

ANIMAL BEHAVIOUR

(ABG 503)

2 Units

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Course requirements:

CAT: 30%

Exam: 70%

Class attendance compulsory

*Contact Lecturer ahead of time if any cogent reason will keep you away from lectures.

*Present medical reports if absence from lectures/CAT was due to ill health.

Aims of the course

- To understand the general concepts that govern the manner in which animals behave throughout their lives i.e. maximizing 'fitness' through essentially selfish actions.
- To appreciate the range of mechanisms by which animals adapt to their environmental conditions using behavioural actions.
- To achieve competence in the skills required to conduct scientifically meaningful studies of animal behaviour.

Introduction

- **Behaviour** can be defined as an expressed course of action produced in organisms in **response** to **stimulus** from a given situation. It could simply be considered as what the animal does.
- The fundamental explanation of behavioural activity must begin with a **stimulus** and end with a **response**.
- **Stimulus:** Any change in the biotic and abiotic environments capable of causing a reaction or response in a living organism.
- E.g. temperature, pressure, radiation, gravity etc.
- Or activities of other organisms within the immediate environment.

- **Ethology:** Scientific study of animal behaviour. It explains responses observed in the field in terms of stimuli eliciting the behaviour. Ethologists have so far tried to answer questions about animal behaviour from **four** major areas:
- **The evolutionary history:**
 - How did various forms of behaviour evolved?
 - Innate/instinctive/genetic or learned?)
 - How does the behaviour compare with similar behaviour in related species?
- **Development:**
 - How does behaviour change with age?
 - What early experiences are necessary for behaviour to be expressed?
 - e.g. How does courtship behaviour develop?
 - Does the male in domestic fowl learn the waltz dance?
 - Does he practice dancing?
 - Is he successful in directing the female?
- **Causation:**
 - What are the stimuli that elicit the response?
 - How has it been modified by recent learning?
- 4. **Function:**
 - How does the behaviour affect the animal's chances of survival and reproduction?

Components (types) of Behaviour

Behaviour

Nature/innate
Genes determine behaviour

Nurture/learned
Experience and learning determine behaviour

<i>Inherited (innate) behaviour</i>	<i>Learned behaviour</i>
1. Set at birth	Acquired after animal is born
2. Species characteristic behaviour	Individual characteristic behaviour
3. Largely influenced by genes (inborn)	Largely influenced by environment
4. Inflexible (stereotype patterns of behaviour)	Flexible

Types of learned behaviours

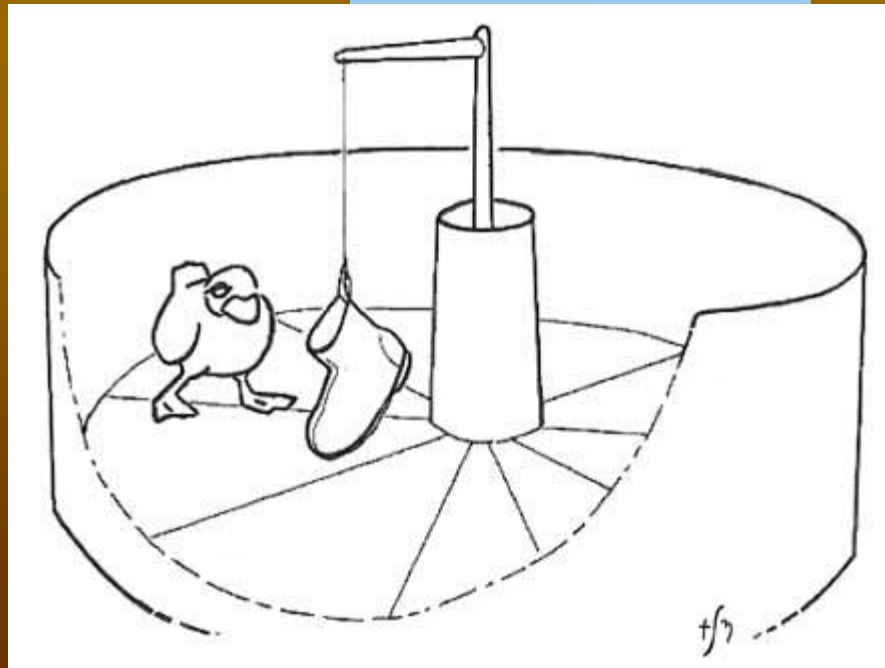
- 1. Imprinting
- 2. Non-associative learning - Habituation
 - - Sensitization
- 3. Associative learning - Classical conditioning
 - - Operant conditioning
 - *Reinforcement (Positive/negative)*
 - *Punishment (Positive/negative)*
 - *Shaping*
 - *Extinction*
- 4. Latent or exploratory learning
- 5. Insight learning

Imprinting

- Imprinting is said to occur when innate behaviours are released in response to a learned stimulus.

