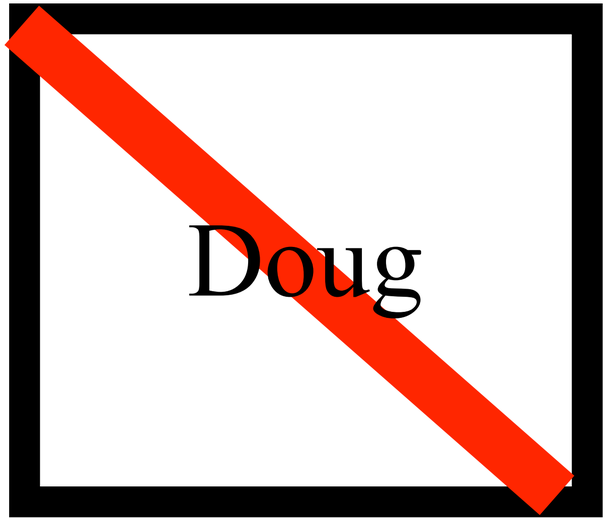
1. Clicker Attendance

- Launch your Top Hat app on your smart phone, or load the TopHat.com website, or text to the course phone number.

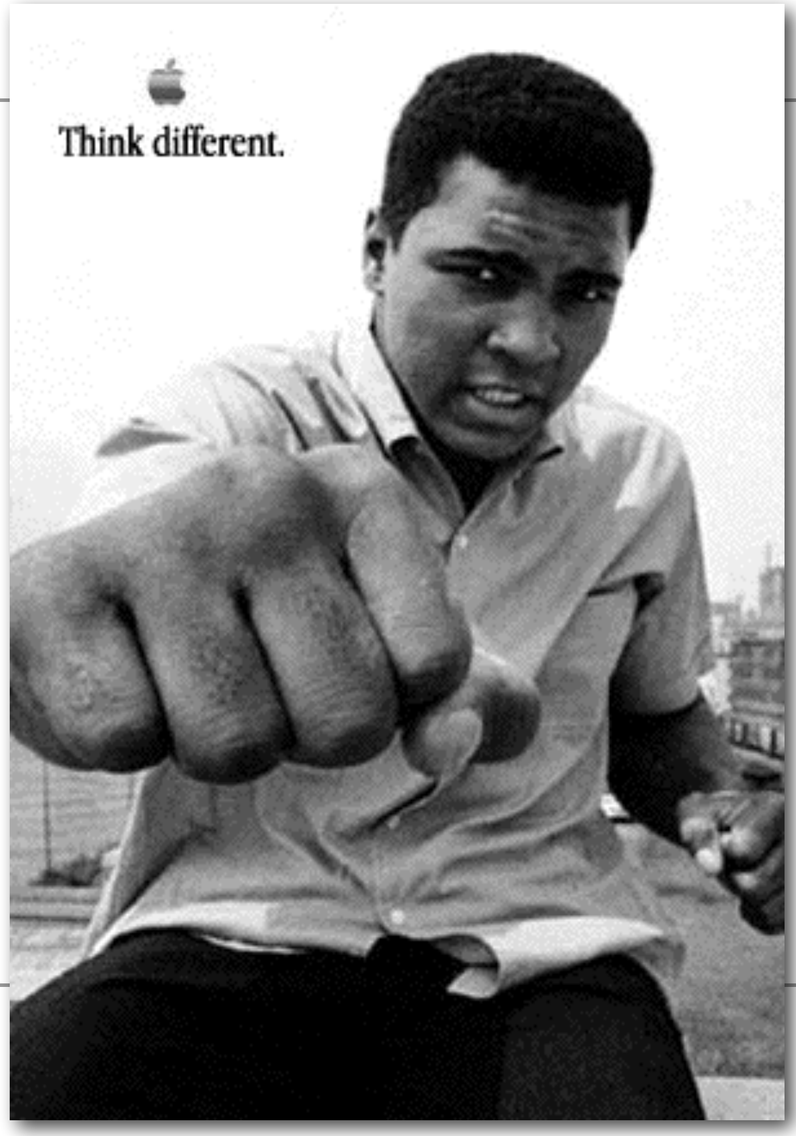
2. Sit with your group in lecture & lab

3. To Opt-OUT of being called upon

- Name Card with red stripe means you Opt-OUT (can Opt-OUT 3 times)



LB144-Pandemic *2022 edition*



“My roomate’s 144 has a normal textbook and talks about phylogeny, am I going to miss out on **learning** stuff here?”

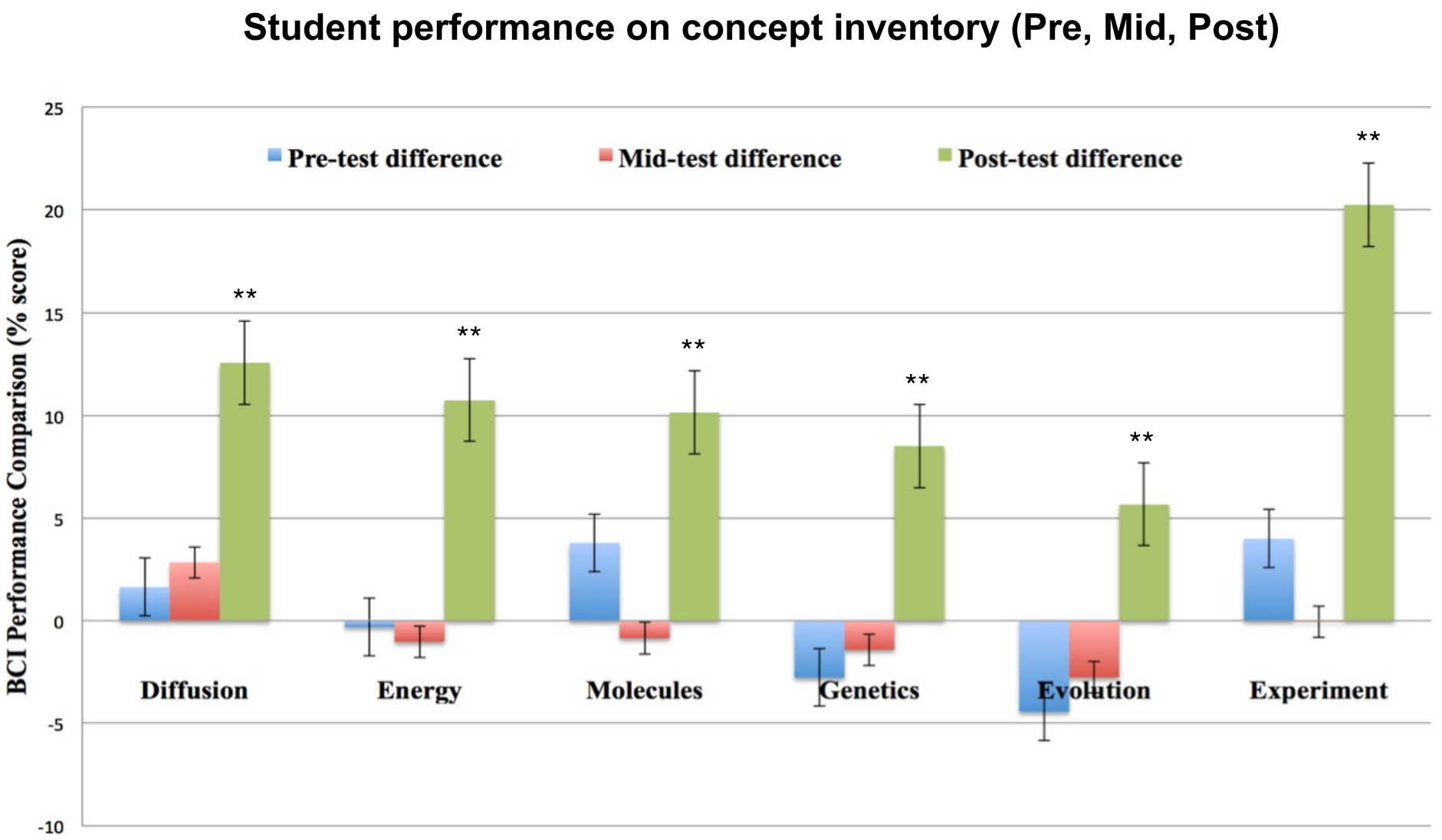


Figure 1: ACT-normalized performance of ICB textbook students (n=76) versus controls (n=98) in LB144 & 145 on biology concept inventory test developed (BCI) by Klymkowsky et al 2009 (SEM; **p<0.01).

Remind me

- 10 minutes left remind me to talk about Exam


BBC
SUBSCRIBE
0:00 / 4:07

Budgeting homework time (50 min): In Ch. 17, section 17.3 (the second half on **meerkats**) is 1180 words in length. This should take 6 minutes if you just read it. But when done properly, when you pause to watch one short movie and then review three figures, read and think about a few of the Integrating Questions, and take careful notes, this assignment should take you 50 minutes (if you are focused).

In-person

1. _____ **For Thursday's lecture,** read and take handwritten notes on the second half of section 17.3 on meerkats (start after Integrating Question 27).

