

MORNING EARTH

Yearning to be Round:

A Primer in Ecological Concepts in 16 Parts

14. Biosphere: Relating Within Species



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Many organisms, including humans, behave differently to their own kind than to members of other species in their communities.

In mammals and birds especially, members of the same species (**conspecifics**) spend a lot of time and energy harassing each other, chasing each other, fighting, and avoiding each other.

This is called **Attack–Avoidance** behavior.

Biologists know that if a behavior exists in Nature, it has a purpose or function. Why all this hassling? How could all this apparently negative interaction be useful to the species?

This reading will explore the ways that members of the same species relate to each other (conspecifics) in natural populations, and suggest

some answers to the questions just asked.

Previously we explored the ways that different species relate to each other in natural communities.

However, most organisms behave differently when they are relating to members of their own species than when they relate to other species.

Most organisms ignore other species unless they look like food.

One-celled organisms such as bacteria and protozoans do not seem to behave differently with conspecifics. Of course, bacteria are conjugating often with bacteria of any kind in the vicinity.

Most simpler animals, echinoderms, molluscs, coelenterates (starfish, snails & clams & squid, corals & sea anemones & jellyfish) do not behave differently toward conspecifics, although some snails are territorial.

Of the more complex animals, insects by and large don't care, a few fish do defend territories at mating time, amphibians don't worry about it, and of the reptiles, only a few lizards react to others of their own species.

Most birds and most mammals **do respond differently** to conspecifics.

We have a bias toward the importance of what mammals do, because we are mammals.

So if we behave in a certain way, we reason, then it must be important, maybe even a law of nature, because we are so important.

If you have spent time watching squirrels or birds or kids on playgrounds, you have probably noticed a lot of threats and hassling, and some

avoidance or running (or flying) away.

You may also have noticed that members of different species mostly just ignored each other, unless one just got too close.

If you watch gray squirrels under a bird feeder gleaning spilled seed, and a chipmunk arrives, the squirrels pretty much ignore the chipmunk.

But if a new squirrel arrives, all the squirrels visibly react to its presence.

One may move out of its way, another may charge and attack and chase the new arrival for a long time.

And if a second chipmunk arrives, the first chipmunk will react somehow. It must.

Conspecifics among mammals and birds are always highly aware of each other, and have no choice but to respond to one another.

How they respond depends on the kind of social expectations their species has.

Dominance Hierarchies

Gregarious animals live in groups, called flocks or herds (or cities).

Most gregarious mammals are herbivores, such as sheep.

Gregarious animals have the social expectation of being with, even being surrounded by, their own kind. They suffer when they are not.

In a flock of highly gregarious domestic chickens, each member has a

place in a dominance hierarchy called a **peck order**.

In this kind of arrangement (found in baboons and wolves as well) each animal has a rank. Only one gets to be “top dog”.

All the others get to be dominant to those under it and must be submissive to those who outrank it.

A dominant chicken has a right to peck those “under” it, but can expect to be pecked by those “above” it.

Many animals have dominance displays which are communication signals to lower ranking conspecifics.

Many animals look bigger when they are being aggressive. These are signals to their own kind, which understand the signals instinctively.

- If mammals are aggressive, they raise their hair or fur; many show teeth.
- If lizards are aggressive, they inhale air and hold their breath.
- Fish erect their fins and intensify their colors.
- Most birds move in close and threaten to peck.

We see dominance behavior in all kinds of human groups, most obviously in military organization, bureaucracies, and corporations.

Conflict Resolution and Submission

In animals with dominance hierarchies, when one is “pecked”, it submits, to appease the dominant one, and avoid being pecked more.

Each species has its own signals which communicate submission.

When the dominant animal receives the submission signal, it stops its threat behavior. **It has no choice** but to do so.

When dogs or wolves submit, they expose their most vulnerable place, their throat, to their attacker, who responds by ending the fight, not by tearing their throats out.

This is Nature’s method of conflict resolution—**you avoid hurting your own kind** because you have built-in inhibitions against it; **when a conspecific signals submission, the conflict is over**, so serious injuries are rare in conflicts between conspecifics. **Submission signals turn off aggression** as surely and routinely as a switch.

Humans and chimpanzees are the only species of mammals we know of that do not have built-in inhibitions against killing other members of their own kind. Murder seems to belong to the primates.

Yes, sometimes other kinds of animals do die in conspecific fighting, such as when rutting buck deer lock their antlers, but this is rare. In this case the submission signal is to run away, so the signal cannot be given.

Loners Many animal species are not gregarious—their social expectation is that they will not run into members of their own species. Many carnivores are loners.

Predators tend to be loners, except for group hunters such as wolves, dogs, and African lions. Their groups (packs and prides) are usually

family groups.