Adaptive significance:

- Enables offspring to rapidly acquire skills possessed by their parents such as learning to fly in birds, song learning.
- Promotes survival of newborn and shapes future breeding activities.



Characteristics of imprinting

- Occurs during critical sensitive period.
- Imprinting is irreversible because the imprinted knowledge is retained for life.
- It establishes an individual animal's preference for a certain species since individuals will prefer to follow a learned stimulus rather than a member of their own species.
- Some behaviours are affected by imprinting more than others. E.g. It may have effects upon the animal's future choice of a sexual partner.
- Stressful stimuli fortify imprinting.

Non-associative learning

1. Habituation

- Occurs when *repeated presentations of a stimulus causes a decrease in response.*
- The *stimulus is not associated with reward or punishment (reinforcement).*
- E.g. birds learn to ignore scare crow. The animal learns not to respond to irrelevant stimuli such as movements due to wind, cloud, shadows, wave action etc.

Significance:

- Helps animals to recognize important cues or signals and adapt to constantly changing environment.

2. Sensitization

- It is the opposite of habituation in that *repeated presentations of the stimulus cause an increase in response.*
- The stimulus has to be unpleasant or aversive.
- In farm animals, increased responsiveness follows a reward or punishment (or 'reinforcement') mainly associated with predator, food and mates.

Associative learning

1. Classical (Pavlovian) conditioning

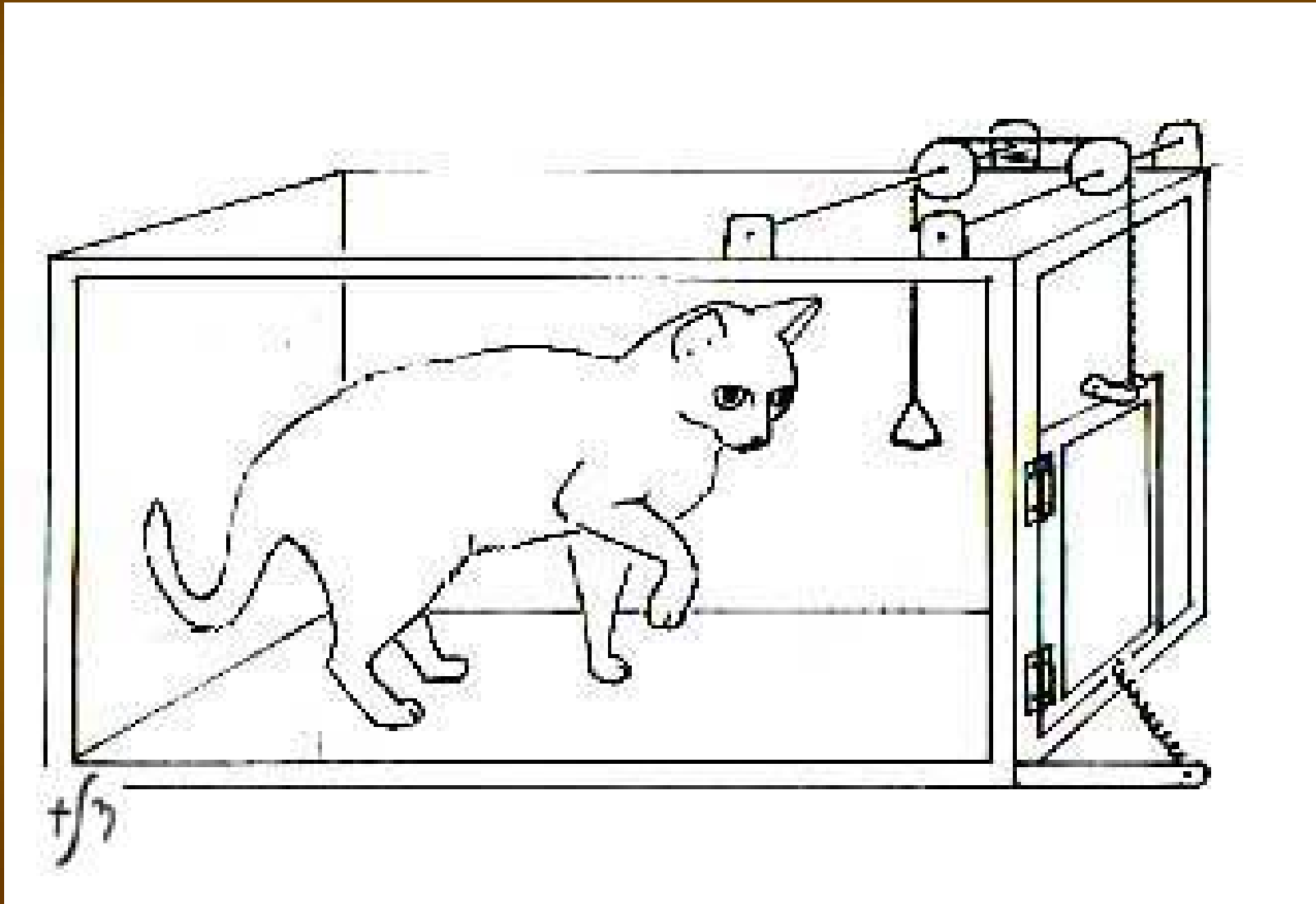
Classical conditioning is the *acquisition of a response to a new stimulus by association with an old stimulus.*

