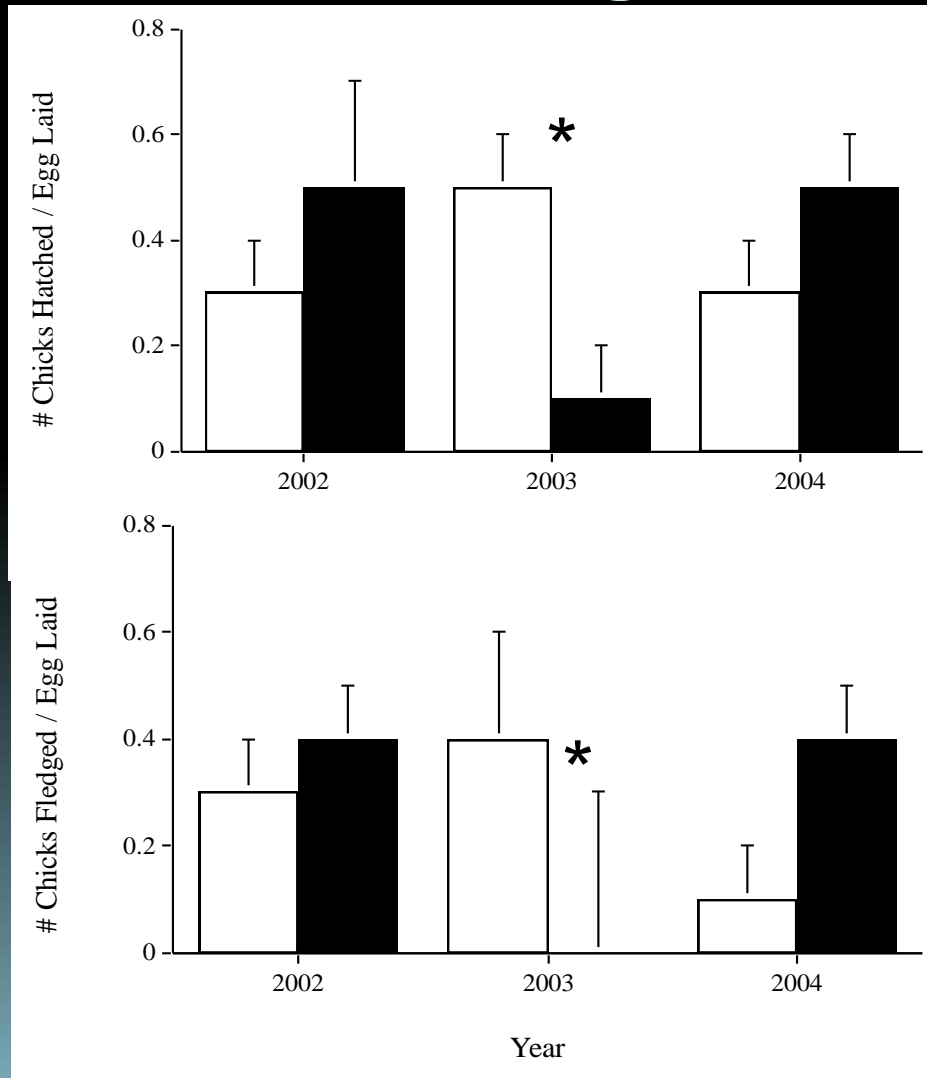
# What is Communication?



