LB144-Pandemic

2022 edition

(sec 11 “Manser”, &12 “Bretagnolle”)

-. Clicker Attendance

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

-. Fill out Index Card

- Front: NAME (pronounce, pronouns)
- Back: CAREER & learn?

Index Card

NAME (in BIG LETTERS)

Front

Career; What do you want to learn in this class?

Back

Hello

(IAmA, this is, these are, what to learn?)

Budgeting homework time (50 min): Ch. 18, section 18.1 (the first half on **crickets**) is approximately 1775 words in length. At what's considered slow reading speed, 200 words per minute, reading the first half of section 18.1 should take 9 minutes. But when done properly, when you pause to review figures, read and think about a few of the Integrating Questions, and take careful notes, if you focus (avoid distraction) it should take you approx. 50 minutes.

1. _____ For the first lecture, read the 1-page **Foreword** at the beginning of the textbook written by the very famous Dr. Bruce Alberts, review the Student Resources in **Chapter 0**, and then begin reading **Chapter 18: Information in the Environment** of our book, Integrating Concepts in Biology (ICB). Read the single Introduction page. You do not need to take notes on any of these pages.

2. _____ Then slowly read the section we will discuss most during lecture, section 18.1 "Have organisms evolved to exploit communication between individuals of other species?" As you read section 18.1 (the part on crickets, not frogs) on your computer be sure to **take handwritten notes on paper in your lecture notebook**. Handwritten notes lead to much greater learning[2].

3. _____ **Try to answer at least one Integrating Question (IQ) in each set**. As you read the ICB textbook always attempt to answer at least one of the yellow **Integrating Questions** each time you get to a set of them. It will help you test yourself to determine if you got the meaning, or not, while reading the last few paragraphs. Just like taking handwritten notes, this too will greatly increase your learning. If you desire a high grade in the course, try to answer more IQs.
   NOTE: Assume you will be asked a question in lecture which is directly from one of the IQs.

4. _____ **Trifecta**: **Prepare to explain (aloud) Figures 18.2, 18.3, 18.4 and Table 18.1 in class**. As you read a section from the ICB textbook always attempt to pause and study **each figure/drawing/table** that is discussed. Some of them are just pictures or drawings and may not require lots of thinking, but others are graphs or tables that contain actual data from research experiments. Spend more time looking at these. In class, during lecture, students will be randomly chosen to explain a Figure or Table aloud (LA will hand you a microphone) so prepare for when your name is called to be sure you are ready. *Some students avoid stress by just writing out in their*

Reading (Chapter 18 section 1 (crickets)

18.1 Have organisms evolved to exploit communication between individuals of other species? (predators / parasites)

- Non-heritable information
- imperfect information transfer produces variation
- bottom line: some species intercept info...

L.O.s

- ID commonalities in communication between vs within species
- Evaluate how info is used to exploit
- Give examples of adaptations in response

Risk in communicating to find mate, others respond (predator, parasite)
(example: fireflies can get eaten)

Cricket songs are exploited by enemies

Males make vocalizations to attract mates: Katydid + Mole crickets — Fig. 18.1

- Mole crickets are nocturnal + live lots underground. fly during mating season.

Study #1

Ulagaraj + Walker 1973 (Florida study)

Purpose: What is purpose if male vocalizations? attract mates? species specific?

Methods Fig 18.2

Recorded male cricket vocalizations in wild of two species, Southern vs Tawney Mole crickets
Performed Playback Experiment with speaker, funnel, jar
One funnel/speaker played "Southern", another "Tawney", third none
Jars captured adults flew in, later in lab, ID'ed species + gender

Findings Fig 18.3

Females from same species dominant captures but not quite like control — WHY?
Other males may sneak in to find females too (can attract predators too)

Ch 18.1 (cont)

Parasitic insects prey on crickets. They lay their eggs on/in crickets
Larvae burrow into host/eat it. Example Tachinid flies.

Study #2A

Fowler 1987 (Florida study #2)

Purpose: Is Tachinid fly attracted to cricket vocalizations?

Methods:

Use Playback Experiment with vocalizations of southern, tawney + imitator Mole crickets.
Set up speakers 50 meters apart (how many, where exactly?) every night for one year.
Catch flies that land to investigate sound. (some method?)
Also Observation element to simply observe fly behavior around speakers

Findings:

from Observations: Fowler reported flies if landed would lay eggs around speakers + depart within 3sec! (Bub Bye!)
from Playback: Fig 18.4

- lots of flies came to cricket vocalizations in Nov, Dec, January [The winter months is when crickets are active + mating (in FL)]
  Appears Tachinid flies have aligned their mating season with that of their prey (natural selection likely)

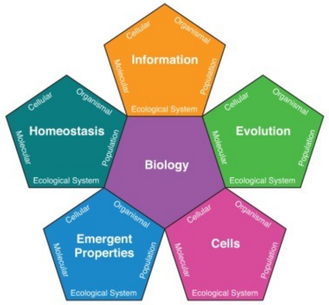
Example of natural enemy intercepting communication

Study #2B | Table 18.1

In Florida

Same Purpose+Methods except add two more cricket species changa + northern + did it for just 10 nights circa January

Findings Flies ignored vocalizations of Changa + northern. (not from South America)
Possibility - shared backgrounds or changa + northern connect evolved defense — Control?



Integrating Concepts in Biology

by A. Malcolm Campbell, Laurie J. Heyer, & Christopher Paradise

18.1 Have organisms evolved to exploit communication between individuals of other species?

- Context: Some predators and parasites have evolved to perceive and respond to information transfer between individuals of the same species.
- Major themes: Non-heritable information is transmitted within and between biological systems, and imperfect information transfer produces variation.
- Bottom line: Some species intercept information transfer between members of another species.

Biology Learning Objectives

- Identify the commonalities between communication within a species and communication between species.
- Evaluate how information is used by organisms to find and exploit other species.
- Provide examples of adaptations of one species to the information passed between individuals of another species.

You learned about the mechanisms and purposes of communication between individuals of the same species in Chapter 17. You know that signals are sent into the environment with some risk. One risk in communicating to find a mate or to announce location is that another species could perceive and respond to the communication and use the communicator as a **resource,** say for a meal. For example, a risk to male fireflies when flashing their double pulse of light is that a predator could use the light to locate the male. The interceptors of the signals are **natural enemies** of the signaler and can be classified as either **predators** or **parasites.** Predators include lions, hawks, snakes and dragonflies. Parasites feed on **hosts** and cause harm to the individual by using them as a resource. Parasites include tapeworms, ticks, and mosquitoes. In this section, you will investigate the ability of predators to locate prey and parasites to identify hosts by intercepting communications.

Cricket songs are exploited by natural enemies

Prey and hosts of predators and parasites are often insects. Crickets, katydids, and grasshoppers are insects found in many areas around the world, being especially common in tropical, subtropical, and temperate zones (Figure 18.1). Males of many species of crickets and grasshoppers make vocalizations to attract mates, much like male fireflies flashed light to attract their mates. *{Connection: Communication between individuals of the same species is investigated in Chapter 17.}* You can hear them chirping all day and night at certain times of the year. Mole crickets are a particular type of cricket with large shovel-like forelegs adapted for burrowing into the ground (Figure 18.1, right). These crickets are nocturnal and spend much of their time underground. They are known to fly during the mating season, which is often the only time people ever see them. Both males and females can fly, but only males emit mating vocalizations. Several scientists have studied vocalizations of males and responses of females.

Figure 18.1 A katydid **(left)** and a mole cricket **(right)**. Note the variation in the legs of these two species.
A.http://upload.wikimedia.org/wikipedia/commons/5/57/Katydid_tx.jpg; public domain. 2007
B.http://en.wikipedia.org/wiki/File:Scapteriscus_vicinus.JPG; Author: Ilona Loser, 2009. This file is licensed under the Creative Commons Attribution-Share Alike 3.0 Unported license.

In one study, S. Ulagaraj and Thomas Walker studied two species of mole cricket, the southern mole cricket *(Scapteriscus borellii)* and the tawny mole cricket *(S. vicinus)* in Florida. They recorded male vocalizations of these two cricket species and broadcast the songs through speakers in a playback experiment. *{Connection: Playback experiments are introduced in Section 17.2.}* Each speaker was mounted in the center of a large funnel and faced skyward (Figure 18.2). One funnel contained a speaker playing southern mole cricket songs, another funnel contained a speaker playing tawny mole cricket songs, and a the third funnel contained no speaker.

At the base of each funnel was a jar, where adults that flew into the funnel were collected. Adults collected from each funnel were brought back to the laboratory, identified, and their sex was determined (Figure 18.3).

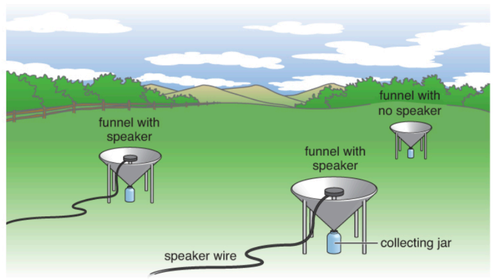


Figure 18.2 Experimental design for testing mole cricket response to vocalizations. Based on Ulagaraj & Walker, 1973, Figure 1.

you are here		Big Ideas of biology				
		Information	Evolution	Cells	Homeostasis	Emergent Properties
levels of the biological hierarchy	molecules	1	4	7	10	13
	cells	2	5	8	11	14
	organisms I	3	6	9	12	15
	organisms II	16	19	22	28	25
	populations	17	20	23	29	26
	ecological systems	18	21	24	30	27

Section 18.1 Have organisms evolved to exploit communication between individuals of other species?