2. Operant conditioning (trial-and-error learning):

An operant response is *a voluntary activity that brings about a reward.*

Classical conditioning	Operant conditioning
1. Acquisition of a response to a new stimulus by association with an old stimulus.	It is a voluntary activity that brings about a reward.
2. Enables animal to associate events over which it has no control.	Enables animal to associate events over which it has control.
3. Animal gains prediction over events.	Increases animal's ability to control environment.
4. Rewards are associated with stimuli.	Rewards are associated with responses.

Operant conditioning (trial-and-error learning) Cont...



Reinforcement (positive/negative) and punishment (positive/negative)

- Operant conditioning allows one to use *reinforcers* or *punishers* that positively or negatively influence the likelihood of a behaviour being repeated.
- Reward strengthens the correct response.
- With selection of appropriate reward, animals could be trained to do remarkable things if reinforced at the right time.
- E.g. By waiting for accidental movement of eye lids, pigeons were taught to blink to receive food reward.
- The speed and strength of learning increases with size and attractiveness of the reinforcer.
- **Negative** in the context of animal training refers to removal of something in the animal's world.
- **Positive** reinforcement refers to addition.
- When trainers reinforce a behaviour with the removal of something unpleasant, they make the behaviour more likely to occur in the future.
- That is, the response has been negatively reinforced. An animal must know that a stimulus is aversive for its removal to be reinforcing.

Reinforcement (positive/negative) and punishment (positive/negative)

Reinforcement, whether positive or negative make response more likely in the future.

Punishment, whether positive or negative make response less likely in the future.

Response is more likely in future	Response is less likely in future
<u>Positive reinforcement</u> e.g. Tit bit reinforces begging at table by dogs.	<u>Positive punishment</u> e.g. Applying tension on the lead increases choking and neck pain.
<u>Negative reinforcement</u> e.g. Easing tension on the lead reduces choking and neck pain in horses.	<u>Negative punishment</u> e.g. Complete removal of food extinguishes begging at table.

Animal training

- *Refers to development of desirable responses and deletion of unwanted responses.*
- It reflects the principle of learning theory.
- Studying animal responses allows one to improve the timing of cues and rewards.
- Top trainers know when and how to reward their subjects.
- - Frequent rewards prevent development of improved responses.
 - Stinginess causes animals to lose interest and motivation.
 - Removing reward brings about extinction of unwanted responses.

*Assignment/term paper: Write on

"Reinforcement schedules in animal training".

Shaping

- *Technique of reinforcing successive approximations to the final response.*
- The concept is applicable in animal training.
- Could reinforce a desired response which has never occurred to one where it is occurring and increasing in reliability.
- Requires patience to monopolize each tiny improvement as the only way to moving towards the final response.
- Behaviour should be rewarded as soon as it happens.
- E.g. Send away exercise in dog training

Extinction

- *It results when learnt response occurs but no longer followed by reinforcement.*
- Behaviours will drop out (extinct) when an animal no longer receives a reward for a correct response.

