

EEB 4260 Ornithology

Social and Breeding Behavior

Class Business

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Reading for this lecture

Required. Gill: Chapter 11 AND Gill: pg. 359 through Chapter 13

1. Introduction

A) SPACING

The nature of social interactions between birds is influenced by their spacing patterns. In simple terms there are three basic ways that birds can distribute themselves with respect to each other:

- They can act in a way that keeps them separated from others. A common manifestation of this is territorial behavior.
- They can be sociable and seek out opportunities to group together with other individuals: this leads to flocking behavior.
- They can completely ignore what others are doing and simply respond to some other aspect of the environment that is important to them (e.g., food availability, suitable nest sites, etc.).

B) WHICH OTHER BIRDS SHOULD A BIRD RESPOND TO?

- i) A key question facing both territorial birds and those seeking a flock is: which other birds should they react to? Just birds of the same species? The same sex? Any bird?
- ii) In general, the answer is that a bird should respond in whatever way maximizes the benefits it receives. An individual bird's needs are likely to be most similar to the birds that are most like it (i.e., birds of the same species).

iii) Hence, birds of a feather often do flock together. However, different species will form multi-species flocks whenever the thing that benefits flock members applies to multiple species.

iv) Similarly, territorial birds usually defend territories against members of the same species.

During the breeding season, birds generally only defend against members of the same sex because they obviously want members of the opposite sex to come into their territory.

During the nonbreeding season, however, these same birds may defend a territory against all members of the same species irrespective of the individual's sex.

v) In some cases birds will defend a territory against members of a different species. Under what circumstances do you think that this is likely to occur? If you had two species exhibiting **interspecific territoriality** what characteristics do you think they would share?

2. Territoriality

A) DEFINITION

i) A **territory** has the following distinguishing features:

- It is a fixed area. Usually, the term refers to fixed piece of land, but it is possible to have a “mobile” territory, e.g., if the fixed area is the area around a mate that a bird is trying to prevent others from mating with.
- It is defended continuously. (This makes a territory different from a **home range**. The latter is a term that is used for an area where an individual spends the bulk of its time, but a home range is not necessarily defended.)
- It is used only by the defending individual and (sometimes) their mate(s) and offspring.
- Usually territorial defense involves some combination of ritualized displays (e.g., singing) to warn others not to enter and active aggression (e.g., chasing, fighting) to keep intruders out.

B) BENEFITS OF TERRITORIALITY

i) The fundamental benefit of territoriality is that it provides exclusive access to some resource.

ii) There are lots of resources that a bird might choose to defend. Among the most common are: food, mates, good nest sites, good places to hide from predators. Often a territory will

have several of these things (this applies to most breeding season territories). At other times, a territory may be defended for a single resource (e.g., hummingbirds frequently defend patches of flowers during the nonbreeding season).

- iii) In some cases a bird will defend an area in order to provide potential mates with access to resources; in other words, by defending an area that is rich in food during the breeding season a bird not only improves their own ability to feed, but also increases their chance of obtaining mates that are attracted to the resource-rich area where the territory lies.

C) TERRITORIES HAVE COSTS

- i) Territories can be costly to defend. Pronouncing ownership and keeping out intruders can be energetically expensive, it can take up a lot of time that could be spent doing other things.
- ii) In addition, although it is rare for things to escalate this far, aggressive interactions with intruders can lead to fights and to injuries.
- iii) Finally, many territorial behaviors (e.g., singing from prominent songposts) can make birds very conspicuous to predators and might increase the risk of getting eaten.

D) WHEN SHOULD A BIRD DEFEND A TERRITORY?

- i) Although there can be substantial benefits to being territorial there can also be substantial costs. Consequently, birds should only defend an area when the benefits outweigh the costs.
- ii) In addition there is no point defending a resource unless access to it is limited.

E) HOW BIG SHOULD A TERRITORY BE?

