

Intraspecific Relationships.

Individuals of the same **species** will always have very similar needs, so their **competition** for scarce resources is more intense. What do organisms compete for?

- mates
- nesting sites
- breeding territories
- food
- space

Interspecific competition is where two species compete for the same resource. In plants can causes a decrease in growth rate, while in animal populations it shows decreased reproductive rate as the density increases. This can show as decreased birth rate (natality) or an increased death rate (mortality).

In animal's competition produces **aggressive behaviour**. This is necessary to assert an individual's right to get a resource. But aggressive behaviour is costly in terms of energy and may result in injury, or even death. So, most animals carry out what is best described as **ritual fighting**. They are not duels to the death but rather wrestling or pushing matches designed to test the strength of each opponent.

When animals live in groups this aggression could be unsettling and counterproductive so it is kept to a minimum in several ways.

Powerful animals show off their status and intimidate weaker animals so they do not even bother to Two other strategies that have evolved to reduce aggression are **social hierarchies** and **territories**. They are both systems designed to distribute resources.

Territories

Many animals move over the same geographical area in search of food and other resources. This area is often quite large and is not defended - no one owns it. We call this area the **home range**.

Within the home range there is usually a smaller area which individuals 'own' and **defends** with aggressive behaviour. They do this because it is here that they will mate and probably raise their young. So it may include the nest or lair. These areas called **territories** are areas which are actively defends so the organism can have its nests and raises its young in safety.



Forms of territory

- Sometimes a territory is established to guarantee a source of food and is usually defended all year round. Territories must be large enough to supply enough food.
- Other animals only establish and defend the territory long enough to breed and raise their young. Once again, the territory provides food.
- The territory may just be a place for mating to occur.
- Animals may only establish the territory as a space in which to nest and raise young. Food is obtained elsewhere.
- Some animals, such as the Pukeko, defend high quality territories around a water hole by forming groups. Group defence allows a bigger territory to be defended.

Why do animals have territories?

Defending a territory is costly in terms of energy and time so the benefits must be worth it.

So what are the advantages of having a territory?

- provides a safe place to court, mate and rear young
- provides enough food for them to survive and breed successfully
- animals can become familiar with the area so know where to find things without wasting lots of energy

Those animals that do not hold territories may not be able to reproduce and are displaced into marginal areas - survival is difficult. Territories are generally held by the most successful animals, so they get access to the best food, protection and mates therefore only they get to leave their genes behind. This has the effect of keeping the species strong. The size and location of the territory are determined by the area that the owner(s) can successfully defend and how well resourced the area is.

High-status individuals will have a bigger, better territory. Weaker males are less likely to secure and/or defend a territory therefore less likely to attract a mate so don't breed.

How are territories defended?

Animals usually show three distinct phases of territorial defence:

- marking or signalling 'keep out' e.g. urine, scent marking area
- threat displays, singing / calling at boundaries
- fighting

Once again real fighting is to be avoided because of the potential harm it could do to both participants. It is also the most time consuming and energy costing.

Distributing resources by establishing social hierarchies

Animals that live in groups share resources, but the sharing is not even amongst members of the group. Animals get resources according to their rank, or status, within the group. We call their ranking system a **social hierarchy**. The earliest studies of hierarchies were done with chickens. Hens show 'pecking' behaviour - they peck each other with their beak to show their rank. For this reason, their hierarchy is often called a **pecking order**. An investigation into the pecking order of 8 hens is shown below.

Pecking bird	A	B	C	D	E	F	G	H
A		X	X		X		X	
B			X				X	
C							X	
D	X	X	X		X		X	
E		X	X				X	
F	X	X	X	X	X		X	X
G								
H	X	X	X	X	X		X	

Such tally charts are commonly used to record interactions when determining the rankings in a group. Notice that bird F pecks all other birds, so we call it the **dominant** bird - it occupies top rank. It is often called the '**alpha**' individual.

The complete hierarchy from most dominant to least dominant is: bird most dominant F - H - D - A - E - B - C - G least

What are the advantages of social hierarchies?

Animals with high rank have obvious advantages - they are the first to feed and they have the choice of mates.

Dominant males leave more offspring than subordinate males. But even the lower ranked males have the possibility of mating in the future, should they move up in ranking. If they were an outcast there would be no possibility.