2. _____ (Trifecta): **Prepare to explain (aloud) Figures 17.12, 17.13, and 17.14 in class**.

3. _____ **Advanced**: Read on further, about Dr. Martha Manser's research on meerkats by looking at one of her papers in the Bibliography.

17.3 Does group living require more derived mechanisms of info transfer?

L.O.s - Explain how communication is used by animals in groups
- Evaluate the comparative approach - Method in this context

Have social animals evolved for group living specialized communication systems. Do they have "derived traits" for info transfer.

Marta Manser - meerkats (social mongoose) South Africa
- observation + recording
comparative approach meerkat vs cape grey mongoose

Sentinel behavior vs jackals, eagles, hawks, snakes
"Contact" call - when stopped guarding went off-duty
Regular multi-note chirps "on-duty"

Fig. 17.12 | Marta Manser 1999 South Africa Study #1

Purpose: To determine the function of Sentinel calls

Methods: Record time it took for meerkat to go on-duty when i. no Sentinel on-duty ii. Sentinel not calling iii. on + calling
Used Playback of chirps on-duty or "Close" "Contact" calls or background noise.
Also record behavior of foraging crew of meerkats foraging time vs alert worried looking around.

Findings A. Pure observation, no vocalization experiment
B. Play back background noise vs sentinel calls

Fig 17.13 | - Focus on foraging crew of meerkats, time worried on alert

Manser Study #1 (continued)

Figs 17.12A - Observed only
- no sentinel (no sound) - 8-12 minutes until another takes over
- yes sentinel (no sound) - 30-50 minutes until another
- yes sentinel (yes chirps) - 60-80 minutes until relieved

17.12B - Playback used
- background noise provided: 12-17 minutes (no sentinel on-duty)
- sentinel chirps broadcast 22-27 minutes (no sentinel on-duty)

Figure 17.13 - Play back used but watch foraging meerkats
- background noise (no sentinel) - 20 min % lot
- sentinel chirps (no sentinel) - 10 min % similar **
- "close" calls (buh bye) (no sentinel) - 20 min % ← * Manser observed more heads raise-up

Figure 17.14 Marta Manser 2001 South Africa
Study #2

Purpose: further de-code functions of vocalizations/calls

Methods Play back vocalizations used. Actual native calls recorded during simulated predator encounters. (Walk by with Dog = Jackal)
then used recorded native vocalizations in playback when no predators present. Watch observed, videotape, record in notebook responses

Findings - vocalizations aligned well with effective strategies customized to each predator

Section 17.3: Does group living require more derived mechanisms of information transfer?

Biology Learning Objective

- Explain how communication is used by animals that live in groups.
- Demonstrate how the comparative approach is used to understand the evolution of sociality in animals.

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- So let’s try to remember what the stories and experiments were about….

Two species of mongoose

Figure 17.8

A, John Richfield, 2012, Creative Commons. B, Sara&Joachim, Creative Commons

What was this?

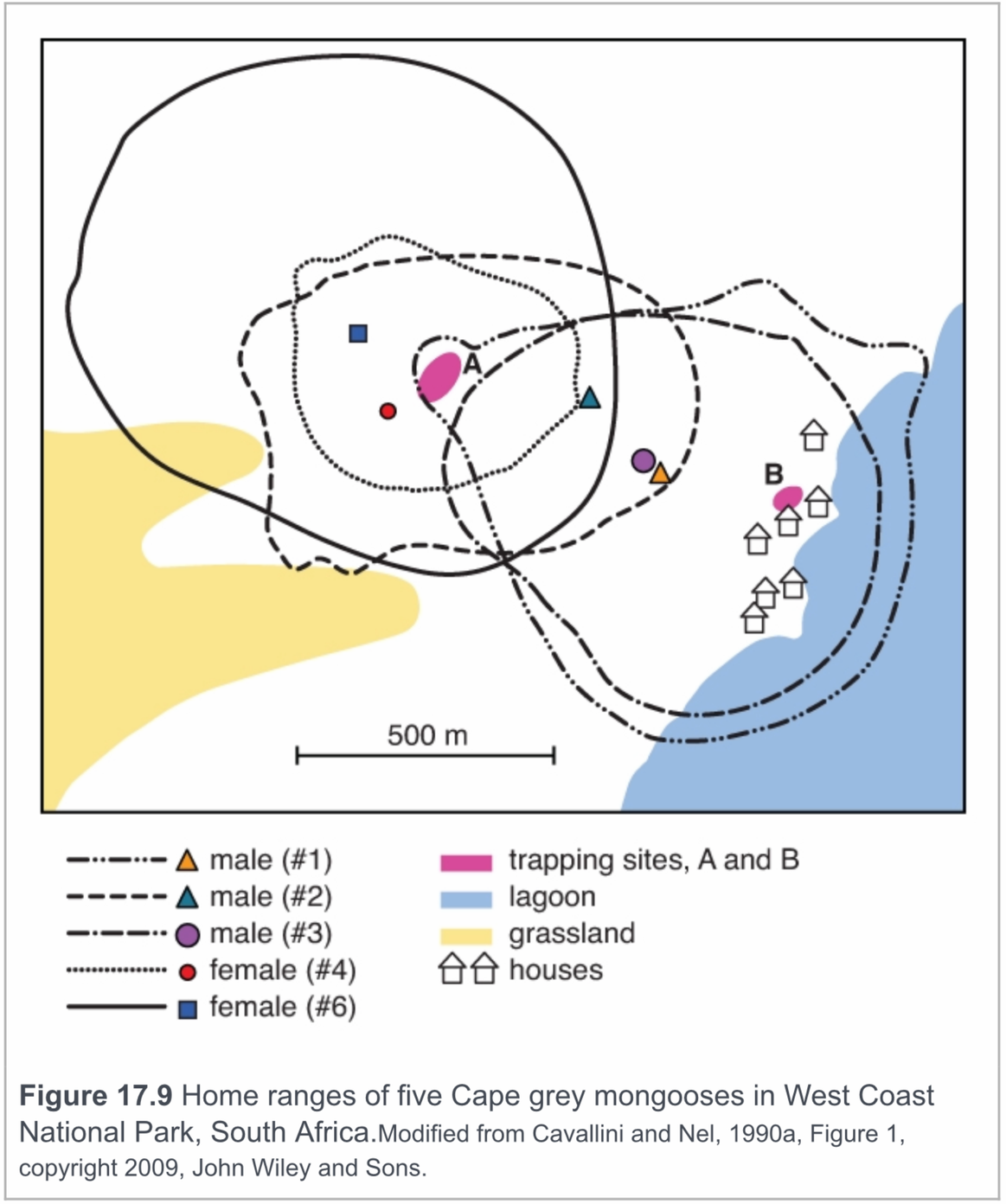


Figure 17.9 Home ranges of five Cape grey mongooses in West Coast National Park, South Africa. Modified from Cavallini and Nel, 1990a, Figure 1, copyright 2009, John Wiley and Sons.

What was this? Translate into human language?