- i) Territory sizes vary from species to species, from place to place, and sometimes depending on the time of year. At all times, though, the ideal size is that which maximizes the relative benefits compared to the costs (see Gill: Fig 14-3).
- ii) The “optimal” size will consequently depend on all the different things that influence both the costs and the benefits. These include the abundance of the resource and its distribution in

time and space; the distribution of competitors against whom the resource must be defended; the distribution of predators; etc.

3. Sociality

A) BENEFITS OF BEING IN A GROUP

- i) Reduced predation risk: because there are more individuals to look for predators, because some other individual is more likely to get caught (the “selfish herd” idea), because the predator is more likely to become confused when in a big swirling mass of birds, maybe also because better able to defend against a predator and reduce their access (e.g., colonial birds often can drive predators away from their nests by working in a group).
- ii) Increased foraging success. Birds can use information on what others are doing to help find food. Birds may stop when they see other birds feeding (this is why duck decoys work). One argument for colonial nesting is that an individual can observe the direction successful foragers come in to the colony from or follow successful foragers to find out where they are feeding. In some cases, birds may benefit from feeding in a group – e.g., pelicans can herd fish into shallow water and increase their capture rates.
- iii) Improved thermoregulation. Some birds benefit from roosting together because they all can take advantage of the heat that they collectively produce. Certain small birds often get together in communal roosts (often in tree cavities), especially in very cold weather.

B) COSTS OF BEING IN A GROUP

- i) Increased competition.
- ii) May attract predators (because a big group is more conspicuous than a single individual).
- iii) There may be a greater risk of disease or parasitism (because greater risk of exposure).

C) NEUTRAL SPACING

In some cases it can be difficult to tell whether birds are actively seeking to be around other birds, or if a lot of birds simply gather in the same place for the same reason. If a resource (e.g., food, nest sites) is very

patchily distributed then birds may all converge on the same patches even if they pay no attention to what others are doing. Consequently, there may be cases where there are no benefits for being in a group.

4. Breeding Systems as a special class of Social Behavior

A wide variety of different breeding systems are found in birds, but there is less variety than is found in animals in general. Various things go into determining the breeding system of a species, but two fundamental issues are the **mating system** (the pattern of pair-bond relationships) and the means by which **parental care** is provided to the young. These two issues are closely related.

The type of breeding system found in birds is influenced by their evolutionary history and other aspects of their biology. Several things constrain the types of breeding systems found in birds:

- Internal fertilization: because eggs are fertilized inside the female it is difficult for a male to “assure paternity” and this can mean that he is less invested in the young than if he were certain they were his.
- Heterogamy (= gametes are different sizes in the two sexes): because eggs are big and costly to produce and sperm are small and cheap, females usually have a much bigger investment in any particular offspring than do males. This imbalance has various effects, e.g., it means that females are typically less likely to abandon their young than are males.
- High body temperature: this means that young birds (a) need a lot of calories and (b) need a lot of brooding from their parents in order to stay warm enough. Hence, birds require a lot more parental care than some other types of animal.
- Relatively big, helpless young: in general young birds are not well equipped to survive on their own when they first hatch. Again, this means they need a lot of parental care.
- Flight: as mentioned previously, the reliance on flight in birds may be part of the reason why **viviparity** has not evolved in the class.

5. Types of mating systems

A) PAIR BONDS

- i) Mating systems are typically defined in terms of **pair bonds**, which in turn are defined as an association between members of opposite sexes for the purposes of reproduction.
- ii) Note that pair bonds can form for variable time periods, ranging from very short term to lifelong relationships.

B) MONOGAMY

- i) A **monogamous** relationship is one in which each bird has only one partner.
- ii) Historically, most birds have been thought to be monogamous. As we learn more about the genetic relationships between young birds and the adults that care for them, our understanding of monogamy has shifted (see below). But, it remains true that the majority of bird species form **socially monogamous** pair bonds.
- iii) Note that it is not straightforward what we mean by “having only one partner”. Some birds mate for life, only replacing their mates if they die, and literally only have one mate. Many others, however, form pair bonds with a different partner every year. Typically species are referred to as monogamous if they only have one breeding partner each year.