Biology Learning Objectives

- Identify the commonalities between communication within a species and communication between species.
- Evaluate how information is used by organisms to find and exploit other species.
- Provide examples of adaptations of one species to the information passed between individuals of another species.

A grasshopper (katydid) and a mole cricket

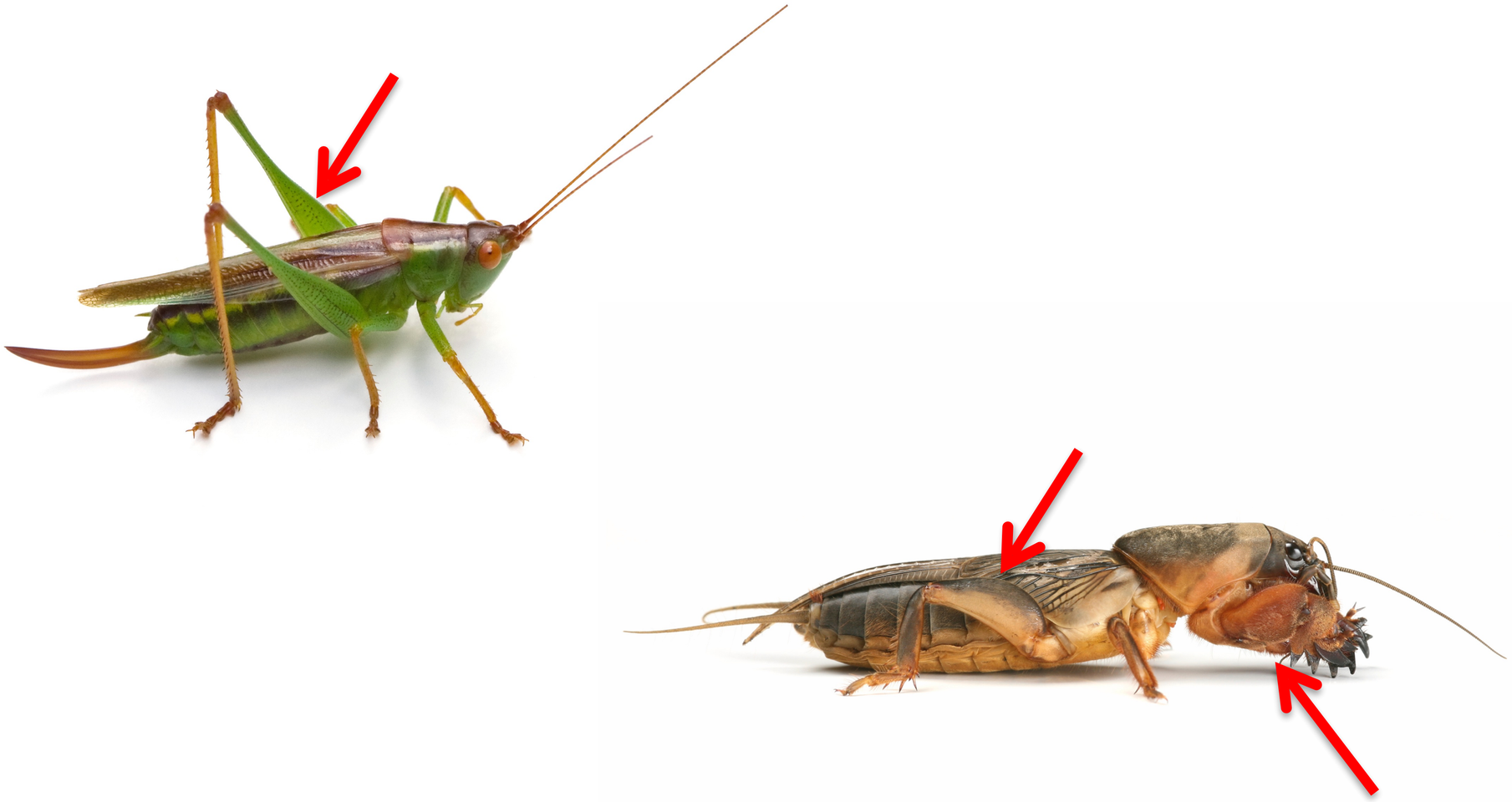
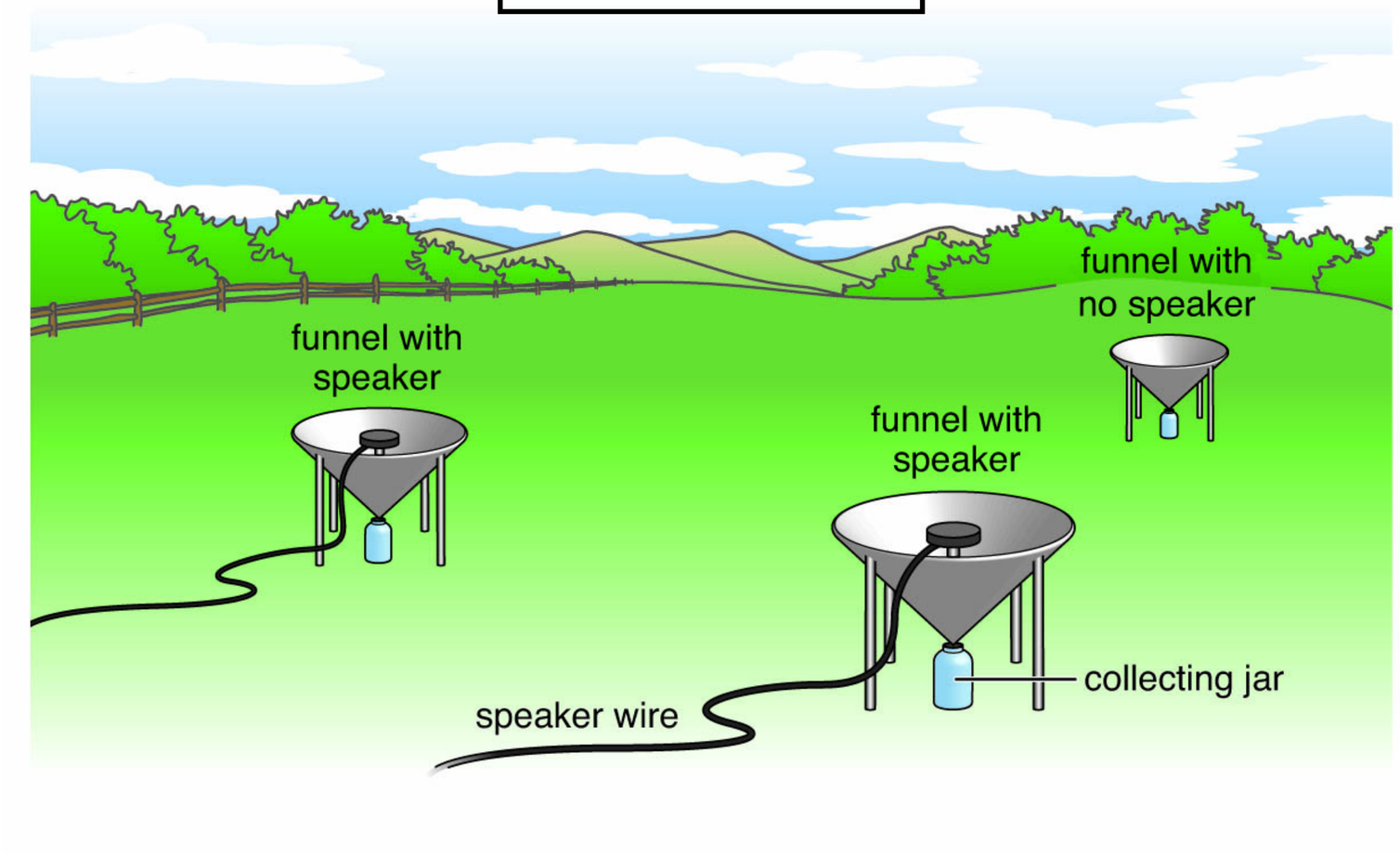


Figure 18.1

mole cricket

Study #1 (Ulaqaraj & Walker 1973)

Trifecta?