Latent or exploratory learning

- Animals explore new surroundings and learn information which may be useful at a later stage (hence latent).

Insight learning

- Highest form of learning (does not result from immediate trial-and-error learning).
- Based on advanced perceptual abilities such as thought and reasoning from information previously learned.
- Previous experience of playing with boxes (latent learning) helped a Chimpanzee to stack boxes and reach out to bananas at the ceiling (Kohlar's work on chimpanzees).
- This response appeared to follow a period of 'apparent thought'.

References

- Blackshaw, J.K. and Allan, D.J. 1986. Animal Behaviour. Third Edition.
<http://animalbehaviour.net/AppliedAnimalBehaviourTopics.htm>
- Taylor, D.J., Green, N.P.O. and Stout, G.W. 1998. Biological Science.
Third Edition. Cambridge University Press. pp 984.

Innate behaviour

- Involves a collection of responses that are predetermined by the inheritance.
- As a result of these 'built-in' pathways a given stimulus will produce invariably, the same response.
- Primary adaptive significance lies in their survival value to the species.
- Include orientations (taxes and kinesis), simple reflexes and instincts.
- **Instincts** - complex, inborn, stereotyped behaviour patterns produced in response to sudden changes in the environment.
- Include biological rhythms, territorial behaviour, courtship, mating, aggression, altruism, social hierarchies and social organization.
- Can be considered as 'unlearned species-specific motor patterns' or species-characteristic behaviour.
- Instinctive behaviour patterns are not completely inflexible due to constant influence of varying environmental factors acting on the genetic framework.
- Hence, some behavioural patterns may not be purely instinctive (genetic) or purely learned (environmental), but influenced by a combination of the two.

Motivation

- Encompasses a variety of factors that modify the extent and nature of any behavioural response.
- At any given moment in time, an animal usually has a range of behaviours which it could exhibit.
- What is it that determines which behaviour an animal decides to conduct?
- No animal exists in isolation from its external environment which may change, E.g. food may appear or disappear, a predator may attack, the temperature could fall, or offspring may start begging for food.
- The same stimulus does not always evoke the same response in the same organism.
- The signals used to bring about a change in behaviour are known as sign stimuli.
- Depending on their origin or function, they are classified as motivational, releasing or terminating stimuli.

Motivation and welfare

- Welfare is a measure of how well an animal copes with its environment.
- Can also be considered as absence of suffering. Welfare is poor if animal fails to cope or its coping efforts have detrimental effects on the productivity.
- ***How can an understanding of motivational systems be important to our understanding of animal welfare?***
- Can give insights into causes of behaviours that are potential welfare problems.
- Many housing systems for husbandry restrict space, foraging ability and prevent natural behaviours, leading to development of abnormal behaviours.
- Some abnormal behaviours are indicative of reduced welfare in that they act as a 'coping mechanism' to allow the animal deal with a stressful environment.
- Animals may be strongly motivated to conduct a behaviour, but unable to do so. Or, animals may be able to perform a behaviour, but be prevented from reaching the functional consequences of that behaviour.

Motivation and welfare cont...

- Two models give different predictions from a welfare perspective:
- Lorenz's model states that it is the performance of the behaviour itself that is important.
- Homeostatic model suggests that the goal of the behaviour is important.
- By understanding the motivational system, we can alter our husbandry systems so that the behaviour itself can be conducted, or so that the goal can be reached.
- **Summary:**
 - Study of motivation looks at how internal and external causal factors interact to produce behaviour.
 - Motivation must be considered as we do not know the exact mechanisms as to why a behaviour occurs.
 - Animal welfare and hence productivity is likely to be compromised when highly motivated behaviours cannot be expressed, or when a functional goal is not achieved.
 - An understanding of motivation allows us to make predictions about when welfare will be compromised.