When loners do encounter a conspecific, they usually react aggressively. One or both display threat, then they fight (rare) or one leaves the area (common).

Loner species are usually very aware of the closeness of conspecifics; they know because of scent-marking.

Loners such as domestic cats “mark” places they frequent with hormones.

The social purpose of this chemical communication is to make sure that there are not too many conspecifics in the area.

So Why All This Hassling? Dispersal and Belonging

The aggression loner species display toward each other has a simple but not obvious purpose: to spread the population out over an area in a way that each one will have adequate food, but will still be close enough that each one will have a good chance of reproductive success.

In other words, **in loner species, aggression toward each other is functional, even cooperative**, since the result is that the species benefits from this spacing out or dispersal.

In gregarious species such as baboons and many herbivores and flocking birds, aggression and dominance do not result in dispersal, but instead may serve simply to **clarify social relations and reduce stresses** that arise from not knowing how to behave.

Many animals would apparently rather be always submissive than be

excluded from the company of their own kind. In other words, the most important thing is to **belong**, even if your status is zero.

In gregarious species, aggression and dominance hierarchies can function as a kind of social glue that organizes and gives coherence to the social structure of a population.

The first field study of howler monkeys concluded that social bonds based in mutual dislike are as strong as bonds based in mutual affection.

Dispersal from the Empty Nest

In most birds and many mammals, we see another kind of way to achieve proper dispersal of conspecifics. After young birds and mammals can fend for themselves, the parents drive them away.

The parents force their offspring to leave; the result is that both will have a better chance of survival.

What looks at first glance like cruelty (from a narrow human perspective) is in fact an ecological necessity.

Most young mammals and birds also leave their parents. Most young animals have a drive to leave, and do so on their own. Most parents will drive their young away if they don't leave on their own.

Territoriality

A territory is an area defended against conspecifics.

Some animals are territorial, and their social behavior reflects it. Territorial animals spend time defending their territories (chasing off intruders) and time encroaching on others' territories without being caught.

Some animals are territorial all the time; some only during mating season.

Territoriality is known to exist among insects such as dragonflies and ants, some fish, a few frogs, some lizards, most birds, and many mammals.

For example, shrews (tiny insect-eating mammals) have permanent territories of about 1/4 acre. Researchers estimate they spend forty percent of their time avoiding other shrews. By scent-marking, conspecifics create an opportunity for the intruder to withdraw without the possibility of violence, or even seeing each other.

Compare the function of scent-marking to the function of gang graffiti. Compare territoriality to "turf wars" among humans.

Songbirds are territorial at breeding time. Male singing is a claim to territory; it is sung to conspecific males as a way of saying, "This is my space, don't come here!"

A red-winged blackbird singing from a cattail is primarily announcing his territory to other males. When a female comes around, he does not sing to her; he actively shows her his territory and several nest-sites he has picked out. If she likes the place, she stays.

Aggressive displays occur most often near the borders of a territory.

When a strange howler monkey approaches the territory of others, resident males set up a tremendous noise, warning the intruder off.

Many songbirds sit on highly visible perches while singing, providing both auditory and visual displays.

Territorial displays conserve energy, making it unnecessary for the resident animal to chase others away.

Furthermore, where display occurs, injury is rare, as physical contact is rarely required.

Ecologists believe that the primary function of attack–avoidance behavior is to allow conspecifics to regulate their spatial distribution.

It also may regulate access to both food supplies and mates.

Populations of all species have an optimum density, and attack-avoidance behavior helps maintain it.

Plants Relate Too

Do plants respond to conspecifics? Yes. Do plants respond to other species? Yes.

Most plants respond to leaves being eaten by increasing their chemical defenses.

Recently, researchers found that the alder tree, when attacked by a sudden invasion of leaf-eating caterpillars, responds in two ways

- the tree increases its own chemical defenses by pumping nasty-tasting alkaloid chemicals into its own leaves.

- it manufactures and releases a chemical signal (a pheromone) which tells other alders to increase their own production of nasty-tasting chemicals. They give this off through their leaves **and** through their roots, many of which are touching the roots of other alders in their community.

In other words, the first tree attacked tells the other trees in its vicinity, “Get ready! Attack! Attack! Attack!”

Notice that the first tree derives no benefit from this social communication; the pheromone is not a distress signal.

Notice also that the message is not sent to trees in general, but only to members of its own species.

The result of this alder tree communication is that neighboring trees who had not yet been attacked had an advance opportunity to increase their chemical defenses and so would be injured less by the caterpillars than the first tree was.

We do not know yet how common or uncommon this kind of social communication is among plants, because it has not been studied much. There is little doubt that many species of plants have evolved this capability.

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