wheel of <u>names</u>

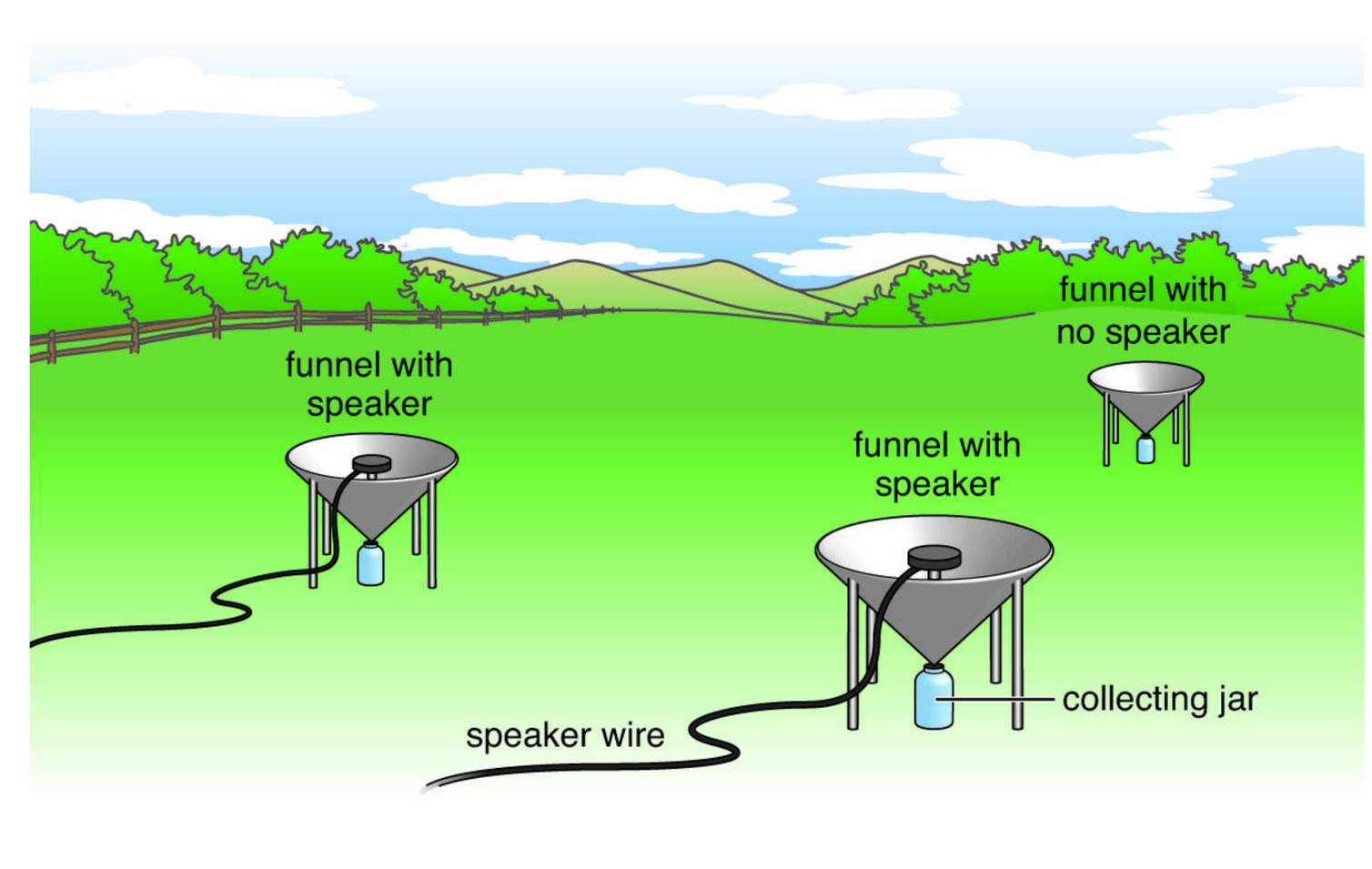
Describe experiment of Ulagaraj and Walker

Figure 18.2

Modified from Ulagaraj & Walker, 1973, Figure 1.

Index cards or wheel of names

Testing mole cricket responses to vocalizations



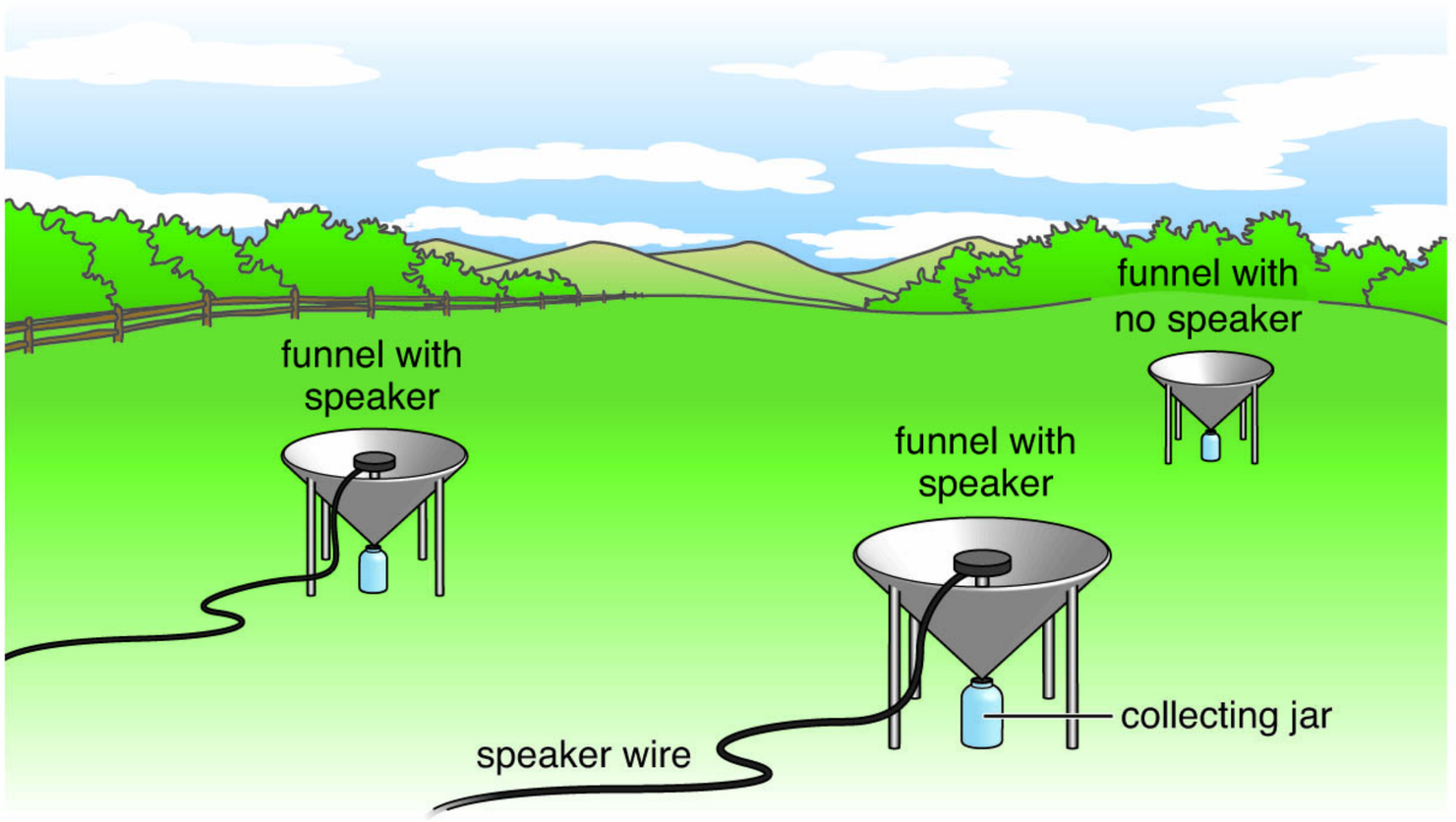
Describe experiment of Ulagaraj and Walker

Figure 18.2

Modified from Ulagaraj & Walker, 1973, Figure 1.

Testing mole cricket responses to vocalizations

Why did the researchers include a funnel with no speaker?



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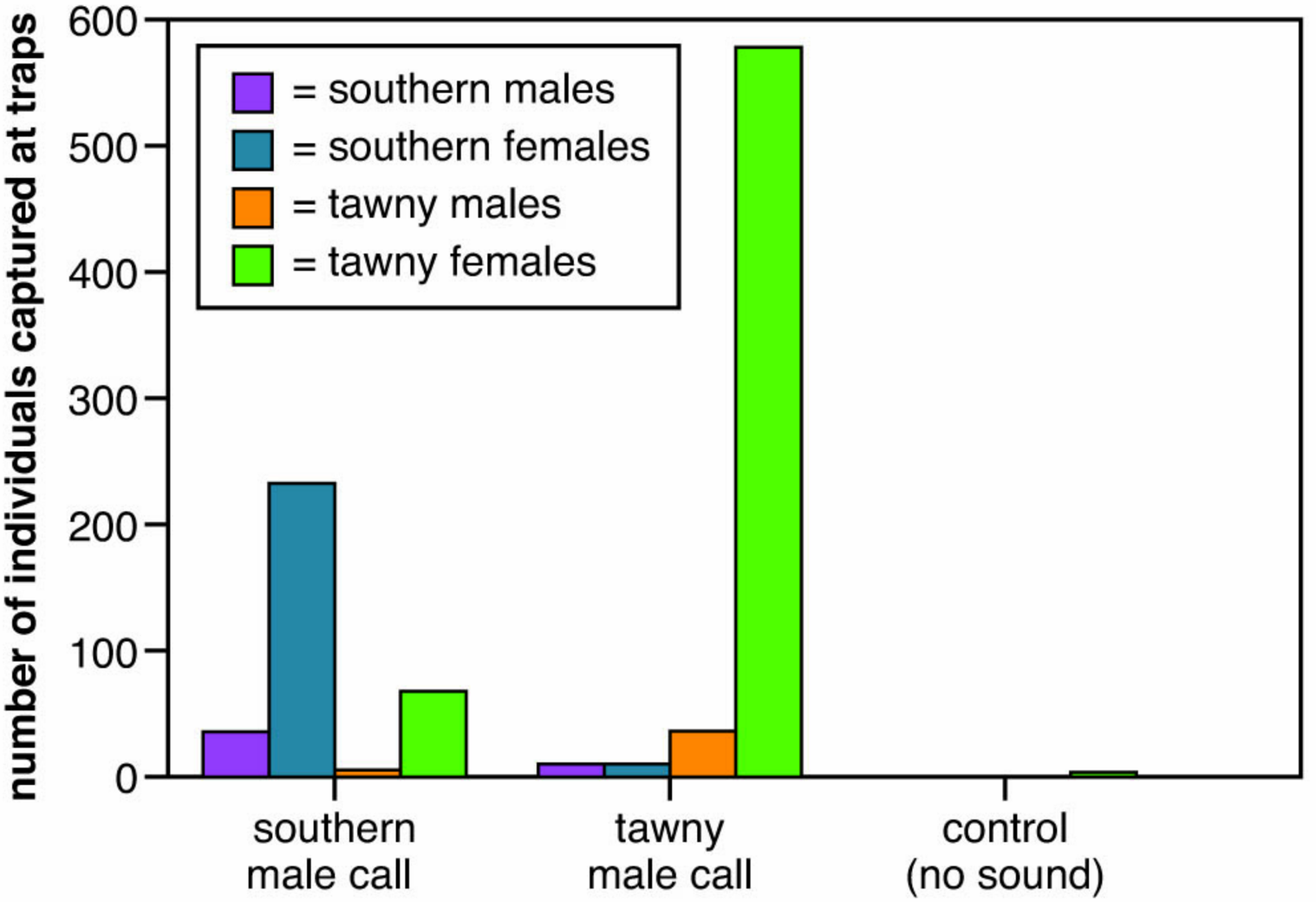
Trifecta?