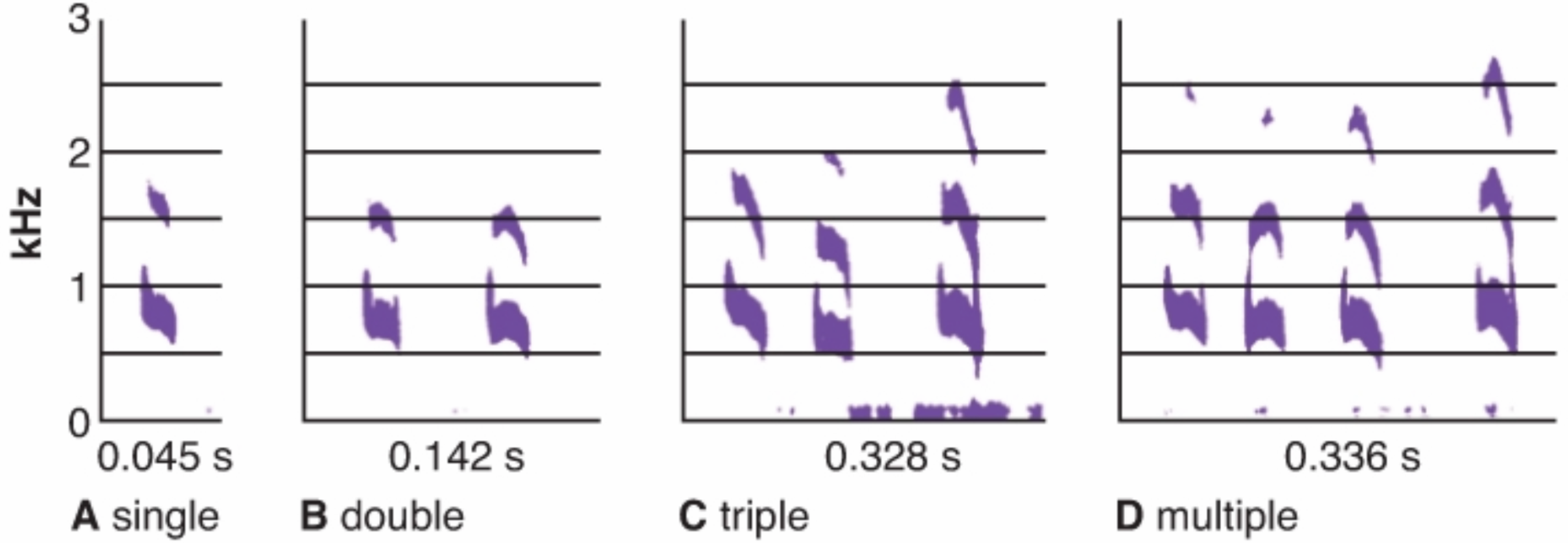
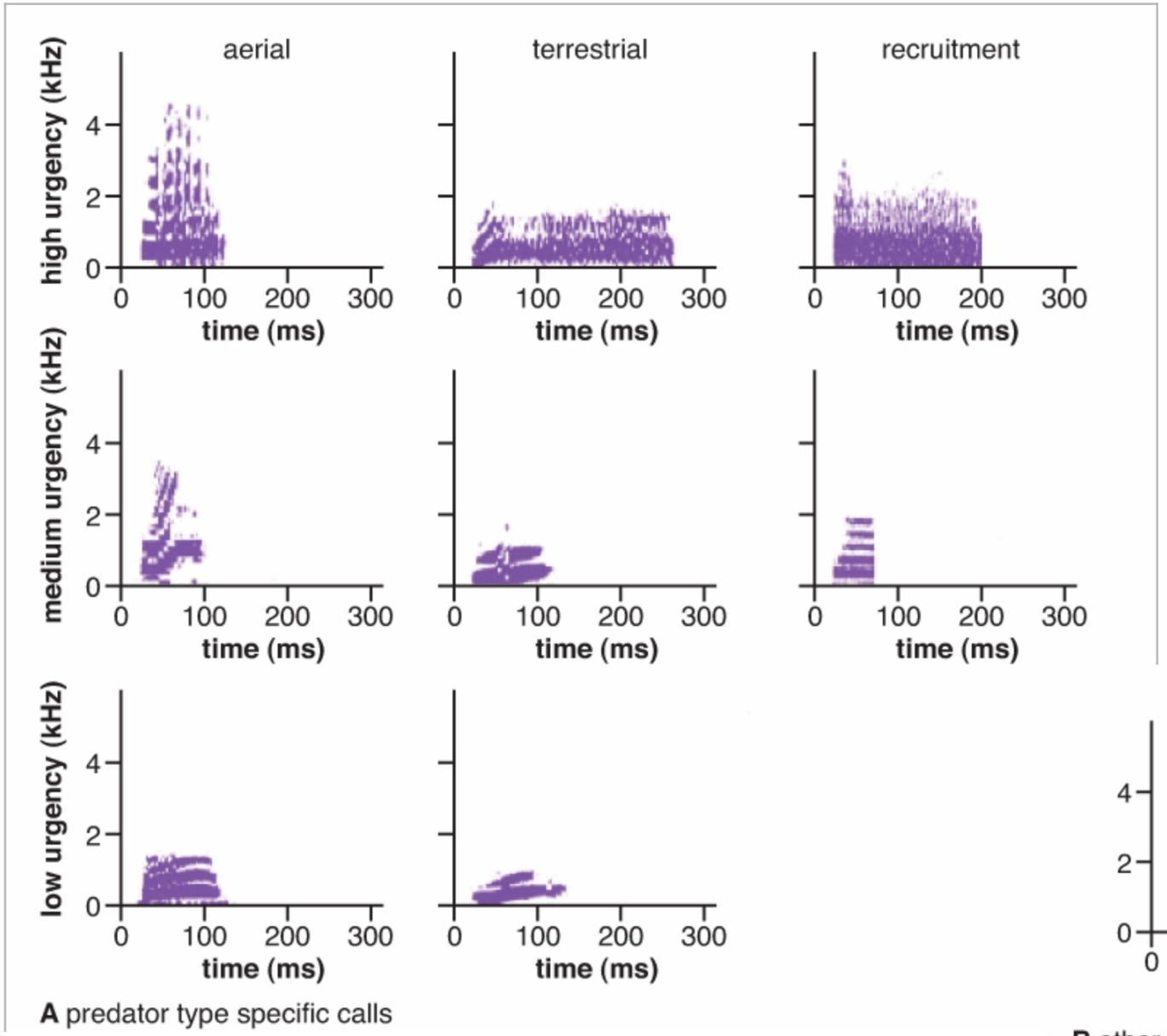


Figure 17.10 A to **D,** Sonograms of the four most common meerkat sentinel calls. Modified from Manser, 1999, Figure 1 a-d, by permission of the Royal Society.

Sonograms of meerkat alarm calls

How distinguish?



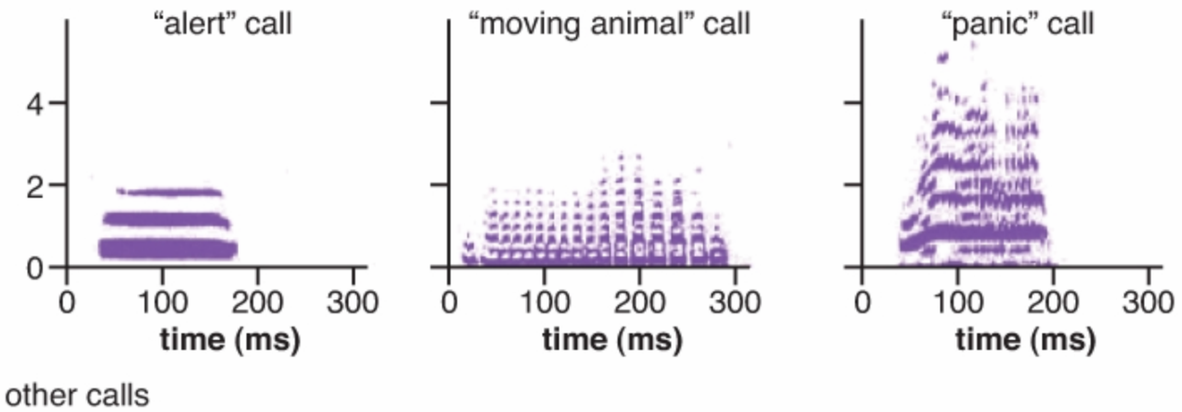


Figure 17.11 Sonograms of meerkat alarm calls. **A,** *Aerial* refers to calls given when an aerial predator was sighted, and *terrestrial* refers to calls given when a terrestrial predator was sighted. Recruitment calls prompted feeding meerkats to mob together. **B,** Generic alarm calls. Modified from Manser, 2001, Figure 1, by permission of the Royal Society.

Trifecta?

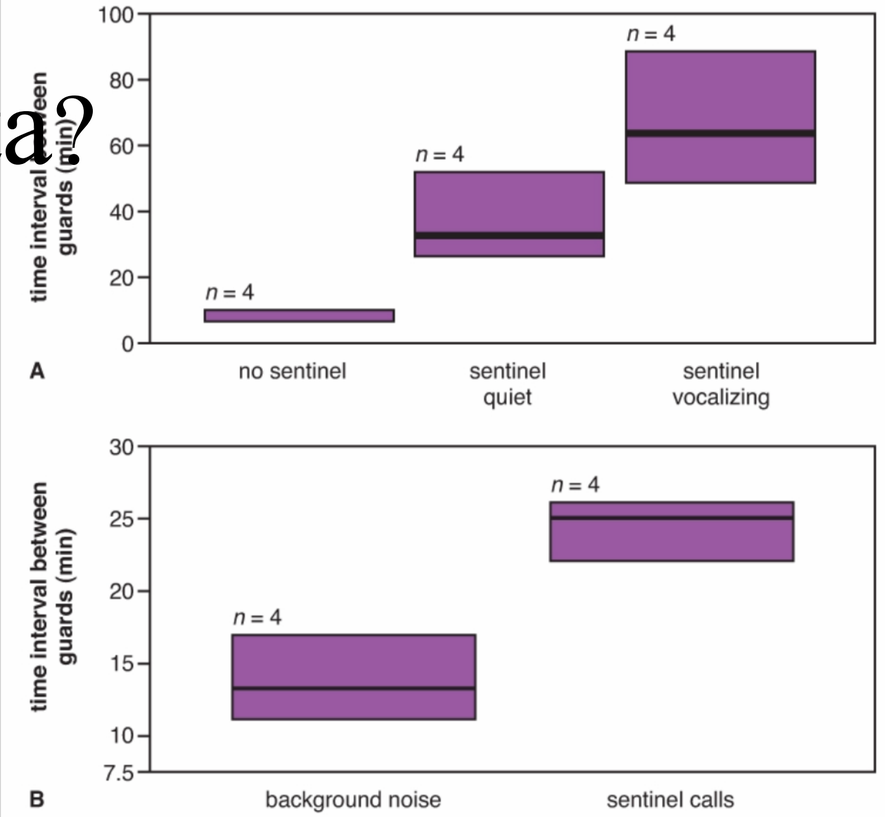


Figure 17.12 The time interval between new meerkat sentinels assuming guard duty under different conditions. The graphs illustrate the time intervals between the time it took for a meerkat to become a sentinel under three observed conditions **(A),** and during playback experiments **(B)** when no actual sentinel was on duty. *n* = sample size. From Manser, 1999, Figure 17, by permission of the Royal Society.