The group structure allows greater opportunity to locate food and greater survival chances for individual group members when conditions are difficult, or in the presence of predators.

Dominant males usually mate with the strong females to ensure genes are passed on and strong leadership continues, which ensures more "fit" individuals are produced and are therefore more likely to survive. The group provides greater care for young through social bonding and increases chances of survival of the individuals into adulthood.

For these reasons social hierarchies are very common in animals living in groups. Once established the hierarchy is barely noticeable due to lower aggression levels. Everyone knows their place. All that we see is that some animals regularly give way to others.

Different types of Social Hierarchy

Linear dominance hierarchy system (often referred to as a pecking order), every member of the gender is recognized as either dominant or submissive relative to every other member, creating a linear distribution of rank.

Complex dominance hierarchy occurs where a group has a social structure controlled by a dominant (alpha) member and is ordered but differs from linear in that it has the following feature(s) with at least one of:

- subordinate groups
- bonding pairs
- family groups
- division of labour

The baboon hierarchy is a complex social organisation and not linear, as there are subordinate groups and affiliations within the overall group, such as mating pairs and families and associations are constantly changing. There is an alpha male in overall charge.

Establishing social hierarchies

Hierarchies are established by animals **competing** for rank. This involves aggression and fighting early on but once established, fighting is no longer needed. Position or rank is maintained mostly by **posture** and display. Only if a new individual comes along to challenge will fighting occur.

How do animals communicate rank?

Animals use posture or display to show either **dominance** or **submissiveness**. Everyone knows what the signals mean and they can be quite specific to the species. But generally a dominant display involves a

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threat or the body is made to look bigger - standing erect, hair standing on end, holding the tail erect, snarling, exposing canine teeth or fluffing up feathers or a mane.

Generally submissive postures are **appeasement** gestures designed to prevent attack by the more dominant animal. They are the opposite of the threats by dominant animals. So **subordinates** make themselves look non-threatening: smaller, lowering the head, avoiding eye contact, cringing, tucking the tail between the legs. They often involve exposing the most vulnerable parts of the body such as rolling over onto the back. This is the ultimate in appeasement signals as it says I mean no harm; you can kill me but don't bother.

Living in Groups:

Remember Costs vs Benefits of group living leading to Differential Reproductive Success.

Advantages of living in groups	Disadvantages of living in groups
<ul style="list-style-type: none"> • Safety in numbers and group defence • Proximity and choice of mates increased • Specialisation of function within group possible – different jobs for different members of group e.g. bees, some animals on watch while others feed • Cooperative food gathering therefore can hunt larger prey • Increased efficiency in locomotion – birds flying in V formation • Groups can work together to modify their environment e.g. build a hive 	<ul style="list-style-type: none"> • Increased Sickness and Disease - Animals that live in close proximity to one another face higher risks of infection than do individual animals • Increased Vulnerability to Predators - Large congregations of animals are more susceptible to predation than are small groups or individuals, they could be easy targets, easy to be seen etc. • Increased Competition for Food, mates etc. therefore more conflict

How else do organisms distribute resources?

Establishing **territories** and **social hierarchies** are just two ways that resources are distributed in animal species. The consequence of this is that **intraspecific** aggression is reduced.

Some species of animal are like plants in that they do not move much - examples are barnacles, oysters and pipis. These species reduce **competition** by **dispersing** their young well away from the parents.

The **larval** stage of such animals is adapted for dispersal, often being free-swimming or floating until it reaches a suitable habitat to settle on and become an adult. This means the young will settle far from the adult and not compete with them for resources.

Other animals, such as many insects, have a **juvenile** stage has a unique **niche**. This means that it will not compete with adult form. Usually, some sort of **metamorphosis** is required change between stages.

Adult butterflies have a straw-like proboscis or tongue, through which they suck **nectar** and water for nourishment. butterflies and moths have four wings, making them highly mobile compared to the other stages of the life cycle.

Larvae have three distinct body parts. They have a head, and body with a **thorax** and an **abdomen**. The head has a pair of very short **antennae** and mouthparts to eat leaves. They move using their many legs.

In some species of **native** birds the male and female do not share the same niche, so they do not compete strongly. Male bellbirds feed primarily on **nectar** while the female feeds more on insects.