wheel of <u>names</u>

Figure 18.3

Modified from Ulagaraj & Walker, 1973, Figure 2a.

Index cards or wheel of names

Responses of mole crickets to recordings of male calls

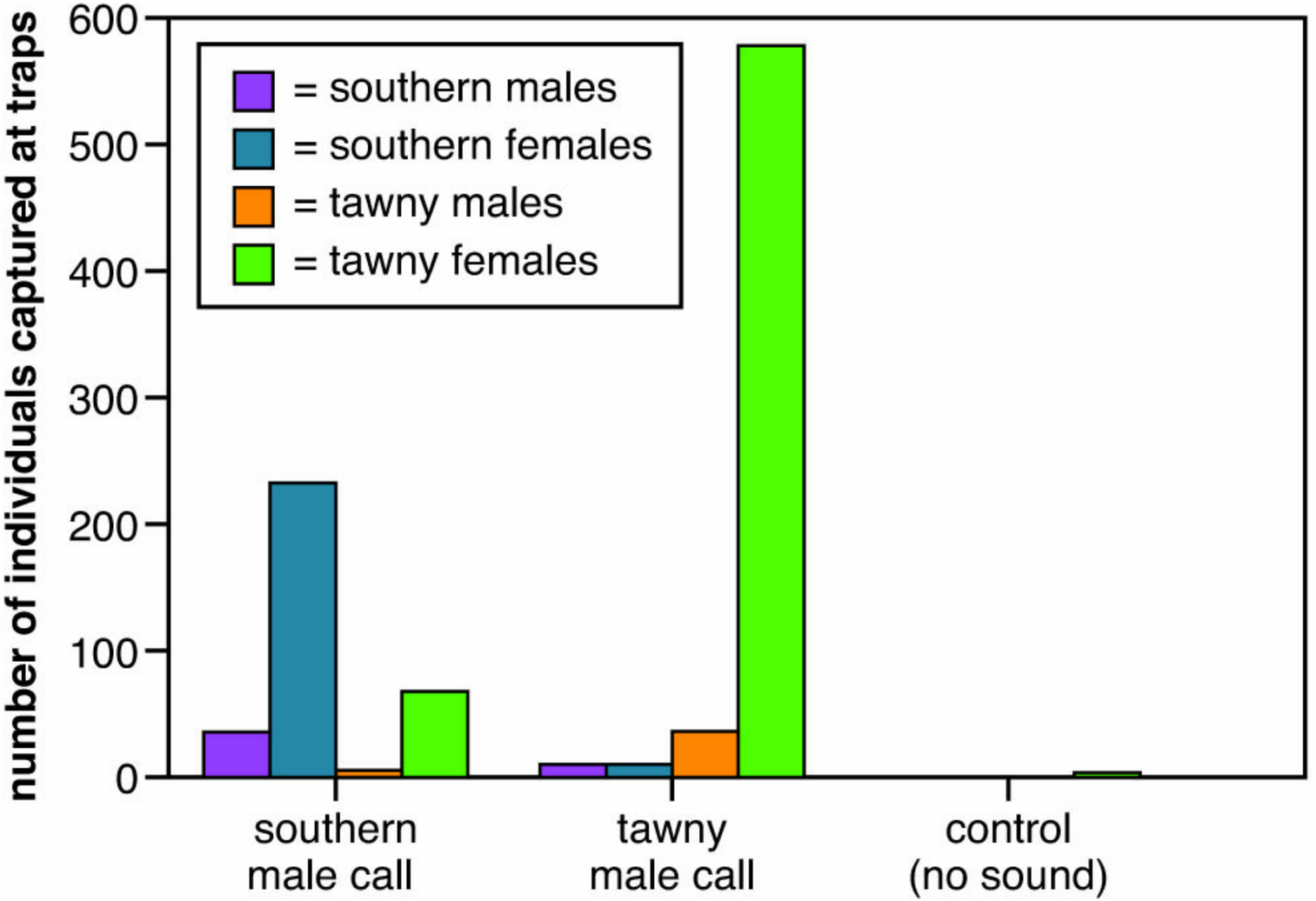
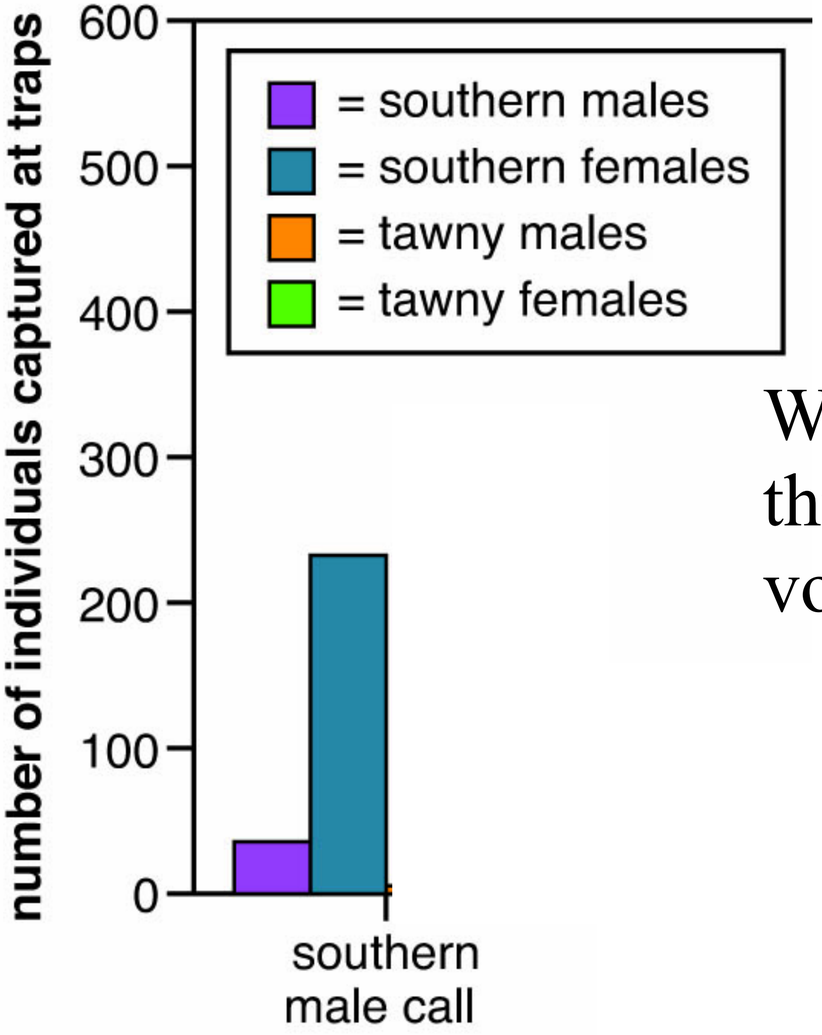


Figure 18.3

Modified from Ulagaraj & Walker, 1973, Figure 2a.