Innate behaviour patterns or types

■ 1. Agonistic behaviour

- Group of behavioural adjustments associated with fighting, which includes attack, escape, threat, defense and appeasement.
- Continuum of behaviours from threat to aggression to submission.
- **Threat** - species-specific vocalizations, odours, postures, facial or body movements that signal the intent to display aggression.
- In stable social systems, threat causes immediate signs of avoidance or submission.
- **Submission** - species-specific behaviours, vocalizations, postures and odours that signal non-aggressiveness and reduce further attack by the aggressive individual.
- Submissive behaviour may be objectively measured because they always follow either an aggressive behaviour or a threat, and because each species has specific submissive postures.
- **Aggression** - species-specific behaviours associated with attacks with the objective of causing physical injury.
- Usually directed towards members of the same sex and species.
- Various functions include: displacement of other animals from an area (territory or source of food), defense of a mate/offspring and the establishment of rank in a social hierarchy.

Classification of aggressive behaviours

<i>Behavioural category</i>	<i>Definition/Example</i>
Inter-specific aggression:	
1. Maternal defense	Mother defends young against potential predators. E.g. Ewe with lamb attacks dog.
2. Defense of territory	Animal attacks intruder. E.g. grazing bull attacks man.
3. Predation	Animal attacks, kills and eats other animals. E.g. Lion catches and eats zebra.
Intra-specific aggression:	
4. Aggression after grouping	Previous unfamiliar animals are brought together, they fight and a social structure or hierarchy results. E.g. pigs.
5. Inter-male fighting	Adult males generally fight to win mates or territory. Eg. Rams or goats fight during breeding season.
6. Resource defense	Aggression increases with limited resources in cattle, etc.
7. Inter-gender fighting	Males attempt to mount non-oestrus females, aggressive behaviour results. E.g. Non oestrus sows attack boar who attempts to mount.
8. Aberrant aggression	Wool biting in sheep, ear and tail chewing in pigs, cannibalism or killing of young.

Ethogram of agonistic behaviours

- Ethogram - complete catalogue of all behaviour patterns and vocalization occurring in a species.

1. Sheep

- Aggressive behaviour (fighting) include: shoving with shoulders, running together and butting. Play butting occurs in young lambs and more damaging aggression in ewes and rams. Most fighting is during breeding season.
- Threat postures include: striking the ground, tooth grinding, lateral body presentation, sniffing, mounting and chasing.
- Aberrant aggression: Some ewes show aberrant aggression towards their lambs or alien lambs. Wool picking with teeth is common in confined sheep.

2. Goat

- Contact agonistic behaviour include: Pushing the forehead against another goat; Butting and rear clash.
- Non-contact agonistic behaviour include: Staring; A-horn threat with chin down and horns forward; Rush or rear as a challenge threat.

Ethogram of agonistic behaviours cont...

3. Cattle

- Pre-fight behaviours: Active or passive avoidance leads to fight.
- Threat: Close contact, head lowered, ready to fight and butting or active fighting. Butting could be regarded as a non-retaliated blow with the head, while fighting involves reciprocal butts, circling and pushing.
- Submissive behaviour: The end of the fight begins with one animal showing submissive behaviour.
- Aberrant agonistic behaviour: Include naval sucking, fence and pen chewing (aggression towards inanimate objects) and ear sucking. These behaviours may be a sign of nutrient deficiency. Other abnormal behaviours include: mis-mothering.

Ethogram of agonistic behaviours cont...

4. Swine

- Threat: Head tilt and retreat or avoidance to chase and nose to nose contact.
- Aggressive: Bites and pushes - Head-thrusts in combination with bites and shoulder pushes represent the phase of interaction that seems most intense.
- Submissive behaviour: Subordinate pig turns its body and either runs away or remains stationary and presents its rump. Submission may be signaled by lowering of the head.
- Abnormal or aberrant agonistic behaviours: Tail/ear biting and cannibalism.
- *High concentration of atmospheric ammonia, dietary factors, floor type and lack of bedding may aggravate tail biting and ear chewing in pigs. Other abnormal behaviours include: abnormal mating behaviour, abnormal maternal behaviour, eating disorders, abnormal dunging etc.

5. Chickens

- Threat: Chickens show threats associated with fighting, leaping and wing-flapping. The major aggressive act is pecking.
- Submissive behaviours are described as retreat.
- Aberrant behaviour can be found among confined chickens. Cannibalism could be influenced by diet and management procedures.

