

9.20 MIT 2013

Lecture #15

Communication

Recent research on sexual selection

Nature 2007, vol 447, p 202-205

"Sexual dimorphism and adaptive radiation in *Anolis* lizards"

The males and females of certain species have differences that are greater than some inter-specific differences. The sexes can occupy somewhat different ecological niches. This raises questions about the consequences for behavior and for speciation.

Scott (2005), ch 5, “Communication”

B. Evolution and design of signals.

5. Why have a great many species evolved ritualized fighting behavior? The author, Graham Scott, has studied this in the birds called blue tits.

To prevent injuries

p 101-102

Also note James Serpell’s study of one genus of lorikeets (p 102; see also the following pictures).

Lorikeet 1



Courtesy of [Nathan Rupert](#) on Flickr. License CC BY-NC-SA.

Lorikeet 2



Courtesy of [Arran ET](#) on Flickr. License CC BY.

Lorikeet 3

The larger lorikeets with larger beaks show more ritualized fighting with conspecifics

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Scott (2005), ch 5, “Communication”

B. Evolution and design of signals.

6. What are the distinct advantages of auditory communication in the case of whales, song birds, and marmoset monkeys? For each species, explain at least one advantage over visual communication.

Pp 102f Sounds get through and around visual barriers.

Note: Whale calls “have effective ranges of more than 100 km”.

Scott (2005), ch 5, “Communication”
B. Evolution and design of signals.

7. What are two distinct functions of birdsong?

p 103-106.

*Actually, there are at least four functions
(not all mentioned by Scott).*

Functions of bird song

- 1) Males attracting females
- 2) Females judging males for purposes of mate selection
- 3) Territorial advertisement: usually male-male
- 4) Also, in some species it functions in pair-bonding, with duets sung by a pair.
 - Such duets can be difficult to distinguish from songs sung by single birds, because the timing is so precise.
 - One can find interesting findings on bird duets in a web search, e.g., see pdf file posted on Stellar concerning work by Nathalie Seddon and Joseph Tobias (2009)

Scott (2005), ch 5, “Communication”

B. Evolution and design of signals.

8. In what situation does communication by electrical signals have a clear advantage? It is used by African mormyrid fishes and South American gymnotid fishes.

Scott (2005), ch 5, “Communication”

B. Evolution and design of signals. **Electroreception**

8. In what situation does communication by electrical signals have a clear advantage? It is used by African mormyrid fishes and South American gymnotid fishes.

It works in murky waters where vision is of little use. The receptors are distributed along the “lateral line”, and are innervated by cranial nerves not found in mammals: the lateral line nerves, up to six in number. These are distinct from the mammalian 7th (facial), 8th (auditory-vestibular) and 9th (glossopharyngeal) cranial nerves.

Mormyrid fish and their emitted electric pulses

Image removed due to copyright restrictions.

Nearby fish or objects distort the electric field, detected by the lateral line system

Illustration removed due to copyright restrictions.

Another adaptation for feeding by fish in the murky waters of muddy rivers

The catfish's specialized taste system is illustrated on the next slide taken from 9.14 class.

Illustration removed due to copyright restrictions.

The small catfish, and other catfish:

- These fish can taste things along the muddy river or lake bottom—anything they brush against.
- The hindbrain secondary sensory cell group is also enlarged, and the animal has evolved specialized behavioral responses (FAPs) to encounters with food objects.

Scott (2005), ch 5, “Communication”

B. Evolution and design of signals.

9. Describe advantages and disadvantages of olfactory communication.

Olfaction appears to have been of major importance in early mammalian evolution, and remains so for many mammals.

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B. Evolution and design of signals.

9. Describe advantages and disadvantages of olfactory communication.

Olfaction appears to have been of major importance in early mammalian evolution, and remains so for many mammals.

Olfaction functions in complete darkness—as a distance sense.

Scents linger for some time, and therefore, olfaction gives information about the very recent past.

Earliest mammals were most likely nocturnal, avoiding the dominant, diurnal reptiles. Vision in these mammals regressed while olfaction increased in importance—as did audition.

Known from fossilized remains of skulls

Scott (2005), ch 5, “Communication”

C. Alarm calls

10. What are two functions of alarm calls: one obvious, and the other not so obvious?

Scott (2005), ch 5, “Communication”

C. Alarm calls

10. What are two functions of alarm calls: one obvious, and the other not so obvious?

#1. Warn conspecifics of danger.

#2. Signal the predator: “You have been detected and are being watched. It is useless for you to continue trying to catch us.” (Recall the mobbing responses of jackdaws and geese.)

Scott (2005), ch 5, “Communication”

C. Alarm calls

11. Why do some foraging birds sometimes emit a fake alarm call?

Scott (2005), ch 5, “Communication”

C. Alarm calls

11. Why do some foraging birds sometimes emit a fake alarm call?

To cause others to disperse from a food source and thereby get rid of the competition.

Problem: the faker becomes recognized as unreliable. If too many did this, alarm calls would lose their usefulness.

Scott (2005), ch 5, “Communication”

C. Alarm calls

12. Explain how ground squirrels and vervet monkeys convey specific information about predators to other members of their species (conspecifics).

p 111-112

Scott (2005), ch 5, “Communication”

C. Alarm calls

12. Explain how ground squirrels and vervet monkeys convey specific information about predators to other members of their species (conspecifics). p 111-112

Ground squirrels: Threat from the air or from a terrestrial predator

High risk → Short, shrill whistle (threat from raptor)

Lower risk → Trill, chatter (threat from ground predator)

Vervet monkeys:

Threat from air → “Cough-cough”

Leopard → Bark

Snake → Chatter

Role of learning: Discrimination of different levels of reliability of the individuals doing the calling

Scott (2005), ch 5, “Communication”

D. Individual recognition

13. Describe at least two functions of individual recognition.

p 115

Scott (2005), ch 5, “Communication”

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13. Describe at least two functions of individual recognition. p 115

- ① An animal can remember how reliable or unreliable an individual has been in the past, for giving warning calls.
- ② An animal can remember previous encounters with an individual and avoid repeats of fights. Remembering the social hierarchy requires individual recognition.
- ③+ Other functions?

Scott (2005), ch 5, “Communication”

D. Individual recognition

14. In what species other than humans may “names” for individuals be used?

p 116

Scott (2005), ch 5, “Communication”

D. Individual recognition

14. In what species other than humans may “names” for individuals be used? p 116

Dolphins use “signature whistles”...

(Other species?)

Horse communication

Reading assigned from Monty Roberts
Study questions on the reading
Videos available online *

* All students should watch a Monty Roberts video
after reading the Roberts selections.

Video clips from *Nature* (PBS) illustrating sexual selection: “What females want...and males will do.”

1. Male Superb Lyre bird of SE Australia: vocal and visual displays to attract females and convince them to accept as mate
2. Palm Cockatoo of north Australia: Males use tools for making drumming sounds to attract and impress female so she will accept mating
3. Male jumping spider's intricate courship dance and "singing" (producing vibrations), to convince female to allow mating
4. Reifel bird's courtship call, dance and visual display to attract and convince females to mate

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