Responses of mole crickets to male southern mole cricket calls

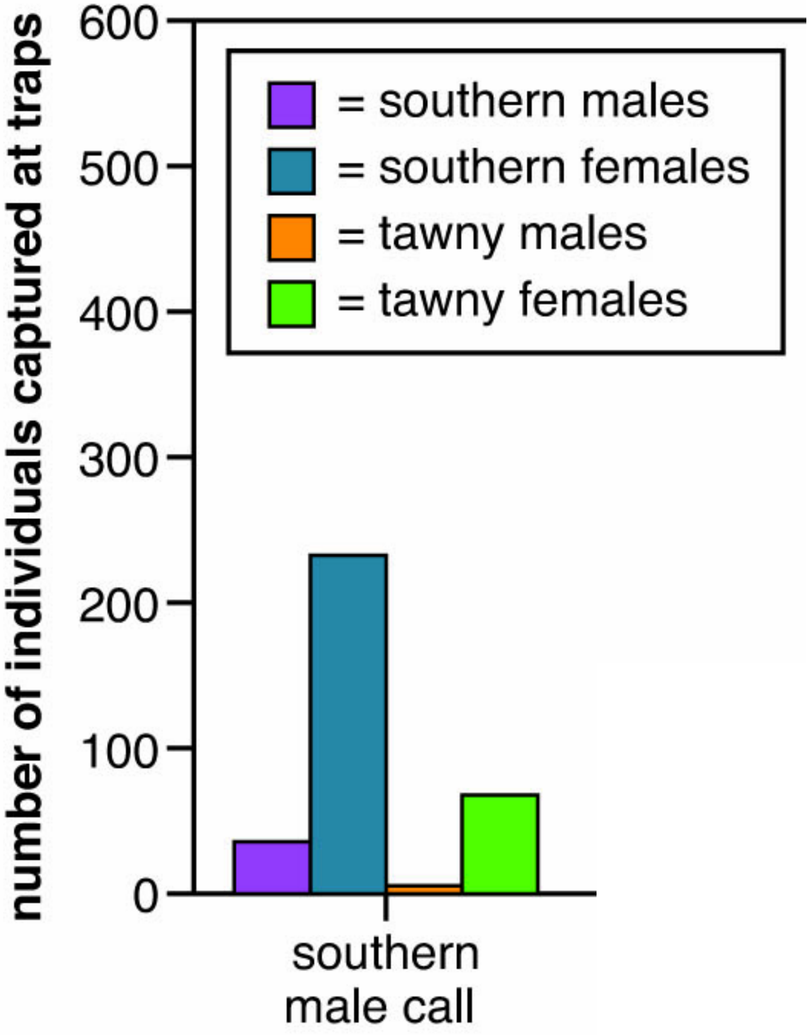


What can you conclude from this about mole cricket vocalizations?

Figure 18.3

Modified from Ulagaraj & Walker, 1973, Figure 2a.

Responses of mole crickets to male southern mole cricket calls

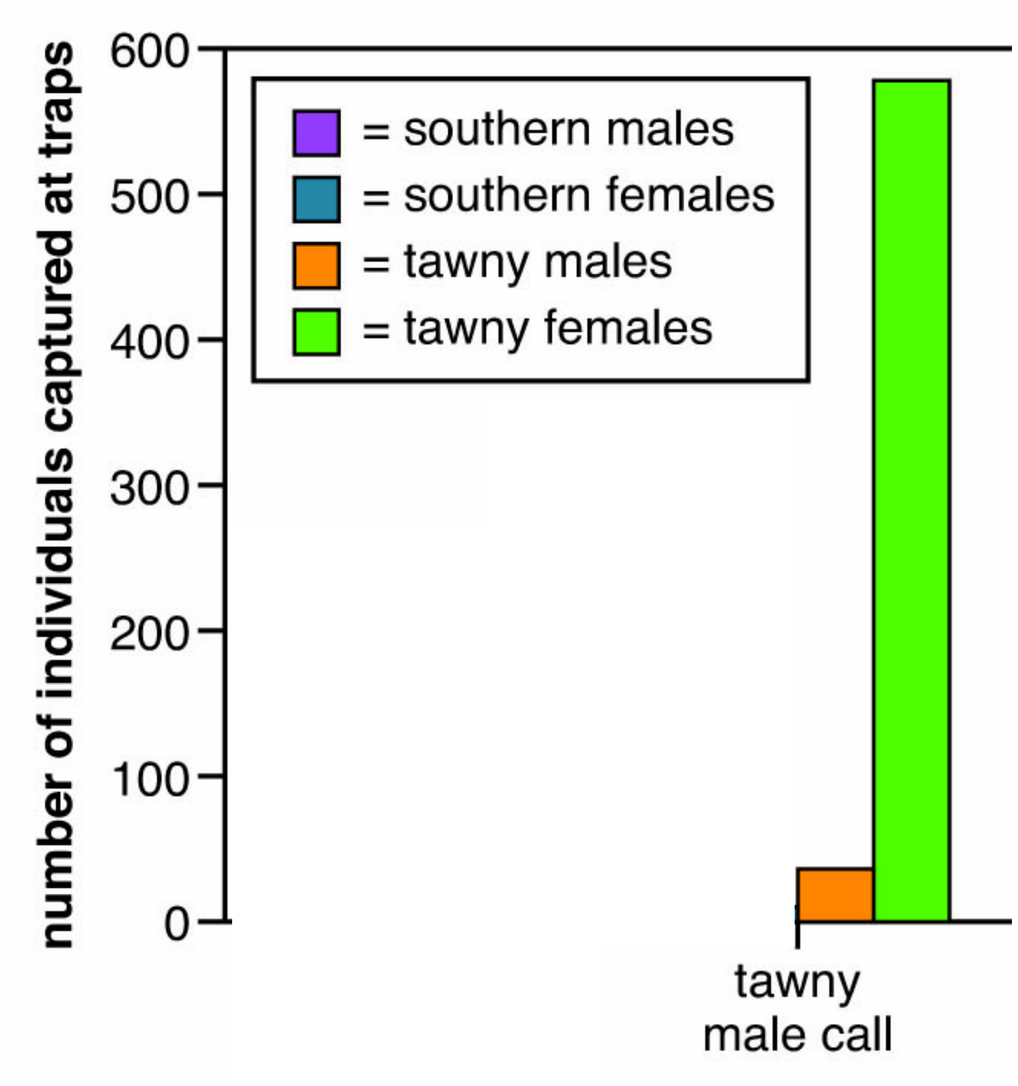


What explains the presence of tawny mole crickets in these traps?

Figure 18.3

Modified from Ulagaraj & Walker, 1973, Figure 2a.

Responses of mole crickets to male tawny mole cricket calls

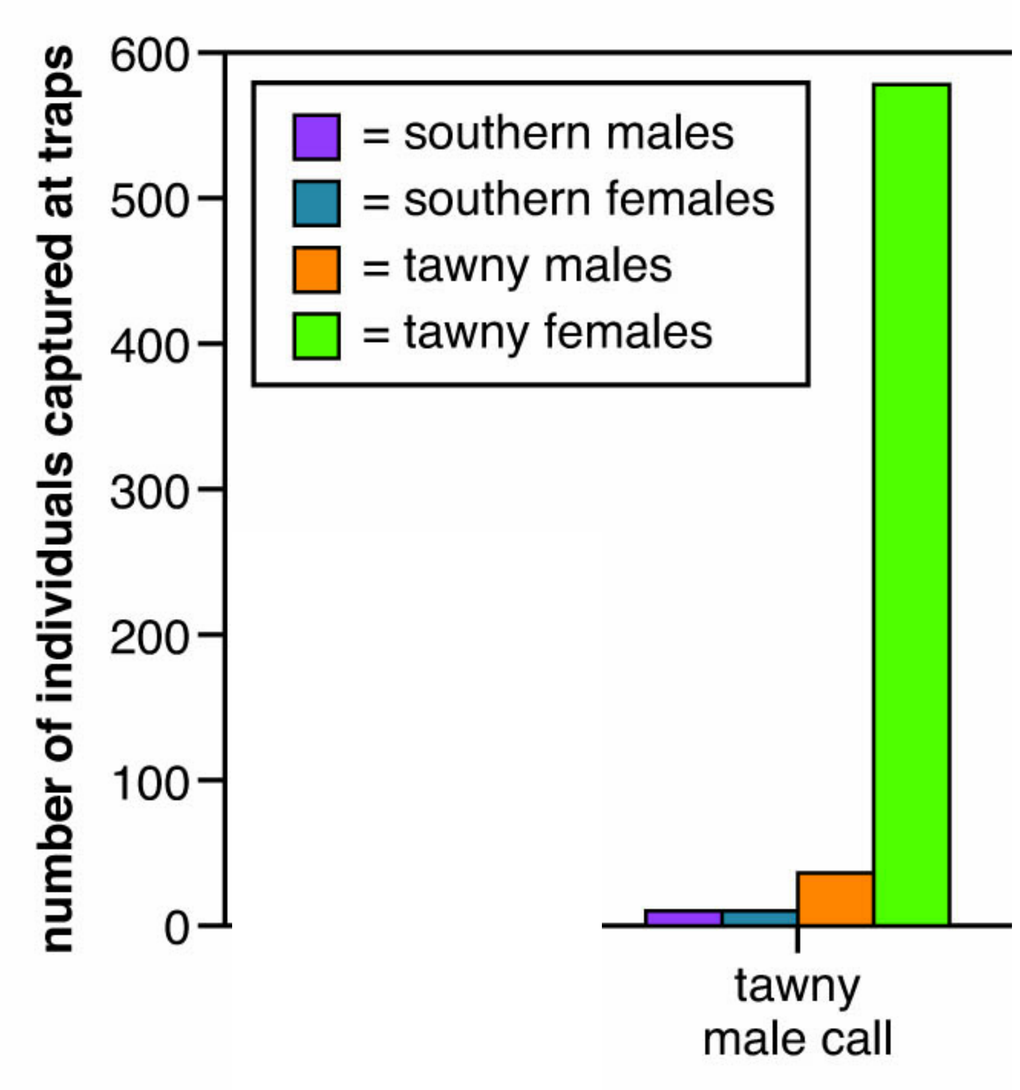


Hypothesize as to why male mole crickets are attracted to the vocalizations of other males.

Figure 18.3

Modified from Ulagaraj & Walker, 1973, Figure 2a.

Responses of mole crickets to male tawny mole cricket calls



What can you conclude about the species-specificity of mole cricket vocalizations?

What explains the presence of southern mole crickets in these traps?