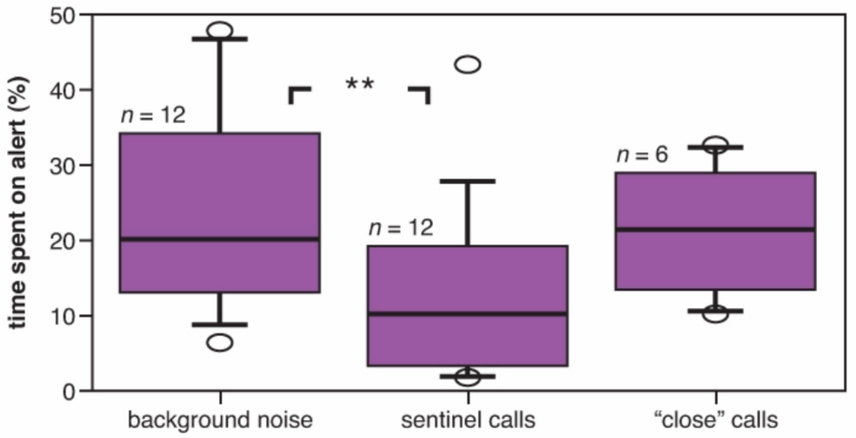


Figure 17.13 Sentinel call playback experiment. The graph shows the percent of time foraging meerkats spent on alert when exposed to recordings of background noise or sentinel calls. *n* = sample size.From Manser, 1999, Figure 3, by permission of the Royal Society.

Random call

Trifecta?

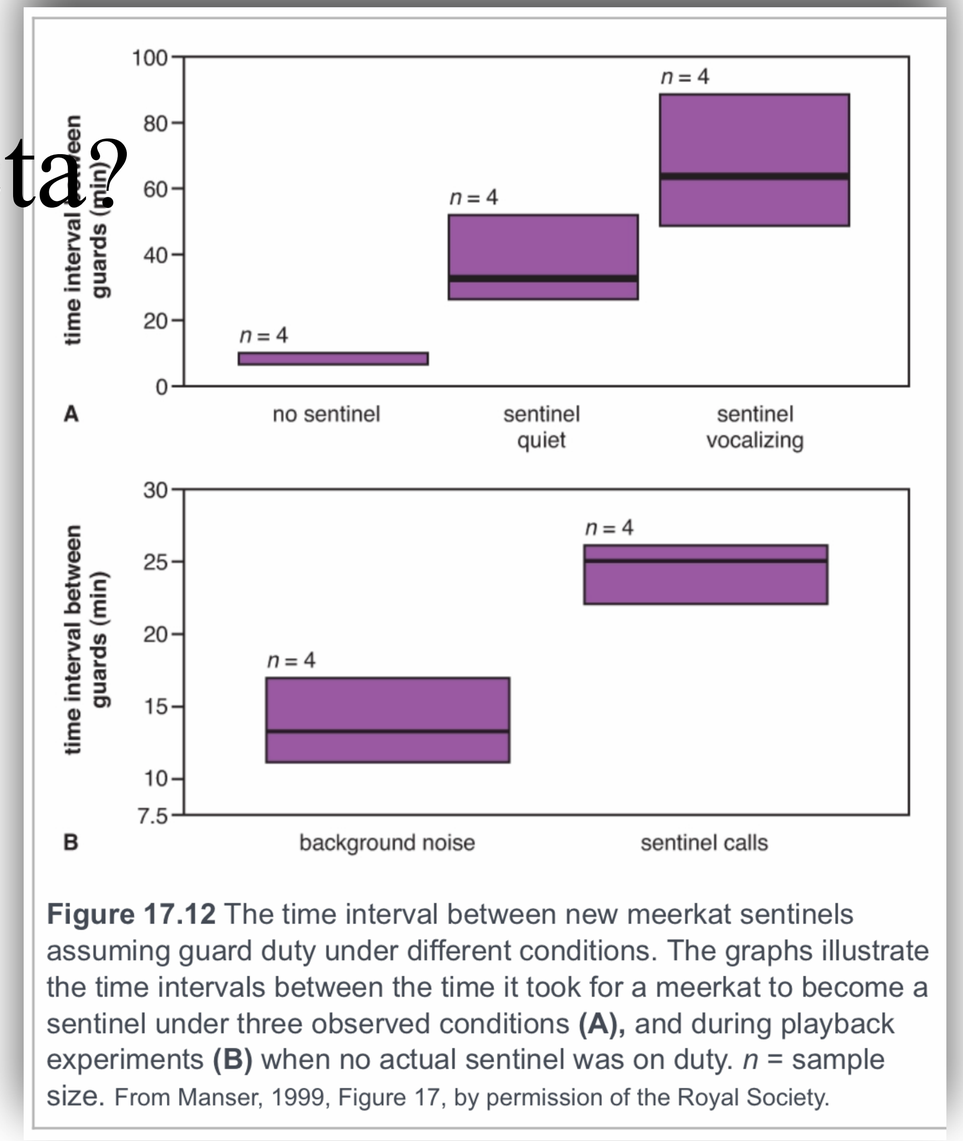


Figure 17.12 The time interval between new meerkat sentinels assuming guard duty under different conditions. The graphs illustrate the time intervals between the time it took for a meerkat to become a sentinel under three observed conditions **(A),** and during playback experiments **(B)** when no actual sentinel was on duty. *n* = sample size. From Manser, 1999, Figure 17, by permission of the Royal Society.

Random call

Trifecta?

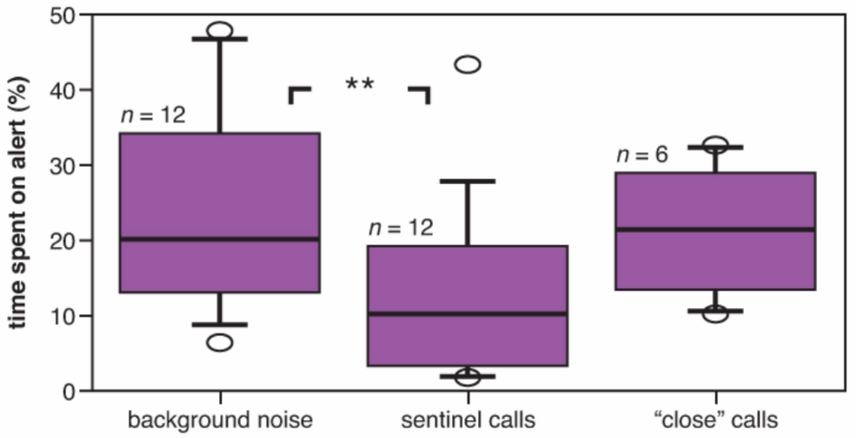


Figure 17.13 Sentinel call playback experiment. The graph shows the percent of time foraging meerkats spent on alert when exposed to recordings of background noise or sentinel calls. *n* = sample size.From Manser, 1999, Figure 3, by permission of the Royal Society.

Random call

Integrating Questions

28. Compare the effect of sentinels vocalizing the sentinel calls versus not vocalizing using Figures 17.12 and 17.13. What does this suggest about the function of the sentinel calls?
29. Do the sentinel calls increase or decrease the efficiency of foraging meerkats? Support your answer with data.
30. If a sentinel is vocalizing, why would a foraging meerkat assume sentinel duty?

