

**AN INTRODUCTION  
TO  
ANIMAL BEHAVIOUR**



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**An Introduction to Animal Behaviour  
(Ethology)**

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# CHAPTER ONE

## INTRODUCTION

The behaviour of an animal is the overt expression of the effect of all the factors that are influencing an animal. Behaviour is a response, which always has some sort of cause that precedes it. The cause or stimulus may be from within or without the animals; it may be a change in the physical or social environment. These factors (stimuli or agents) cause changes in the activity of the organism, and the changes are called responses.

Stimuli may bring about conflicting responses. When a prey animal sights a predator, for instance, there is tendency to want to remain hidden or to run. The response of such an animal depends on the varied stimuli being received at the time and on past experience of the prey. Thus the behaviour that we observed in animals is response to a complex integration of many factors or stimuli.

These factors/stimuli are received from the environment in the form of sound, sight, touch, and through chemicals (scent, taste and hormones). Man has these sensual capabilities too but his abilities seem very much different from that of lower animals. Owls can locate prey species with great accuracy in very dim light or even total darkness. Some carnivores can smell their prey very well from considerable distance and hawks have exceptionally keen eyesight for locating prey in the ground cover.

It is easy to recognize the obvious behavioural responses of animals (running, etc) but many responses are only internal. However, they may affect later activity. Physiology cannot and must not be separated from behaviour. The two are related in a functional way, and both of them must be considered before one can understand how an animal lives under natural conditions.

One of the most striking examples of the chain of events that include both internal and external stimuli is reproductive behaviour. When pheasants are exposed to longer periods of daylight, their reproductive organs reach a functional condition. The testes and ovaries become active; sperm and eggs are produced, and mating can successfully occur. The actual time of copulation depends on external behavioural response that males exhibit in the presence of females. Thus, there is a chain of events that begins (internally) with the effect of light on the reproductive organs; changes in the reproductive organs, and finally an external behavioural response that results in successful mating.

One could say behaviour is adaptation while response can be defined as an attempt to adapt. The nature of adaptation can simply be stated thus: An organism tends to react in ways that are favourable to its existence (Scott, 1972). In other words behavioural responses are the results of the basic drive (within all animals) to survive, and these results in the survival of the species. Individual survival depends on the ability of the animal to get food; to find enough protection from the forces of weather; and to escape mortality from diseases, parasites and predators. The survival of the population depends on the ability of the animals to mate successfully and produce young ones. And rear them to an age when they are self-sufficient members of the population, capable of reproducing.

The presence of this basic drive in all animals leads to some definite patterns of behaviour within animal populations. And these are characteristics of the species.

The behaviour of an individual affects that of others, and these interactions lead to social organization, a special part of which is the process of communication. Social organizations in turn affects the growth and decay of populations (Scott, 1972).

## **REFLEXOLOGISTS AND BEHAVIOURISTS**

Reflexologists explain all behaviour on the conditioned and unconditioned reflexes and asserts that complex sequences of behaviour are nothing but chain reflexes (Ziegler, 1920) quoted in Eibl-Eibesfeldt, 1970). Behaviourists stress the influences of the environment; investigations tended to focus on learning phenomena and frequently overlooked the inherited and innate basis of behaviour. J. B. Watson was the founder of behaviourism.

For the longest time reflexologists and behaviourists overlooked spontaneity of behaviour, which was not readily observable in their particular experimental stations. To them all behaviour consisted of reactions to stimulation. They clung over tenaciously to an experimental method once it was found successful, and this resulted in certain one-sidedness. Some extreme proponents of behaviourism consider all behaviour the outcome of learning processes. They opine that the environment alone determines the behaviour of the animal during the course of his ontogeny (Eibl-Eibesfeldt, 1970). Behaviourists and reflexologists have made contributions to the study of behaviour through rigorous application of the scientific method; and this is especially true in respect to the phenomena learning (Eibl-Eibesfeldt, 1970).