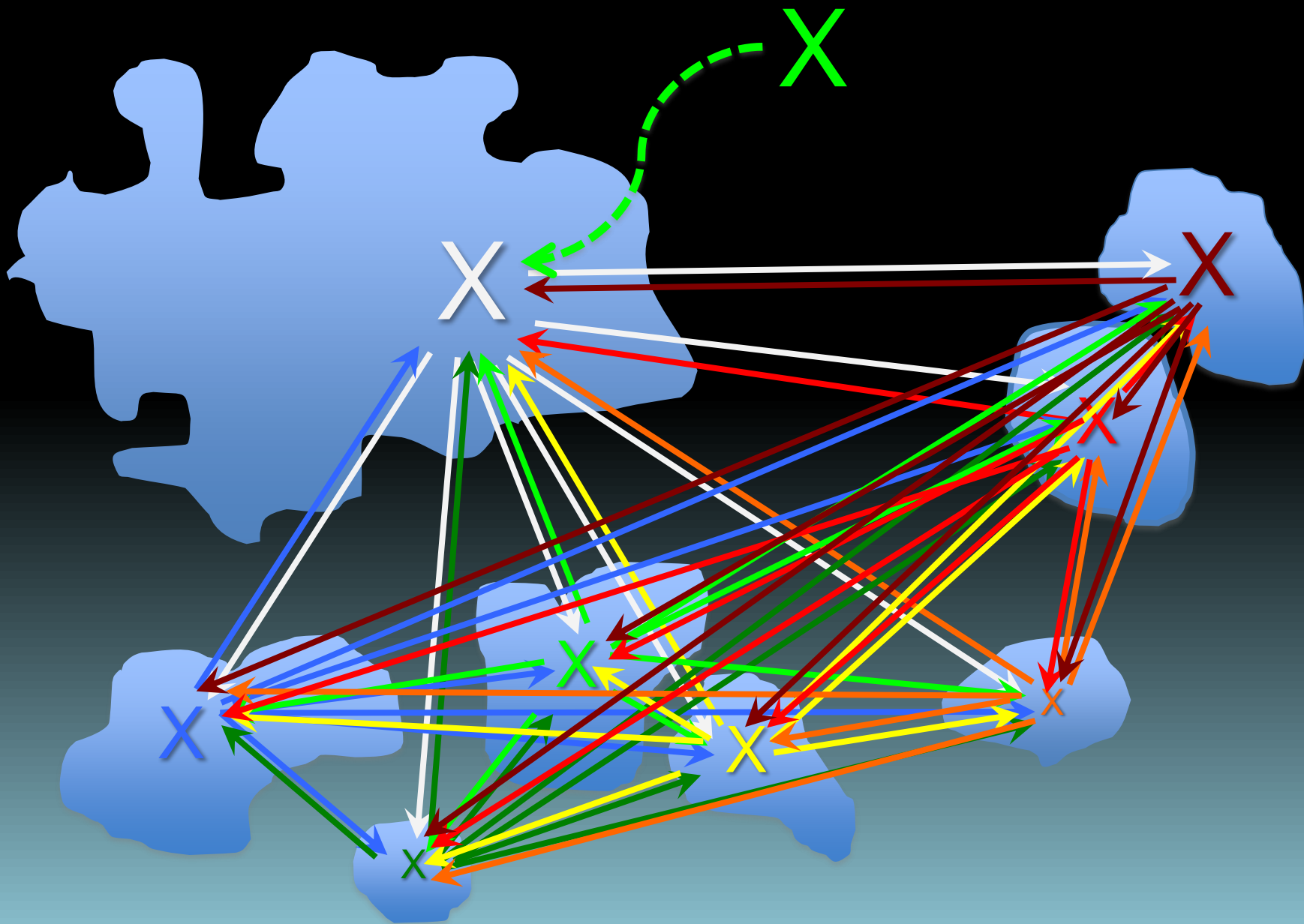
# Did contests escalate on treatment territories?