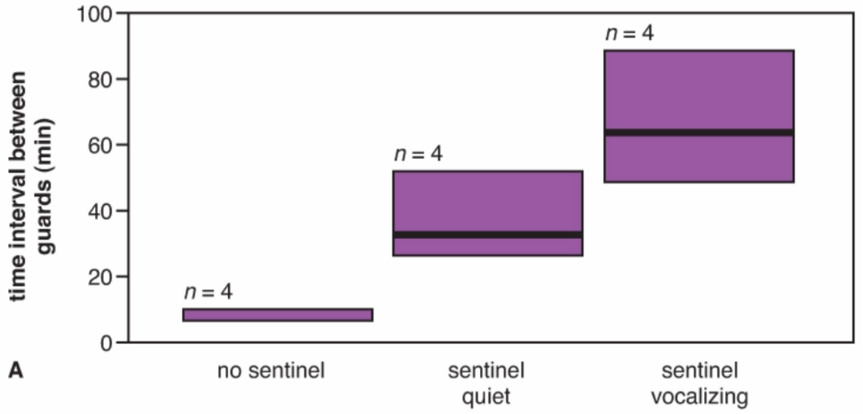


Figure 17.12 The time interval between new meerkat sentinels assuming guard duty under different conditions. The graphs illustrate

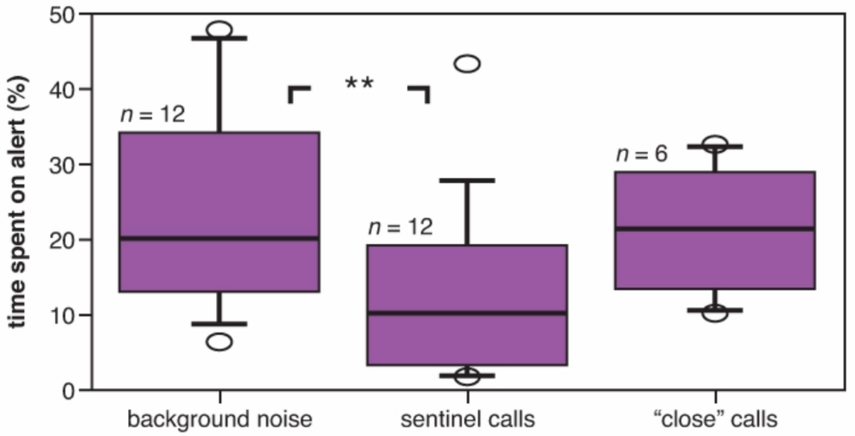
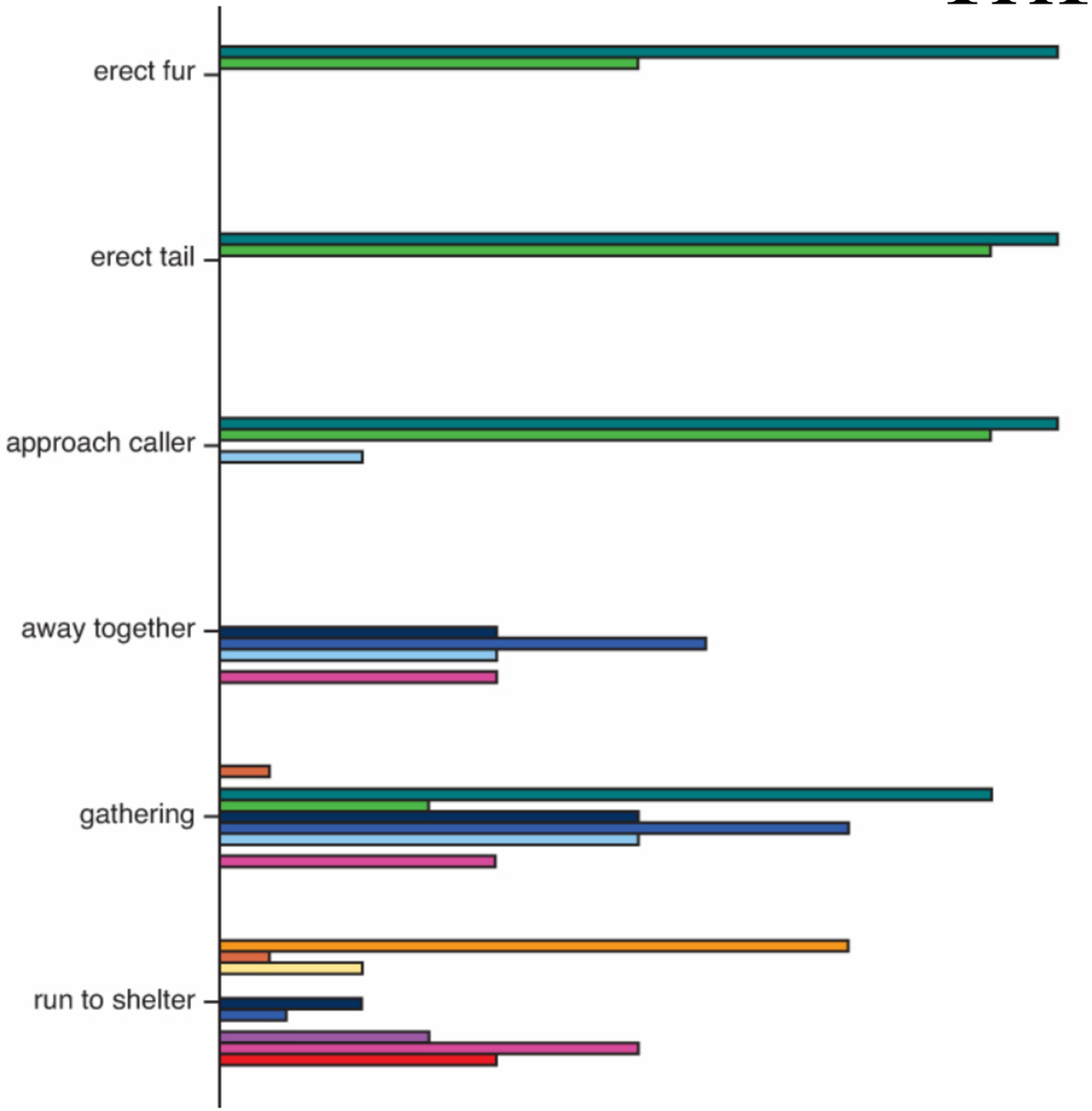


Figure 17.13 Sentinel call playback experiment. The graph shows the percent of time foraging meerkats spent on alert when exposed

Trifecta?



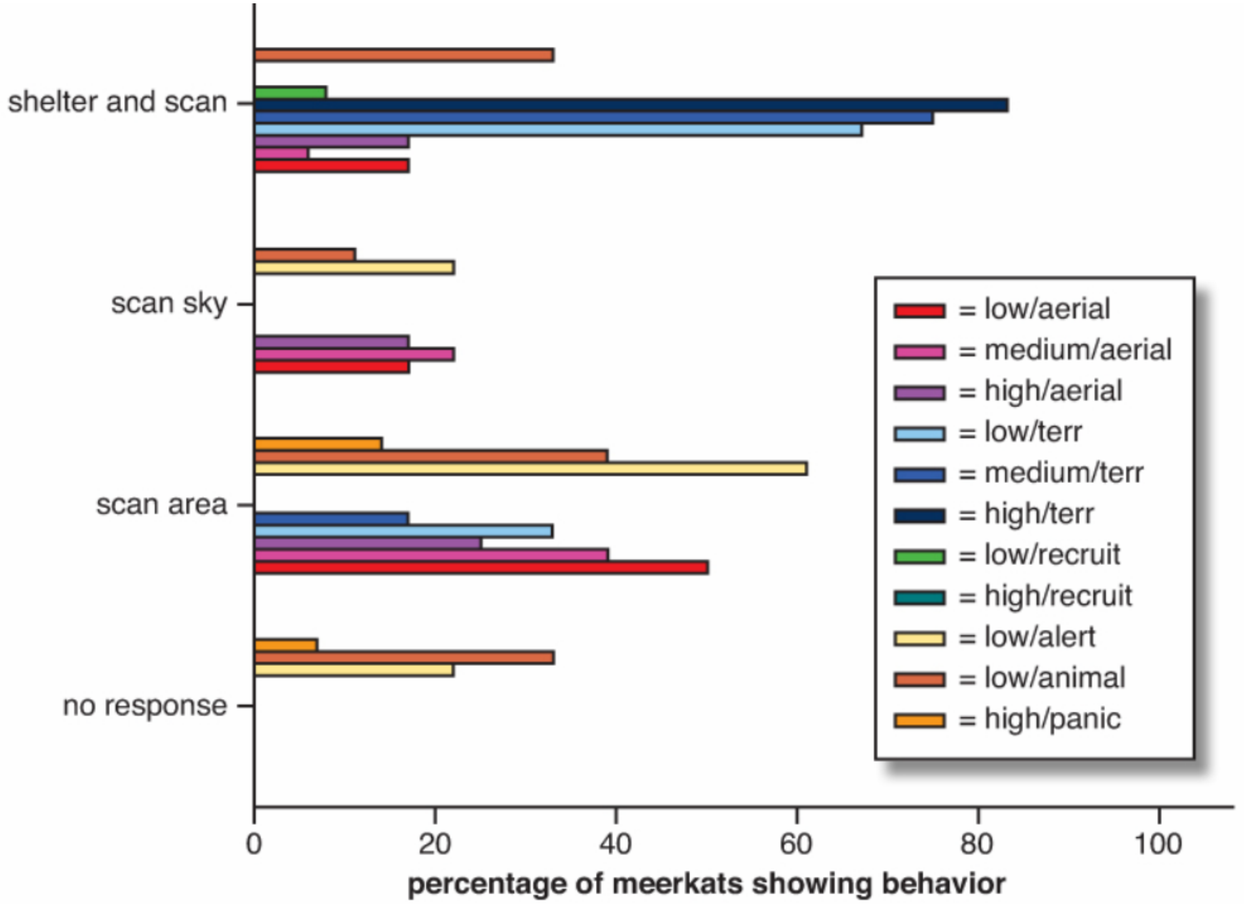
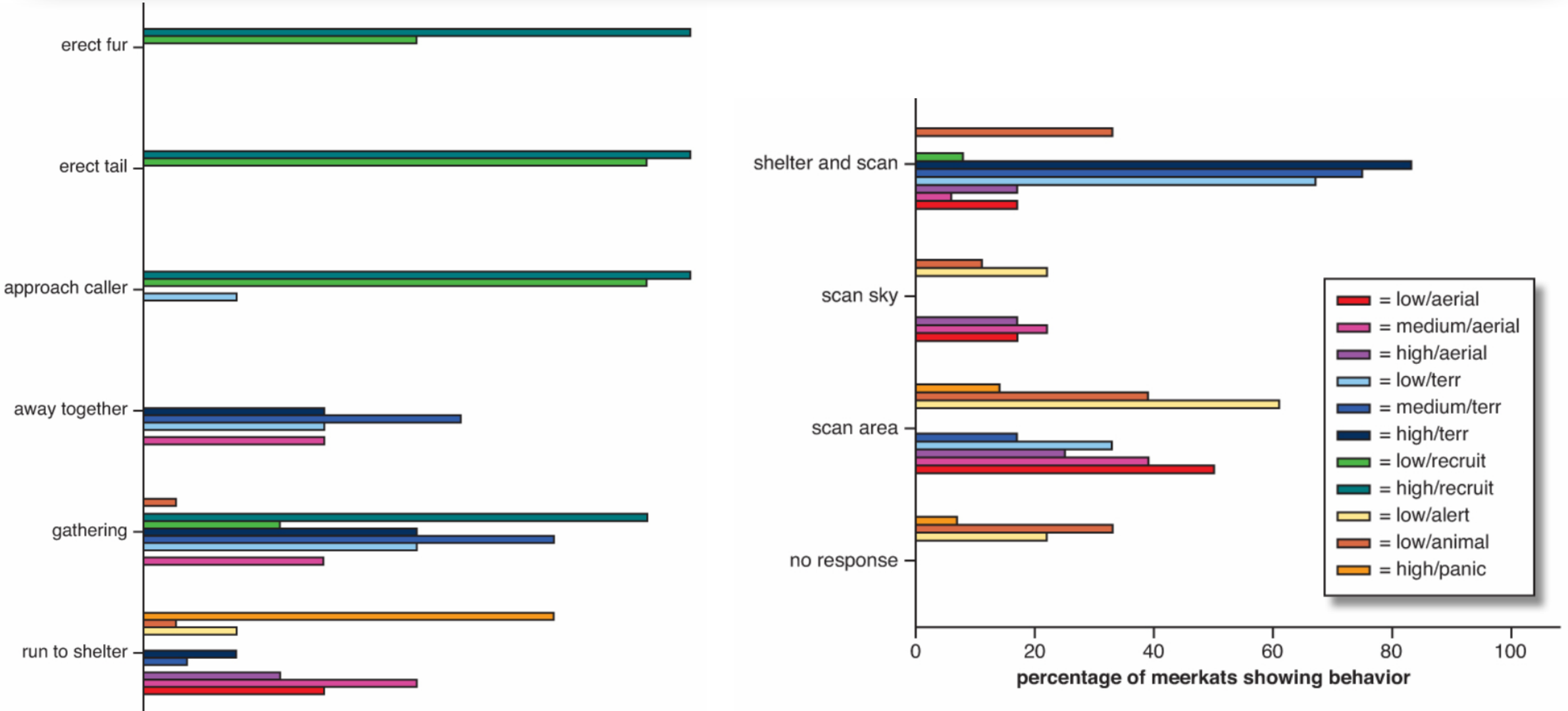