## THE NEED FOR THE STUDY OF ANIMAL BEHAVIOUR

The scientific study of animal behaviour is of importance for the following reasons (Scott, 1972):

- (1) The behaviour of animals has economic consequences. This is evident in the destructive activities of wild animals to agricultural crops, the hazards involved in bird strike to the aviation sector of some countries, etc.
- (2) Ethology of animals serves as yardstick for human behaviour. Conclusions drawn from observing activities of animals are being applied (rightly or wrongly) to human nature. Whether we like it or not, ideas of animal behaviour would always be applied to human behaviour. This being so, it is highly desirable that these ideas be as correct as possible, and this is something which can be achieved through scientific investigation.
- (3) It is convenient to use the behaviour of one species as a standard of comparison with another. Indeed, one of the main techniques of the science of animal behaviour is an exact systematic comparison of behaviour, checking off likenesses and differences. When the method is applied to the human species, however, certain general principles needed to be considered in order to produce significant results.
- (4) The study of animal behaviours inevitably gives rise to new ideas, which can be tested on human beings. Many of our striking new ideas and insights regarding human behaviour have come from animal studies, but the final test of their correctness always depends upon the direct study of human beings.
- (5) Animals can be used as testing material for ideas derived from human behaviour. Psychologists and psychiatrists frequently get ideas about behaviour from their experiences with fellow human beings. It is impossible to test these new ideas experimentally on human subjects. Attempts are therefore made to experiment with animals, hoping that this will shed some light on human behaviour.
- (6) General laws of behaviour: the study of animal behaviour helps to develop general ideas and theories which explain the behaviour of all animals and by extension that of man.

In order to arrive at a limited number of broad general ideas, there is need for careful study of a large and representative sample of the animal kingdom.

## ELEMENTS OF BEHAVIOUR

Behaviour pattern is a segment of behaviour (action(s)) that has a specific adaptive function. In order to ensure that one is dealing with a single behaviour pattern or a series of such patterns, one has only to subdivide the behaviour further and see if it retains its specific function.

A series or groups of behaviour patterns that are organized are referred to as behavioural systems. To identify a behavioural system the first task is to describe the behaviour patterns and see if there is any sort of order among them. Some animals do different things at different seasons or times, such things may belong to different systems.

## GENERAL SYSTEMS OF ADAPTIVE BEHAVIOUR

In order to survive, an animal has to carry out various vital activities such as feeding, reproducing and protecting itself; consequently, attempts have been made to classify behaviour patterns according to the functions they serve. Nine categories have been described, although the simpler animals do not carry out all of them (Scott, 1972, Neal and Neal, 1978).

- (1) **Ingestive behaviour** – this is the way by which an animal obtains its food and takes it in. This varies greatly in different species.
- (2) **Shelter seeking behaviour** – this is the tendency to seek out optimum environmental conditions and to avoid dangerous and injurious ones. It is found in almost all animals.
- (3) **Agnostic behaviour (aggressive behaviour)** – The word "agonistic" derives from a Greek root, which means "to struggle". Therefore, any sort of adaptation that is connected with a contest or conflict between two animals of the same species, whether fighting, escaping, or "freezing", may be included under this term (Scott, 1972). This also includes competing for dominance and defense of territories (Neal and Neal, 1978).
- (4) **Sexual behaviour** – this includes courtship, coition, and any related behaviour. Many animals have elaborate courtship patterns of behaviour.
- (5) **Care – giving behaviour (epimeletic behaviour)** – this is also called attentive behaviour. Epimeletic behaviour comes from a Greek word meaning "care-giving". Other more specialized terms that are sometimes used are "nurturant behaviour", applied to rearing the young, and "succorant behaviour", the giving of help to a distressed individual.

(Scott, 1972).