Figure 18.3

Modified from Ulagaraj & Walker, 1973, Figure 2a.

Responses of mole crickets to control

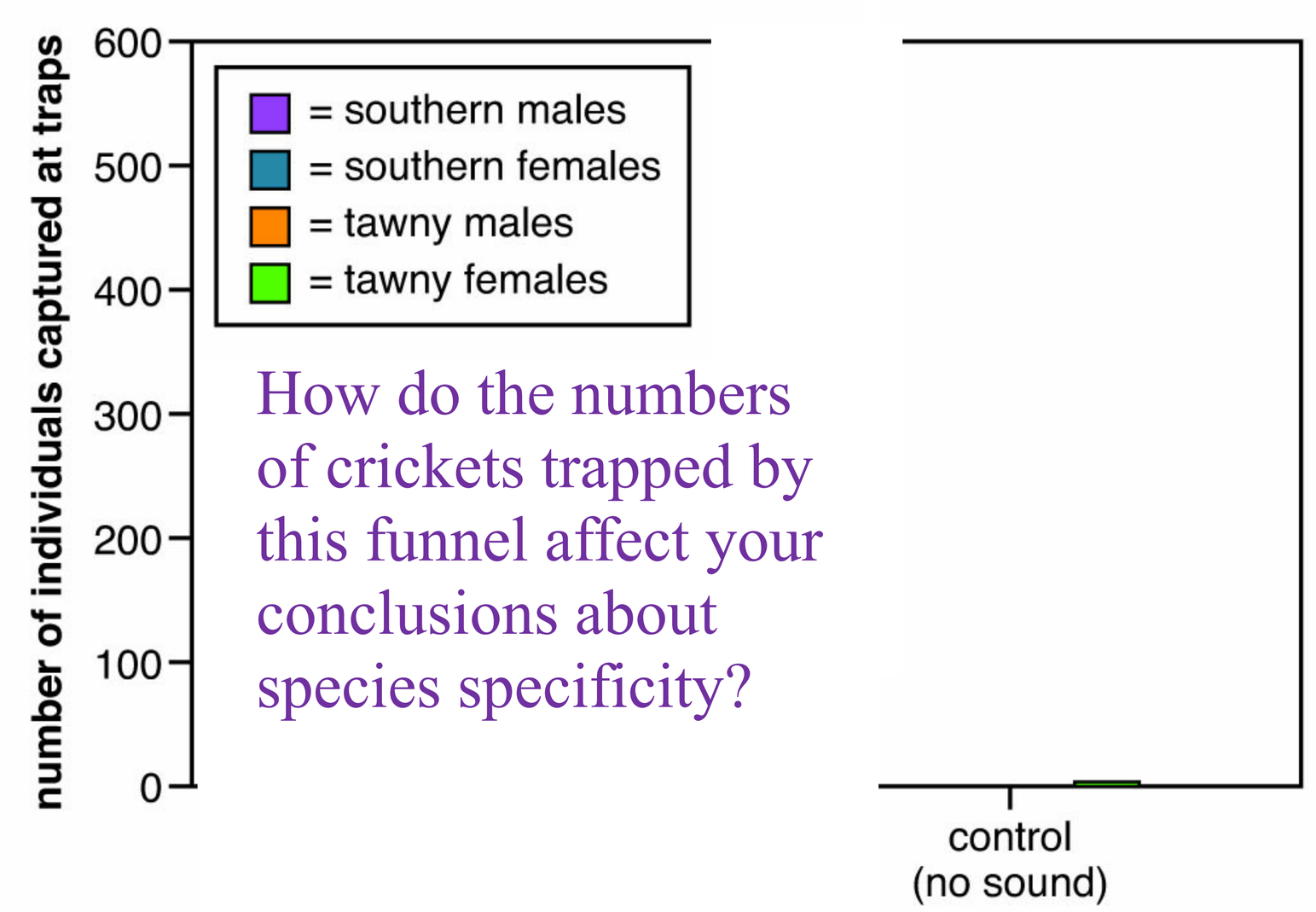


Figure 18.3

Modified from Ulagaraj & Walker, 1973, Figure 2a.

Responses of mole crickets to recordings of male calls

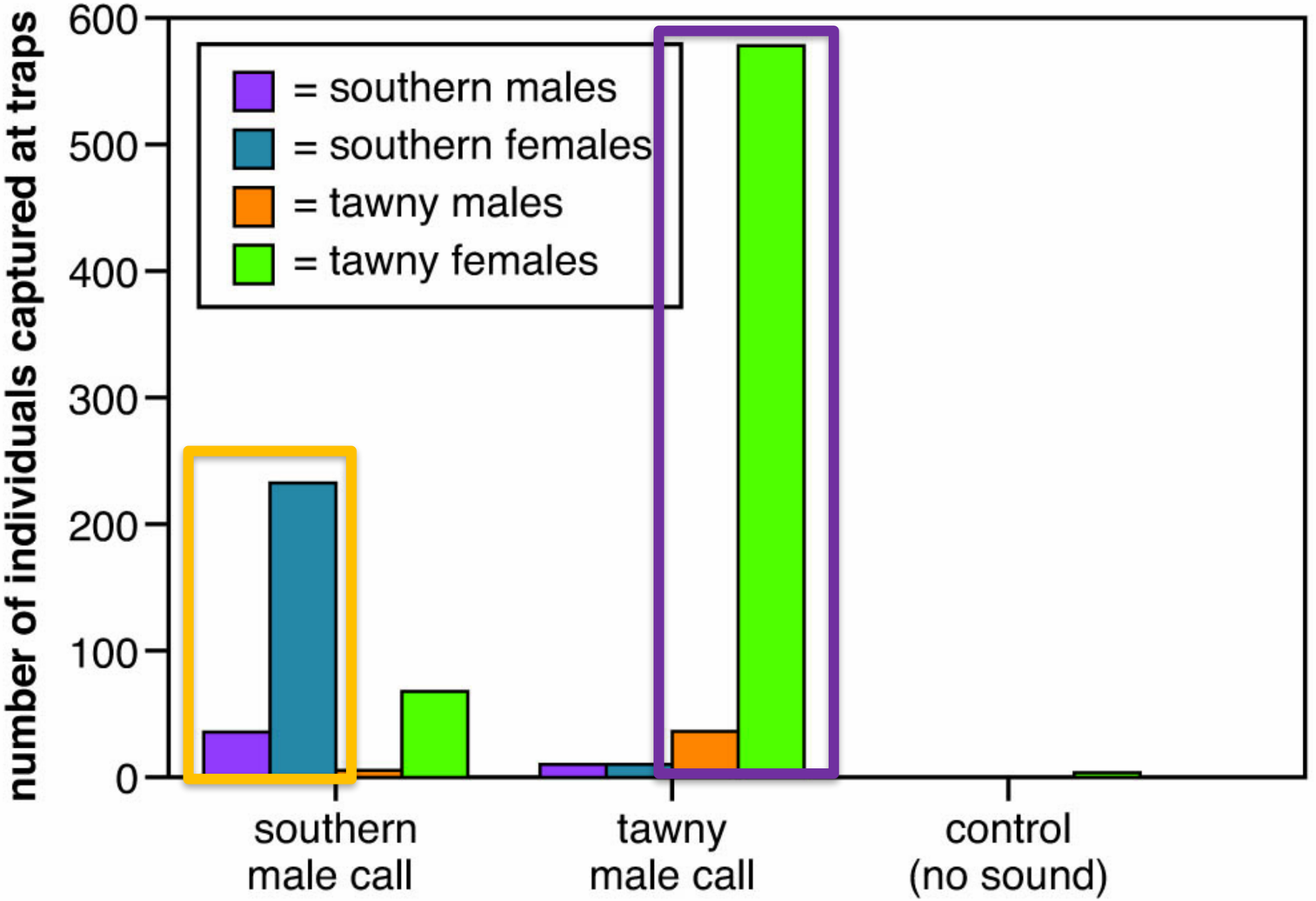


Figure 18.3

Modified from Ulagaraj & Walker, 1973, Figure 2a.

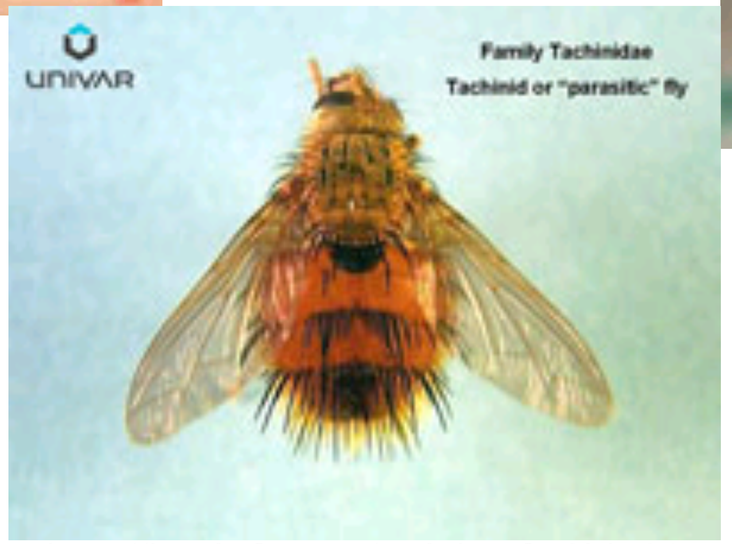
What about this experiment?