Figure 17.14 The percentages of meerkats displaying one of nine behaviors in response to recorded vocalizations when no predator was within sight. Percentages in a vocalization category may add up to more than 100% because meerkats may exhibit multiple behaviors after one call. Data from Manser, et al., 2001, Table 2, by permission of the Royal Society.

Random call

Integrating Questions

31. Why would it be important to be sure that no actual predators were present before playing back the calls to the meerkats?
32. Do the responses shown in Figure 17.14 seem appropriate to the type of threat communicated by each call?



Percentages of meerkats displaying a behavior in response to recorded vocalizations

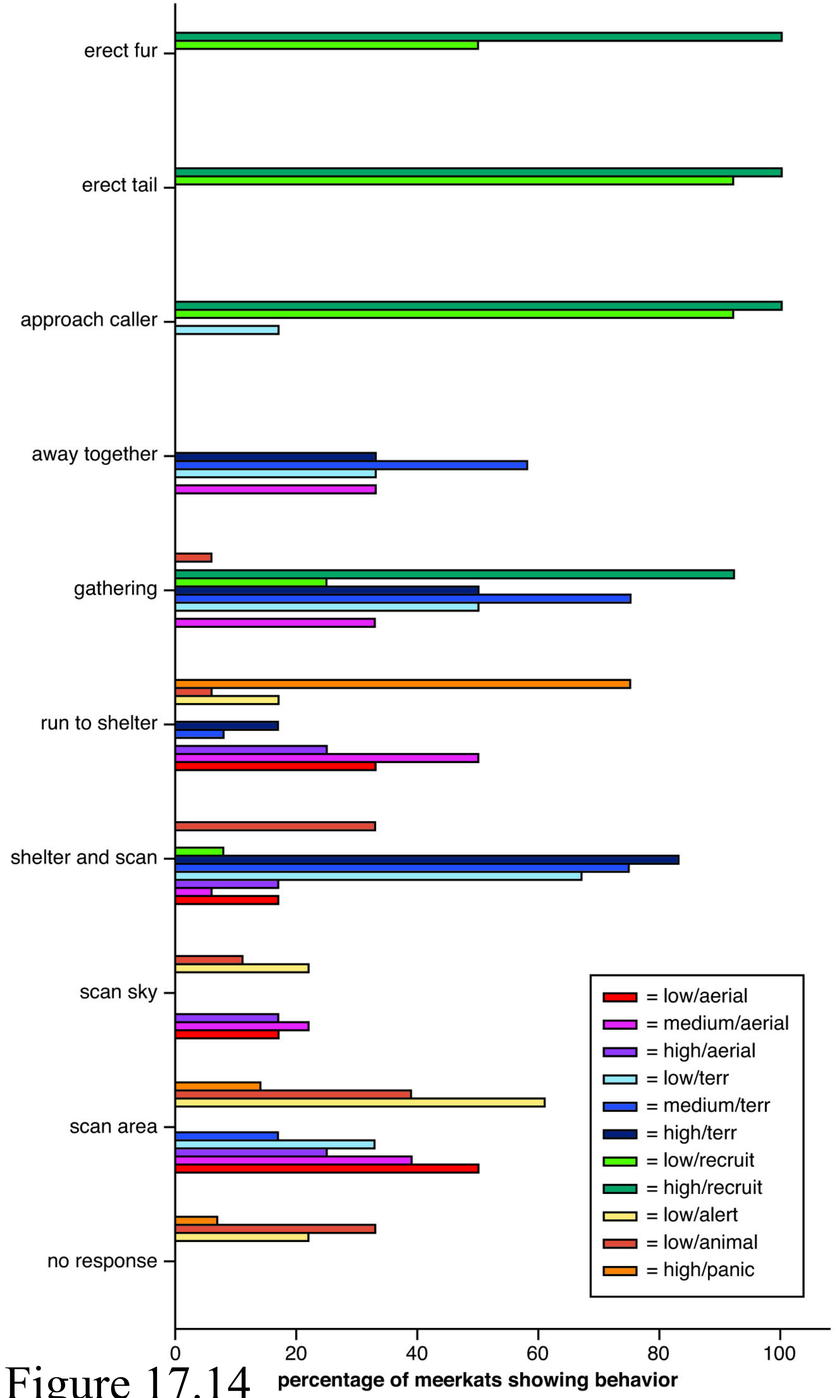


Figure 17.14

Modified from Manser, 2001, Table 2

Percentages of meerkats displaying a behavior in response to recorded vocalizations