- (6) **Care – soliciting behaviour (et – epimeletic behaviour)** – a call or signal, which may result in care and attention from another animal. The word *et-epimeletic* is formed by prefixing a form of the Greek word *aeto* ("to call") on the word "*epimeletic*" (Scott, 1972).
- (7) **Eliminative behaviour** – this relates to the elimination of waste products. This may have social connotations when it is used in the marking of territories.
- (8) **Allelomimetic behaviour** (*mimesis*, contagious behaviour) – it is also referred to as gregarious behaviour. This behaviour always seems to involve some degree of mutual stimulation, and the term *allelomimetic* has been coined out of two Greek words meaning "mutual" and "mimicking". It may be defined simply as behaviour in which two or more animals do the same things, with some degree of mutual stimulation and coordination (Scott, 1972).

Two types of behaviour can easily be mistaken for allelomimetic behaviour. Firstly, a number of animals may happen to respond to the same stimulus at the same time, as when a group approaches a water hole and drinks. Close observation will usually show whether or not the animals actually coordinate their movements. Secondly, is the case of a group of young animals in a litter; they engage in the same type of activity and obviously stimulate each other, but close observation will show that their movement are not really coordinated (Scott, 1972)

The functions of Allelomimetic behaviour according to (Scott, 1972) are -

- (i) It helps in finding food
- (ii) Increases the effectiveness of attacks by predators.
- (iii) Conversely, it facilitates escaping by the prey
- (iv) Its most common function, however, is the mutual protection afforded by a group reaction to danger, providing safety

As a system the general function of allelomimetic behaviour is the facilitating of any response whose adaptiveness is increased by cooperation (Scott, 1972).

- (9) **Investigative behaviour** – this is sometimes called exploratory behaviour. It is any kind of sensory investigation of the environment or the tendency to explore an unfamiliar habitat. This includes the search for intruders or predators.

## CHAPTER TWO

### FIXED ACTION PATTERN

This is the kind of behaviour pattern that is not learnt but, in some way not understood, are passed from generation to generation. Therefore they are said to be innate. It is also known as instinctive behaviour. Innate behaviour patterns may already be fully functional at the time of hatching or birth. However, not all inborn behaviour patterns are fully developed at the time of hatching/birth. An animal that relies on rigid innate patterns of behaviour has a set of ready-made responses to all the usual problems it is likely to face. This is true as much for the young as for the adult. This is of great importance to survival under normal conditions. But when the animal confronts unusual circumstances it may be disastrous (Neal and Neal 1978).

Animals respond to particular stimulus in a definite manner. But in many situations animals are exposed to more than one stimulus at the same time, and these may be conflicting. In such cases the animal cannot respond to both stimuli at one and the same time. In other words when a variety of stimuli is presented to an animal it may respond to only one or a small part of the total situation.

These points have some form of internal control, which determines which pattern of behaviour is followed. However, on many other occasions an animal may be stimulated strongly in conflicting ways but neither action pattern becomes dominant; instead the animal performs an action that is quite irrelevant to the situation. For instance, a bird when confronted with a rival may be uniformly stimulated to fight or fly away – in the event it does neither, but starts to preen its feathers (Neal and Neal, 1978). This is termed a **displacement activity**. It should however be noted that an animal may have an innate behaviour pattern, but its application must be learnt.

### LEARNING

Every animal shows variation in its behaviour; all appear to be able to learn from experience to some extent. In fact some animals rely much less on inborn skills; they learn rapidly, and their behaviour is governed mainly by the experiences they have built up. This kind of behaviour, which is characteristic of mammals, and especially man can be described as adaptable (Neal and Neal 1978).

An animal that depends largely on learning is at a disadvantage when young, as it takes time to gain experience. Fortunately, adaptable behaviour is usually associated with high level of parental care. This provides opportunity for the young to survive until they have gained the necessary experience. Once the early stages

are over, adaptable behaviour gives room for an animal to cope better with unusual and difficult situations (Neal and Neal, 1978).