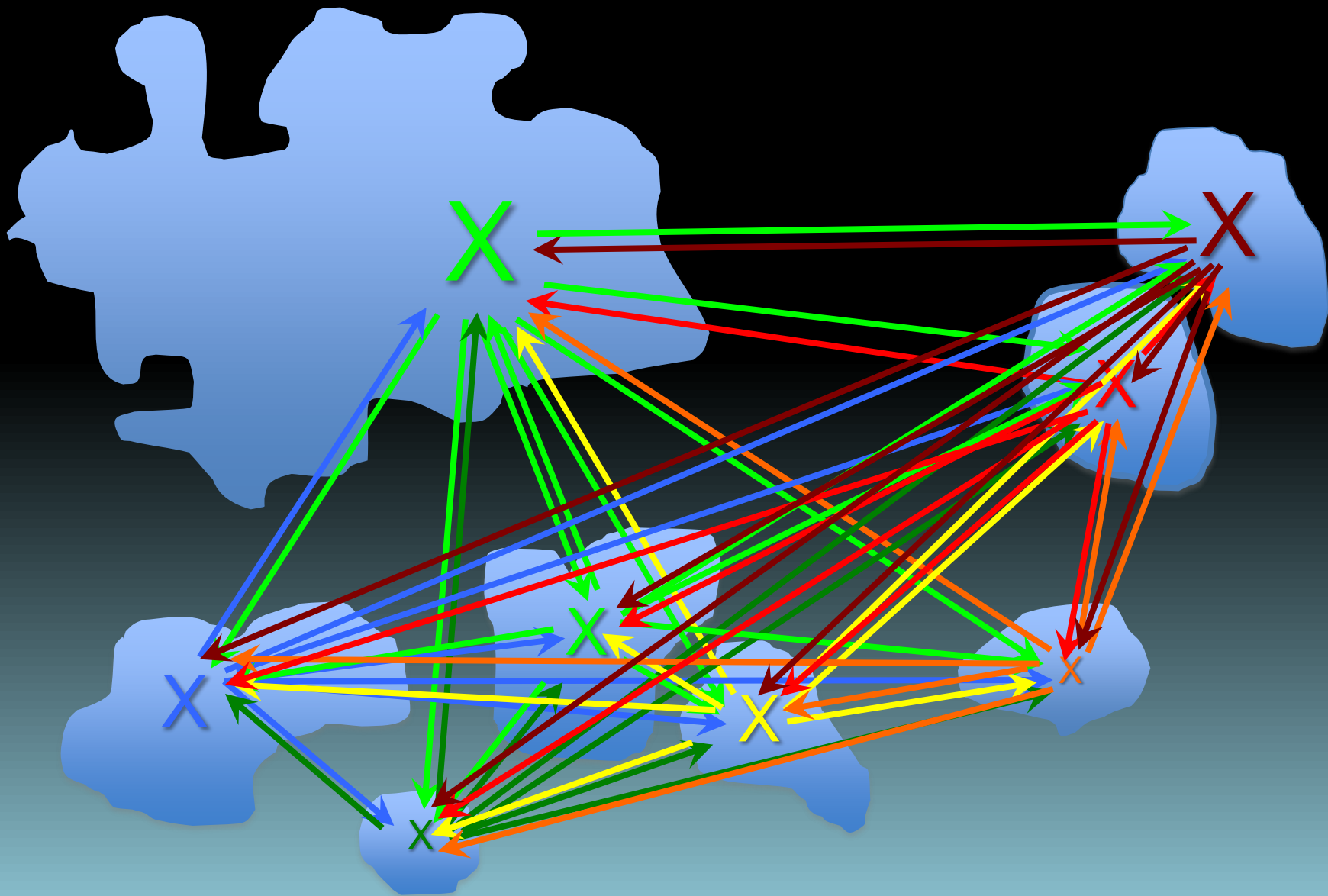


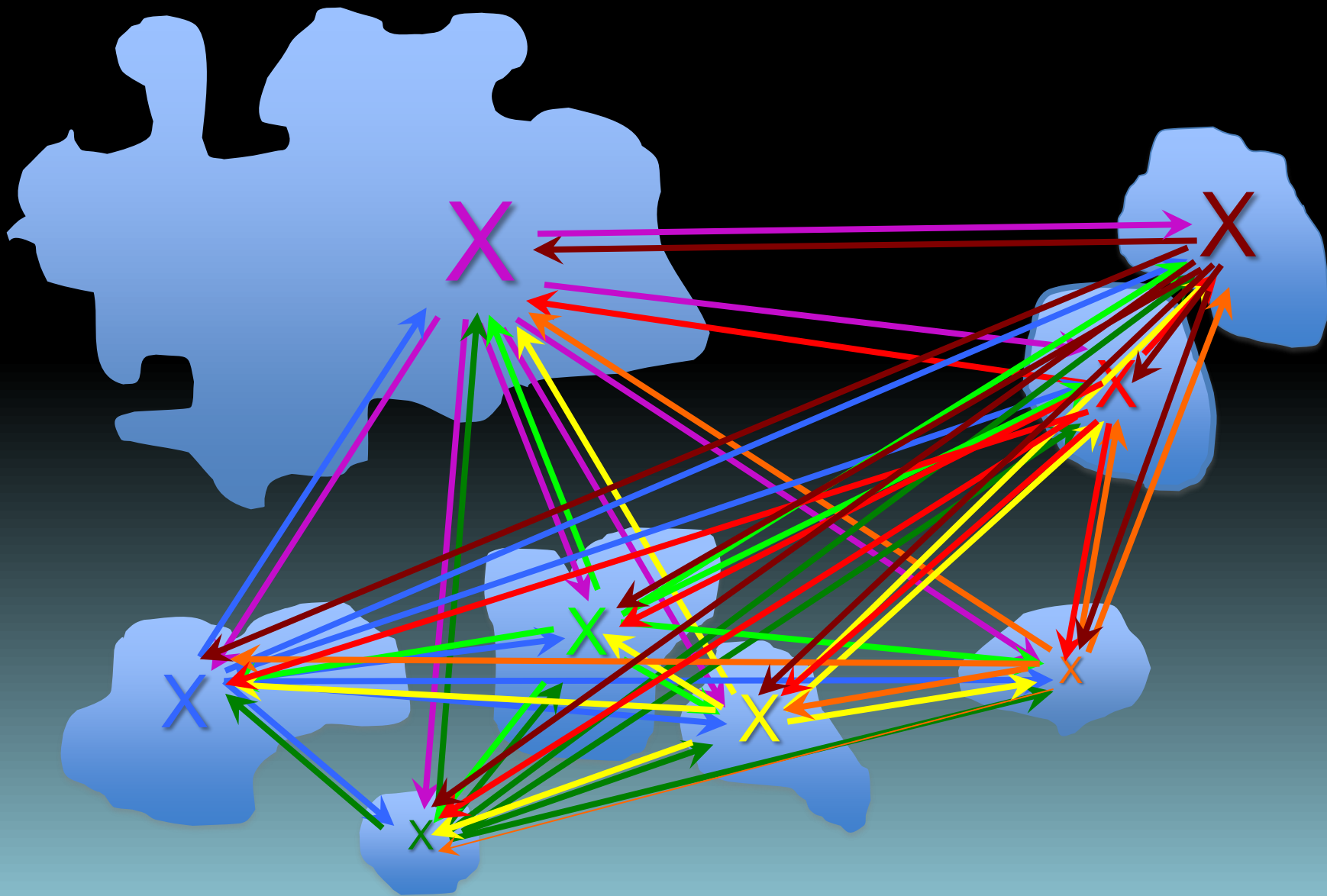
# Platform territories experienced lower reproductive success during the treatment year.