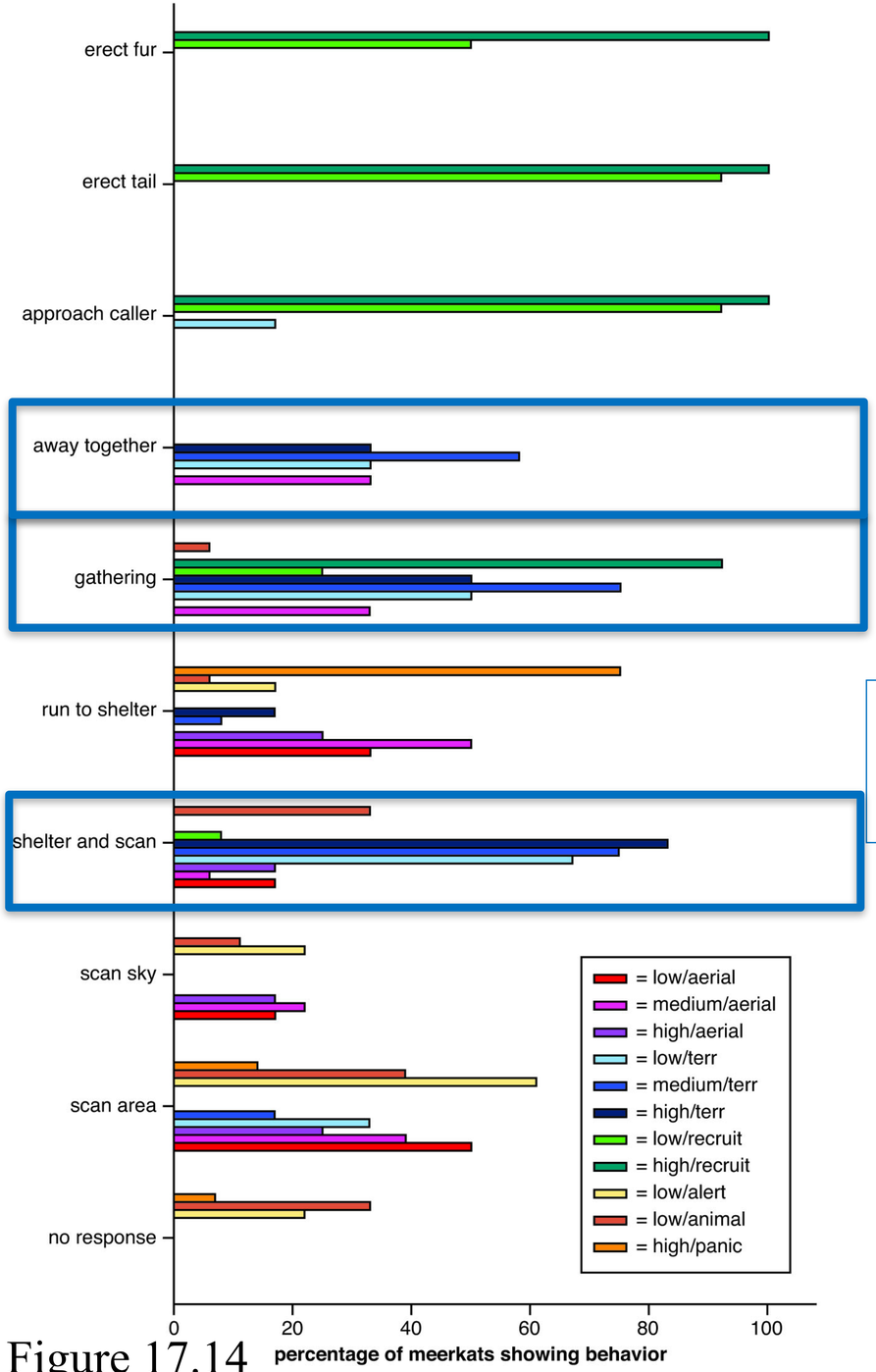


Figure 17.14

List behaviors associated with terrestrial threats (shades of blue)?

Modified from Manser, 2001, Table 2

Percentages of meerkats displaying a behavior in response to recorded vocalizations

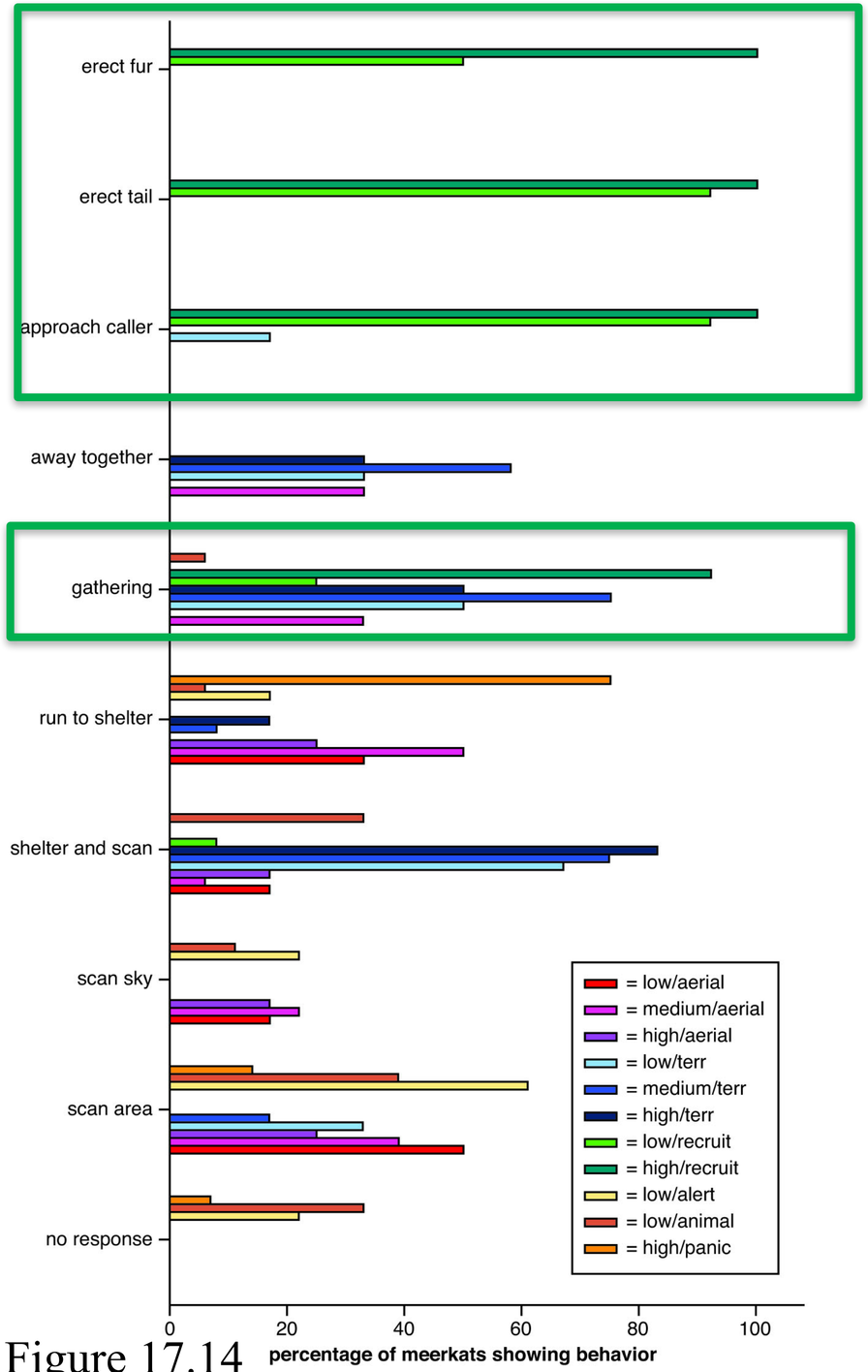
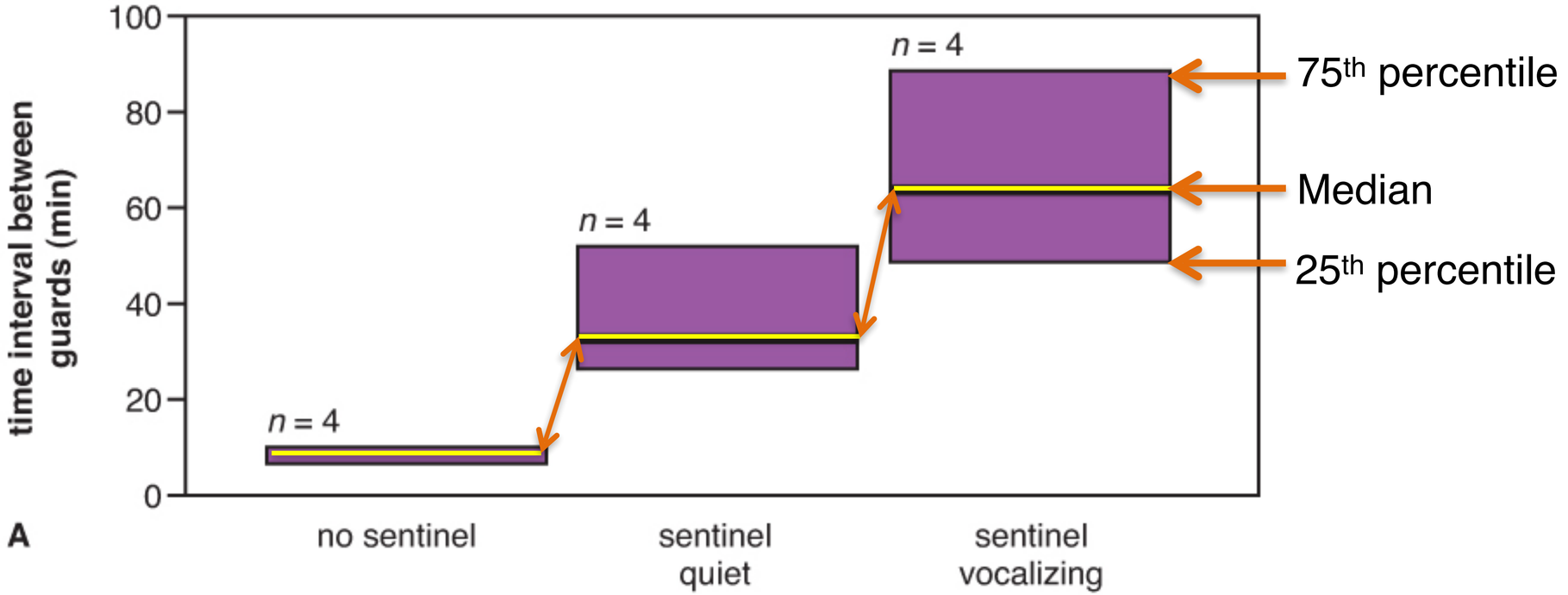


Figure 17.14

List behaviors associated with recruitment calls (green)?