Tachinid, or parasitic flies

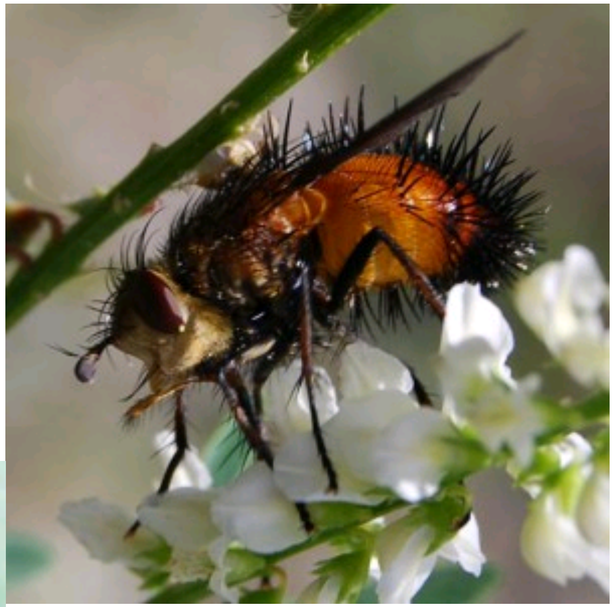
Tachinid fly vs. Tomato hornworm

Tachinid vs. caterpillar: http://www.youtube.com/watch?v=gxKoK4rnBbw

Tachinid, or parasitic flies



http://buginfo.com/article.cfm?id=81



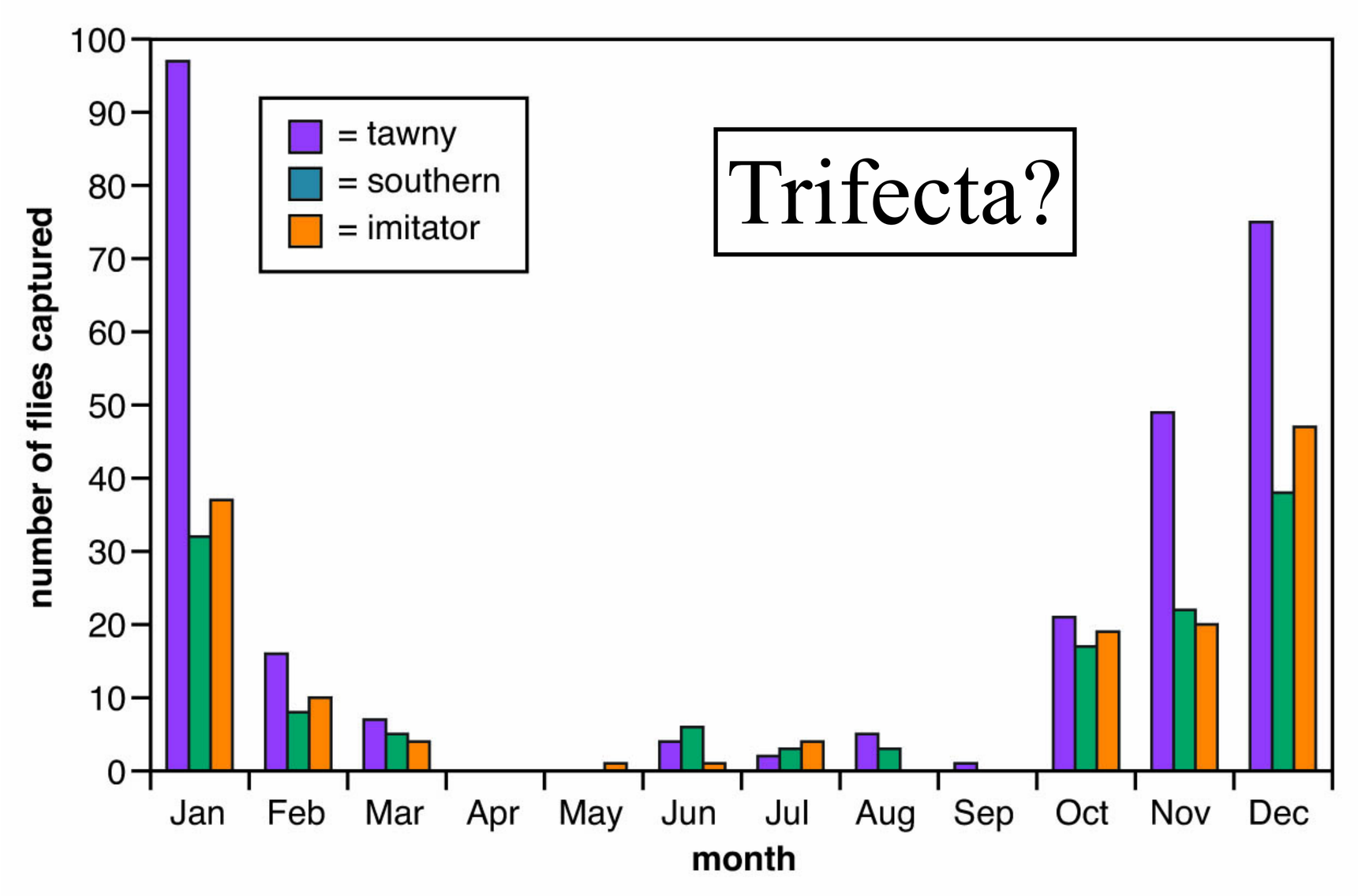
[Tachinid vs. caterpillar: http://www.youtube.com/watch?v=gxKoK4rnBbw](http://www.youtube.com/watch?v=gxKoK4rnBbw)

http://www.oocities.org/brisbane_flies/TACHINIDAE.htm

http://www.whatsthatbug.com/2010/08/10/tachinid-fly-9/

Tachinid larvae that were living in a caterpillar

Study #2A (Fowler 1987)

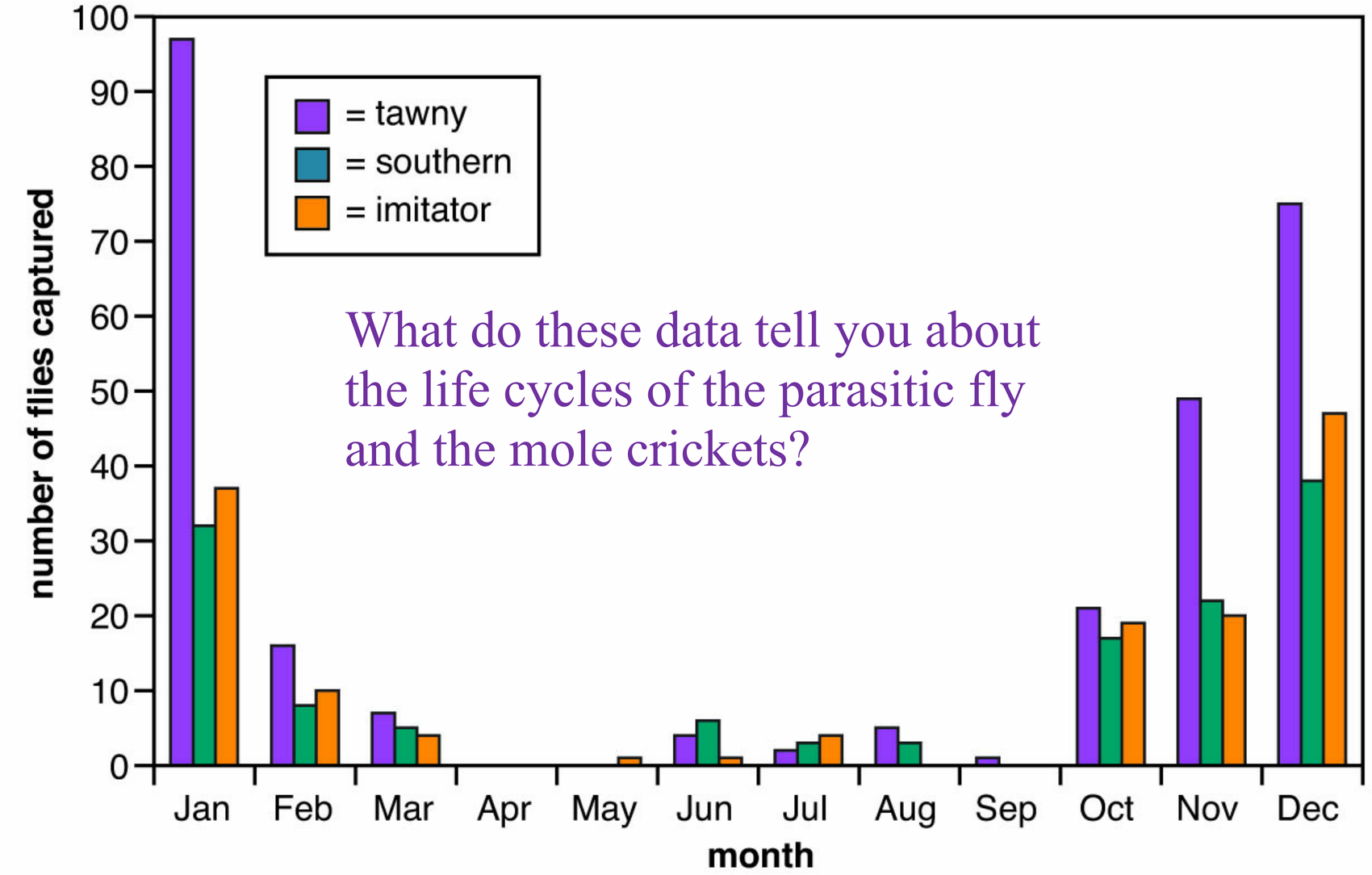


wheel of <u>names</u>

Figure 18.4

Data from Fowler 1987 Table 1.