\*significant at an  $\alpha$  of 0.05 (Mann-Whitney Z test)



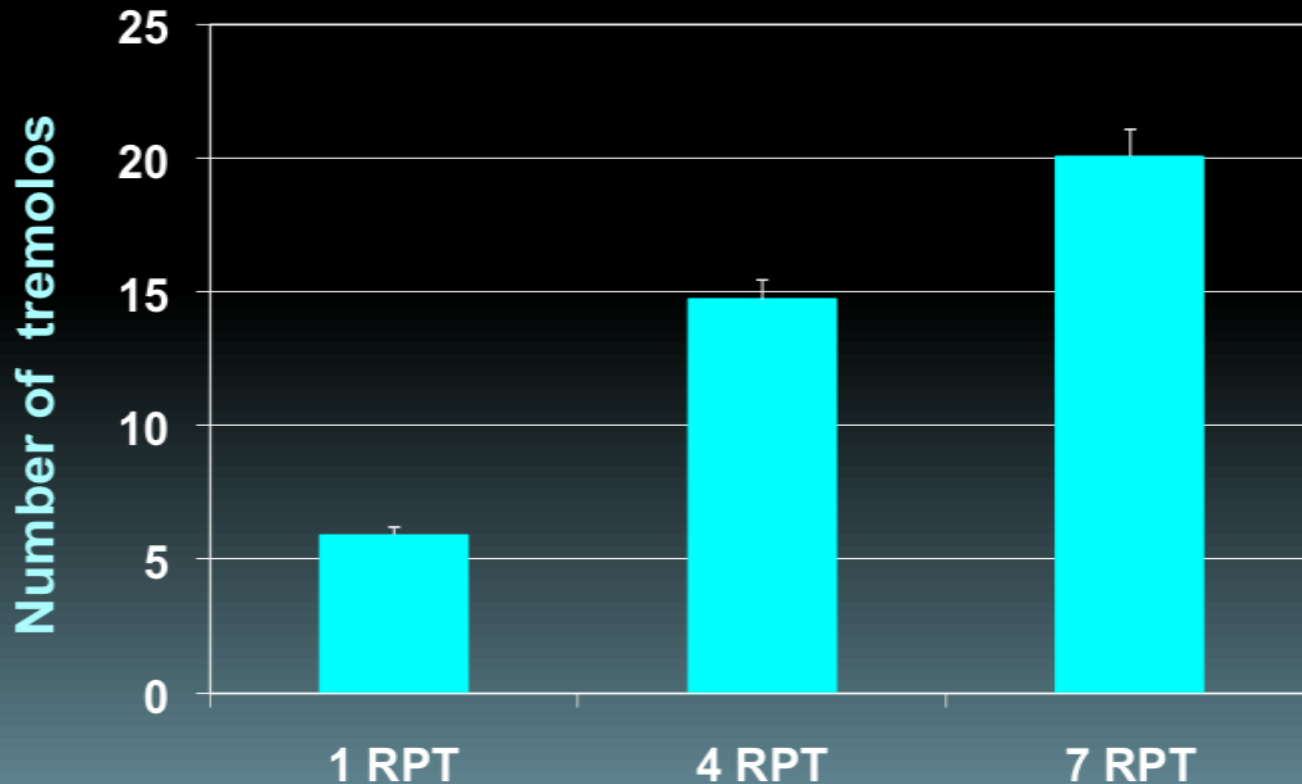








# Pairs tremolo more to yodels having more repeat phrases



Linear Growth Model  $F_{1,112} = 5.26$ ;  $P = 0.023$