C) POLYGAMY

- i) A **polygamous** relationship is one in which at least one individual has multiple mates. There are several different forms of polygamy: **polygyny** (male forms pair bonds with multiple females), **polyandry** (female forms pair bonds with multiple males), **polygynandry** (both males and females form pair bonds with multiple members of the opposite sex), **promiscuity** (birds mate more or less indiscriminately without ever forming real pair bonds. There are examples of each of these in the text book.
- ii) Polygyny tends to be the most common form of polygamy. Polyandry is less common and is found in about 1% of all bird species.

D) ASSIGNING MATING SYSTEMS IS COMPLEX

- i) People typically refer to a particular species as having a certain mating system. This approach can greatly oversimplify reality because there is often a range of mating systems present within any one species. For example, phalaropes are typically said to be polyandrous, and many female phalaropes do mate with more than one male. But, studies of phalaropes also have shown that there are lots of females that only mate with one male; these individuals are therefore monogamous.
- ii) The timing of different relationships also complicates things. For example, some species have multiple mates at the same time, which clearly counts as polygamy, but others have multiple mates sequentially. A polyandrous phalarope, for example, typically cycles through males in series: they form a pair bond and mate with one, lay him a clutch of eggs, and then leave him with the eggs and go in search of another male. This system is not too different from that of many species (including humans) that we tend to think of as monogamous. In general, ornithologists will refer to this system as **sequential polygamy** if pair bonds are formed with multiple mates in a single breeding season.

6.. Parental care needs largely determine the mating system

A) GENERAL PATTERNS

- i) The ubiquity of social monogamy seems to be a direct result of the need in most birds for two parents to take care of the young. In these cases, if either parent were to desert the young would die and that parent would fail to get its genes into the next generation. This in turn would result in selection against desertion as a behavior and favor social monogamy.
- ii) Polygamy, therefore, tends to occur in situations where it is possible for one parent to raise the young on their own. For example, when young are able to take care of themselves (at least partially) at birth, when resources are very abundant, or both. Polygamy (both polygyny and polyandry) is relatively common in both the shorebirds and rails. It is, therefore, no surprise to learn that both these groups have **precocial** chicks and live in habitats where food is extremely abundant.

7.. Monogamy can be complex

A) A REVOLUTION IN UNDERSTANDING

- i) With the advent of genetic fingerprinting techniques in the last two decades our understanding of bird breeding systems has changed dramatically. The main discovery has been that many young birds are not raised by their genetic parents. It turns out that in many birds there are large numbers of **extra-pair copulations** (EPCs) and that many of these lead to **extra-pair fertilizations** (EPFs).
- ii) Consequently, many birds that are socially monogamous still have a lot of families in which the young are of mixed parentage. (Extra-pair interactions also occur in birds that are polygamous – it's just not as surprising when birds are already mating with several individuals.)

B) SOURCES OF MIXED PARENTAGE

- i) Both sexes are known to seek extra-pair copulations. Males can be very aggressive about seeking opportunities to mate with females with which they have not formed a pair bond (e.g., male Mallards often seem to rape female Mallards). Equally, mated females will often leave their home territory and seek out EPCs with neighboring males.
- ii) A consequence of all this is a behavior referred to as **mate guarding** in which males will follow females around to both guard them against the advances of other males and also to restrict their opportunities for surreptitious matings.
- iii) EPFs are not the only source of mixed parentage. In some species, females will engage in a behavior called **nest parasitism** or **egg dumping** in which they lay their eggs in the nest of another bird of the same species. In a minority of species this is very common (see lecture on parental care), but it is now known that it occurs at a low level in quite a lot of