Management of aggression

- Besides farm machinery, animals are considered to be the 2nd leading cause of injury in some livestock farms.
- With understanding of behaviour patterns of cattle, sheep, pigs, etc., a production programme to minimize aggression, livestock injury and maximize safety to stock men will include the following:
 - 1. Animal should be raised in groups for better control.
 - 2. Provision of adequate housing/holding area as well as wallowing area for pigs.
 - 3. Provision of adequate feed/water & pasture: Location of feed in the environment is very important.
 - 4. The stockman should maintain a dominant role with farm animals because animals form social relationships with caretakers who provide shelter and care for animals.
 - 5. Stock men should be alert when handling animals during the most active time at dawn or dusk.
 - 6. Some short-term treatments sometimes used to minimize aggression between newly mixed pigs include the use of tranquillizer (azaperone).

2. Dominance status

- Existence of social hierarchies or pecking orders.
 - A pecking order is a dominance hierarchy in which animals within a group are arranged according to status.
 - Position - decided by some agonistic form of behaviour other than fighting.
 - Animals recognize each other as individuals & possess some ability to learn.
 - Size, strength, fitness and aggressiveness may have influence.
 - Lower order male may be raised up the hierarchy by injection of testosterone.
- Advantages of pecking order*
- Decreases the amount of individual aggression.
 - It avoids injury to the stronger.
 - It ensures that resources are shared out so that the fittest survive.
 - Increase genetic vigour of the group.

Effects of breed and horn size on social hierarchies in goats

Variable	Sub-class	No.	LSM (\pm SE)
Breed	WAD (1)	16	2.06 \pm 0.13
	Red Sokoto (2)	13	2.03 \pm 0.14
			(P>0.05)
Horn size	Small (1)	10	1.21 \pm 0.16
	Medium (2)	10	2.00 \pm 0.16
	Large (3)	9	2.93 \pm 0.17
			(P<0.001)
Breed*Horn Size	1,1	6	1.17 \pm 0.21
	1,2	5	2.40 \pm 0.23
	1,3	5	2.60 \pm 0.23
	2,1	4	1.25 \pm 0.25
	2,2	5	1.60 \pm 0.23
	2,3	4	3.25 \pm 0.25
			(P<0.05)

Source: Bemji *et al.* (2002)

3. Territorial behaviour

- Territory is an area held and defended by an organism or group of organisms of the same or different species.
- Common to all vertebrates except amphibians.
- **Formation of territory** ensures that each mating pair of organisms/offsprings are spaced to receive a share of the available resources (food/breeding space).
- Size of territories occupied by species varies from season to season.
- Defense is greatest during breeding season and fiercest between males of the same species.
- Threat displays are used by owners of adjacent territories. These threat displays involve certain stimuli which act as releasers.
- E.g. An adult male robin would attack another adult male displaying a red breast and a bunch of red feathers.
- Individuals mark out the boundary by leaving a scent trail.
- Aggressiveness of males is determined partly by the level of **testosterone** in the body and this can affect territory size.

4. Altruistic behaviour

- Form of social behaviour whereby one organism puts itself either at risk or personal disadvantage for the good of other members of the species.
- E.g. Birds and monkeys call out warnings to others in danger and female monkeys carry and care for the babies of other monkeys.
- In insects such as honey bees, wasps and ants, sterile female workers are prevented from producing offsprings, yet they spend their lives looking after their brothers and sisters.
- The conferring of a genetic advantage on closely related organisms forms the basis of altruistic behaviour.
- Altruistic behaviour is very common amongst primates and varies from the extremes of social protection which exist between members of the same troop (monkeys), through acts of mutual grooming and food sharing (apes) to deliberate acts of self-sacrifice for family (God of humans).
- The extent of altruistic behaviour appears to be related to close relatives (kin) such as offspring and siblings (brothers, sisters cousins) with whom they share certain alleles.
- Thus **adaptive significance of altruistic behaviour** is to increase the frequency of those alleles common both to the donor and recipient(s) of the altruistic behaviour.

Module Skills

Research skills

Students' ability to work independently and solve problems will be developed by assignments.

Communication

Students are required to present information precisely and concisely in a clear and informative manner. Oral discussions and presentations will form part of the module.

Improving own Learning and Performance

Students will have to manage their own time in developing assignment.

Information Technology

To complete assignment, students will have to obtain information from a variety of sources including books and websites. This will involve the use of IT to compile finished report, as well as retrieving relevant information