## TYPES OF LEARNING

- (1) **Imprinting and early learning:** - Imprinting is an extremely quick form of learning. This has been shown in some birds and mammals. In many cases learning is genetically programmed such that the animals are able to learn in specific sensitive periods and possess specific learning capacities only at this time. When this period is restricted to a developmental stage after which the animal can no longer learn, we speak of a critical period (Eibl-Eibesfeldt, 1970). The sensitive period does not have to be restricted absolutely to the first few days or weeks of life. The time duration of this period varies depending on the reaction even within the animal. Imprinting is irreversible and only specific reactions become imprinted to a particular object. The learning that occurs early in the life of an animal is undoubtedly very important in the development of the personality of the individual.
- (2) **Habituation:** - This is a situation where an animal learns to discriminate and disregard some stimuli and react only to those stimuli that are known to be significant. This is the simplest learning process (Eibl-Eibesfeldt, 1970).
- (3) **Conditioning:** - This is the type of learning where the animal associates a response with a certain stimulus as a result of re-inforcement (which is the practice of rewarding or punishing an animal when it responds successfully or unsuccessfully respectively).
- (4) **Trial-and-error behaviour:** - This type of learning may be seen as an extension of conditioning. It occurs when an association is built up between a certain action and a reward or punishment. Young birds learn to avoid consuming insects which are yellow and black once they have eaten such a specimen which is either bad tasting or can sting (Neal and Neal, 1978).
- (5) **Insight learning:** - This is the highest type of learning and is best shown in apes and man. This learning involves reasoning. It is the ability of an animal to respond correctly at the first time the animal encounters a certain situation. It enables the animal to solve a new problem without trial-and-error. However, animal studies indicate that severe malnutrition in very early life can result in long-lasting behavioural

changes, including what has been interpreted as retarded ability to solve relatively complex problems

According to Neal and Neal (1978), it is an example to intelligence, which may be defined as the ability to organize behaviour in the light of experience. There is considerable evidence that the organization of sexual and material behaviour in some of the higher mammals is dependent upon experience gained after birth, and also that coordination and efficiency of these behaviours improves with adult experience.

## CONDITIONED REFLEX

In pavlovian terminology, the response to a primary stimulus is referred to as unconditioned (or unconditional) response, while according to the instinct theory, a primary stimulus is called a releaser.

The principle of association is illustrated when a secondary stimulus, which closely precedes a primary stimulus, is associated with the usual response produced by the primary stimulus. This is what Pavlov called "conditioned reflex" (a mistranslation from the original Russian, where it read "conditional reflex" meaning a reflex that appears conditionally) that is, a reflex that had been affected by previous combinations of stimuli (Scott, 1972).

When an animal is exposed to a secondary stimulus with the addition of another stimulus to which it would not respond ordinarily. And the response to the secondary stimulus is thereby reduced this is called **the law of negative association or inhibition**. If an association is formed between a particular secondary stimulus and a primary one, the response will tend to be given to any similar secondary stimulus. This is termed **generalization**. In a situation where the primary stimulus does not in fact occur with such similar secondary stimuli, the generalized response will tend to die out or be extinguished; and the response will be given to only one secondary stimulus. This is called **discrimination** (Scott, 1972).

When an animal is trained to an association between a primary stimulus and a secondary one. And the animal is exposed to the secondary stimulus alone. If the animal's response dropped to zero after a few trials, this is called **the extinction of a response**. However, when such an animal after a long rest from stimulation for several days or weeks respond to the secondary stimulus in the absence of the primary one, this is called **recovery from extinction**. The association of a stimulus with a response is otherwise known as **habit formation**.

Skinner's experiment on the rat shows that the irregularity of success makes

it much more difficult for the rat to discriminate between a situation in which the machine (releasing food) is working and one in which it is not. It follows that partial or irregular success produces much more lasting motivation than uniform success (Scott, 1972).

Escape behaviour (apparently) does not extinguish as easily as ingestive behaviour. In other words, the fear response in animals are extra ordinarily persistent once they are developed.