Modified from Manser, 2001, Table 2

What are box plots?



Explain differences in medians and ranges

Figure 17.12

Modified from Manser, 1999, Figure 17 by permission of the Royal Society.

What are whiskers, asterisks, circles?

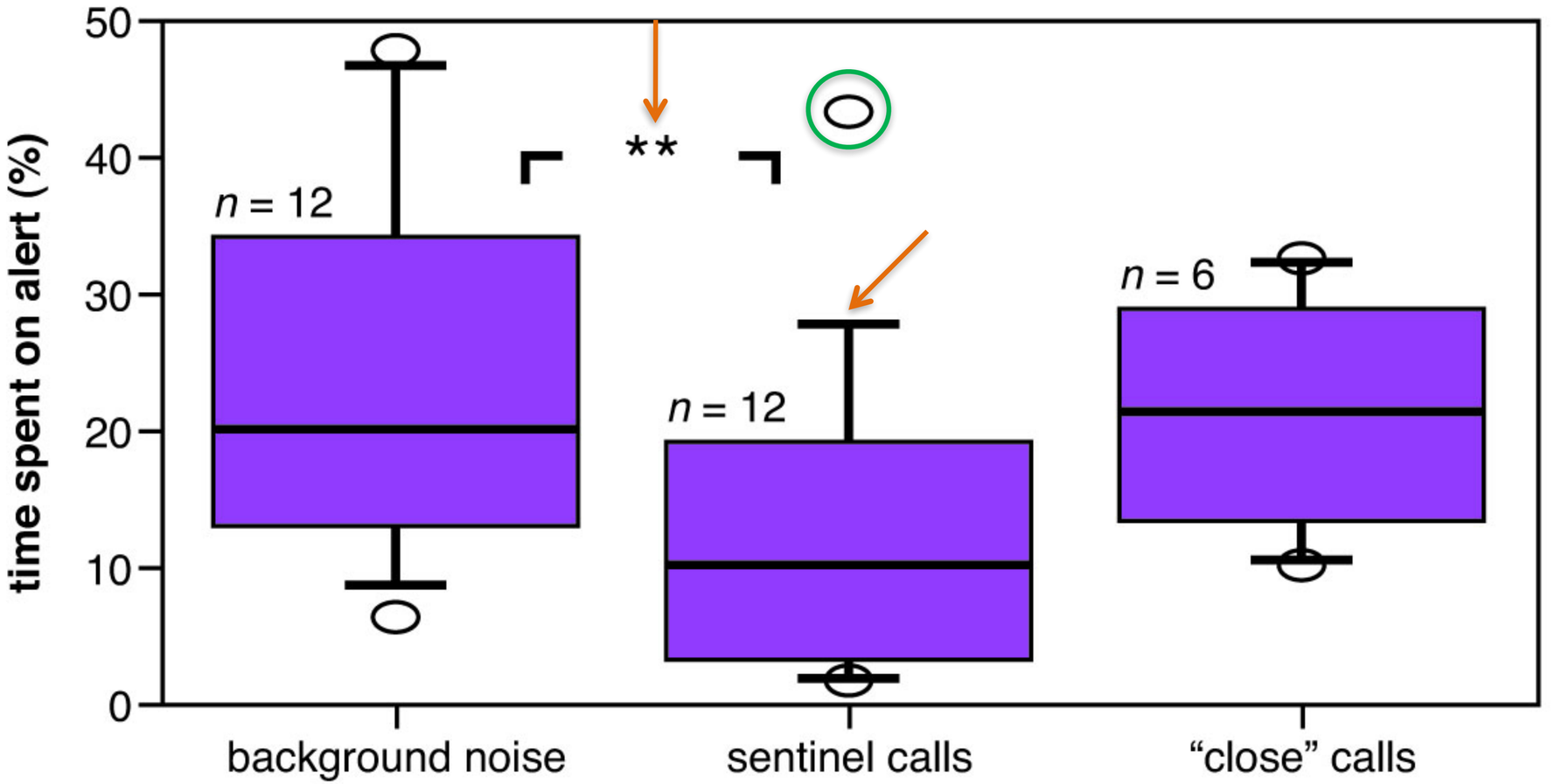


Figure 17.13

Modified from Manser, 1999, Figure 3 by permission of the Royal Society.

Announcements

1. **Exam I is next week (12:40pm Monday in E-26A Holmes Hall).** Expect 20-30 *multiple True/False/Why* questions. Pick T/F and explain. Many figures from papers, may use 3x5" card with notes.

   Figures (not Tables) from the research papers of: Ulagaraj & Walker (crickets), Ryan & Page (bats), Sara Lewis (fireflies), Katharina Fabricius (corals), Vincent Bretagnolle (petrels) & Marta Manser (meerkats). **Case** studies in "Talking to Strangers", **Trifecta** of "Islands of Creation."

2. **What will questions look like, be like?**

What is a multiple True/False/Why question?
(Multiple-choice with partial credit)

Example:
A. What are the official sport team colors of Michigan State University?

1. Maize
2. Blue
3. Green
4. Yellow
5. White

6. Why?: Historically, why were those colors chosen?

For full credit you must respond with:
The answer #3 is True
The answer #5 is True
The answer to #6 you accurately explain why those are the colors

How should I study ?

Dr Sara Lewis

- Who is she, what's the purpose of her research, and relevance?
- Draw a figure from her paper and Trifecta it.
- Explain two learning goals associated with our textbook readings on her work. What are you supposed to learn as a result? Is this ecology, evolution, chemistry what?

8 papers of: Ulagaraj & Walker (crickets), Ryan & Page (bats), Sara Lewis (fireflies), Katharina Fabricius (corals), Vincent Bretagnolle (petrels) & Marta Manser (meerkats 1, 2)

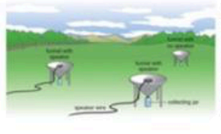
Readings

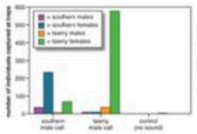
Ecological System—Information & Environment: Communication within a species, between species, and to exploit other species.

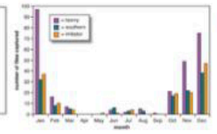
Have organisms evolved to exploit communication between individuals of other species? (Prey Detection)

- (18.1 crickets call)

Cricket songs are exploited by natural enemies





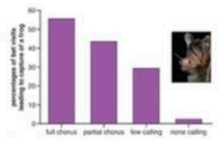


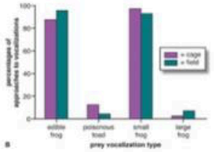
mole cricket call	number of tachinid flies
southern	24
tawny	51
imitator	33
changa	0
northern	0

Raj Ulagaraj, T. Walker: Phonotaxis of crickets in flight: attraction of male and female crickets to male songs, *Science* 182(4118):1278, 1973.

- (18.1 frogs sing)

Frog choruses attract some predators





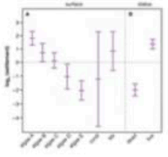
treatment	mean number of trials	standard error	sample size
inexperienced bat with experienced bat	5.3	1.7	10
two inexperienced bats	96.8	3.2	5
one inexperienced bat	96.2	3.8	5

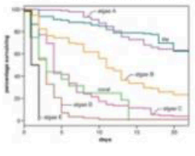
Rachel Page, M. Ryan: Social transmission of novel foraging behavior in bats: frog calls and their referents, *Curr Biol* 16(12):1201-1205, 2006.

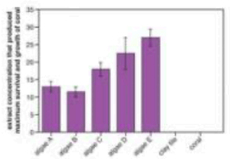
Is chemical communication used to block competition or defend self? (Competition)

- (18.3 corals settle)

Information is used by corals during settlement







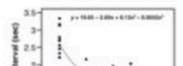
http://ctools.msu.edu/144/syllabus.pdf

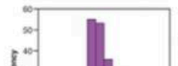
Lindsay Harrington, Katharina Fabricius, et al: Recognition and selection of settlement substrata in corals, *Ecology* 85(12):3428-3437, 2004.

Populations—Behavior & Exchange: Non-heritable information transfer in individuals, imperfect transfer produces variation.

How is information transmitted between members of animal species? (Populations, Communication, Animal Behavior)

- (17.1-2 fireflies blink)





LB144-Pandemic

2022 edition