Captures of parasitic flies at speakers playing male calls of three mole crickets



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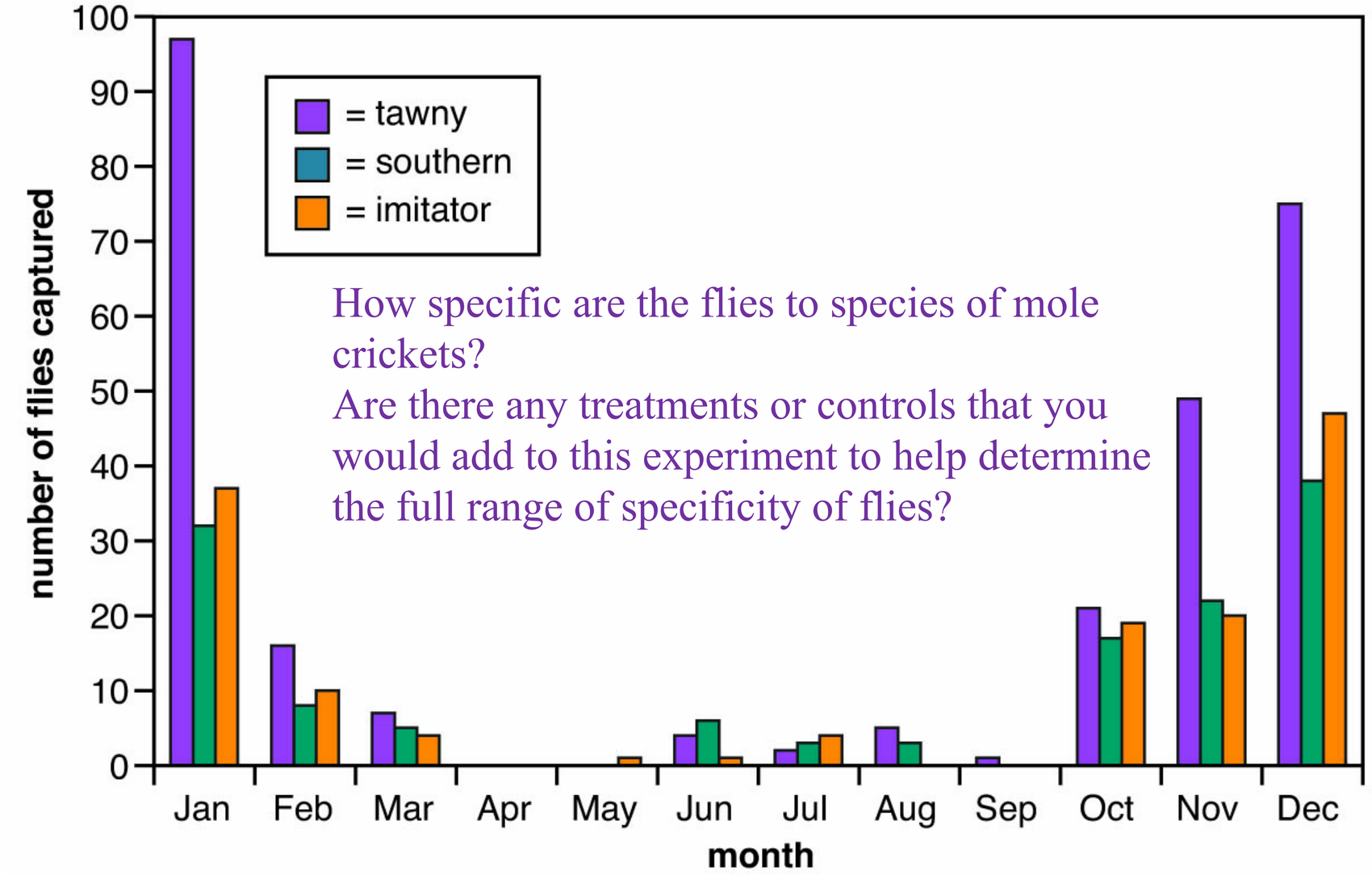
Index cards or wheel of names

Captures of parasitic flies at speakers playing male calls of three mole crickets



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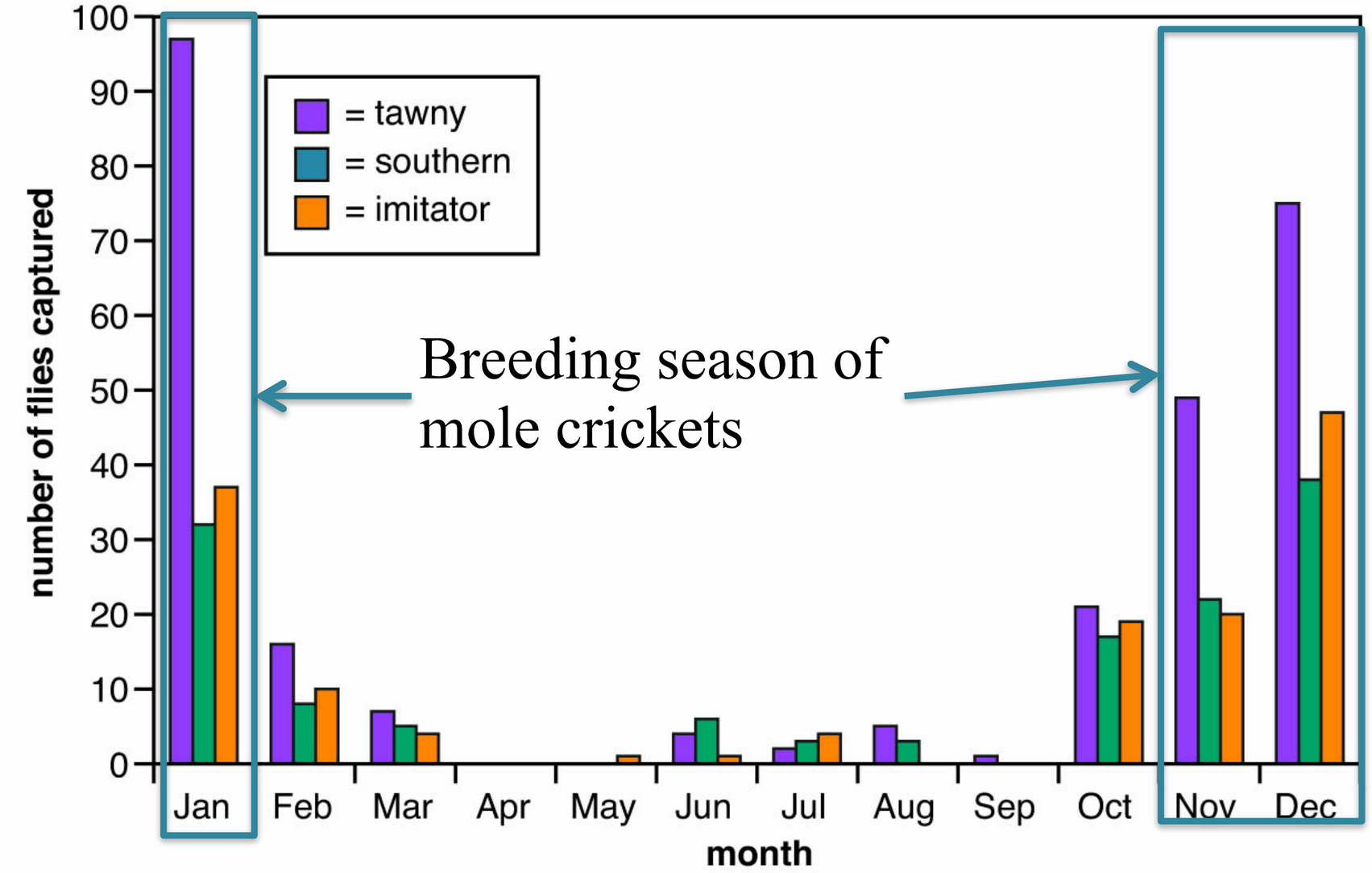

Figure 18.4

Data from Fowler 1987 Table 1.

Study #2B (Fowler 1987)

Trifecta?

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

wheel of names

Table 18.1

Data from Fowler, 1987, text p. 476.

Tachinid flies captured at traps playing vocalizations from 1 of 5 mole cricket species

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

Table 18.1

Data from Fowler, 1987, text p. 476.

Tachinid flies captured at traps playing vocalizations from 1 of 5 mole cricket species

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

Speculate as to why the parasitic flies have not evolved to recognize the vocalizations of all mole crickets

Table 18.1

Data from Fowler, 1987, text p. 476.

Announcements

1. **Lab1 ONLINE!** Everyone is invited to attend lab on D2L.
2. catme.org: Complete survey ASAP (deadline Monday 5pm)
3. "To increase your learning... I'm now going to ask you a question”
4. **Distractions**: Alert LA when you cannot hear a fellow student speak.
5. **Opera**: start on time, doors close, then ushered in.
6. **Contracts:** Review the course *Contract* in syllabus, sign, photo, upload to Dropbox (on TopHat). Due Friday Sept 9th.
7. **TopHat, Coursepack and Course website:** Have all the good stuff

Questions??

LB144-Pandemic

2022 edition

(sec 11 “Manser”, &12 “Bretagnolle”)