In conclusion, it should be noted that despite the fact that the general principles apply to all systems of behaviour, the underlying motivation and physiological mechanism may cause profound modification of the results in any practical situation.

## CHAPTER THREE

### OBSERVATION AND DESCRIPTION OF BEHAVIOUR

**METHODS OF OBSERVATION:** - The best way to observe an animal is to get into a position where they are not disturbed by your own behaviour. At times, this can be done from a high hide (or blind) but it is even better if the animals become accustomed to and no longer react fearfully to your presence.

The best observational studies are done under natural or semi-natural conditions, using short-sample techniques. These may be used to study the daily round, seasonal cycle, and individual development of behaviour. The observer should endeavour to put down everything that the animals do. It is also good to take note of the weather conditions. And of course one should note down the place, the date, and the time (Scott, 1972). An observer has the choice of using portable tape recorder for note taking. This is advantageous in that he does not have to take his sight off the animals and there is less chance of catching a mistake in recording, and the data must effectively be transcribed. However, the sound of the observer's voice may disturb the animals unless he uses a sound-absorbent mask (Scott, 1972).

As one watches, many ideas and possible interpretations of the behaviour that comes to mind should be noted. However, this should not be mixed with observed facts. Motion pictures can also be used as a supplementary record. A good camera with a telephoto lens is advisable.

### EXPERIMENTAL ANALYSIS OF BEHAVIOUR

**FIELD EXPERIMENTS:** - Systematic studies of many representative species are required in order to lay a firm foundation for the science of comparative behaviour. Each study of this sort raises exciting questions, which can be answered through experiment.

There are two general methods for studying behaviours- observation and Experiment. The best experiments are done under field conditions with only a slight degree of interference in the activities of the animals,

The usual assumption of an experiment is that there is a cause and effect relationship, and so changing the cause will change the effect. The experiment has to be done a sufficient number of times (repeatedly) to ensure that the results do not occur by chance. For an experiment to be repeated in the field it is absolutely necessary to tag (mark) or identify animals in some way (Scott, 1972). Before this could be done the animal has to be captured.

**LABORATORY EXPERIMENTS:** Since laboratory experiments are always under close monitoring there is opportunity of greater accuracy. This is due to the fact that a laboratory experiment is devoid of all sort of interruptions, environmental interference and loss of experimental animal due to predation. Neither observation nor experiment provides all the answers by itself. The observer collects basic facts which suggest theories and explanations, which can be tested by the experimenter. Their combined efforts may result in more refined theories and more accurate facts (Scott, 1972).

## **HEREDITY AND BEHAVIOUR**

Under carefully controlled environmental conditions some behaviour traits segregate in accordance with the mendelian laws of heredity. However, even under these conditions there is considerable environmental variability (Scott, 1972).

Most traits are affected by more than one hereditary factors or gene. Heredity does not destroy an animal's capacity for variability of behaviour. However, it may hinder its ability for successful adaptation. Animals have the ability to combine their native capacities in various ways to meet complex problems (Scott, 1972).

Heredity affects behaviour in many ways. One of the most important ways by which it affects behaviour is by increasing or decreasing the ease with which an animal can be stimulated or motivated. This in turn has great effect on the ease with which an animal can learn (Scott, 1972).

Heredity can produce important effects on behaviour by modifying the growth and development of various parts of the body, but anatomy may not be the only hereditary determinant of behaviour. Heredity can also modify other physiological processes such as production of hormones, which affects behaviour and the physiological processes that occur in the nervous system itself (Scott, 1972).

## **THE ORGANIZATION OF BEHAVIOUR**

**TESTING "INTELLIGENCE" IN ANIMALS:** In the broadest sense, the concept of intelligence may be defined as the organization of behaviour. Therefore, to study intelligence, one has to find out how behaviour is organized in a particular animal species or a group of species (table 1). The most general method is to present the animal with a situation that requires adaptation and see how it performs. These can be done under natural conditions. The kinds of apparatus that can be used are only limited by the ingenuity of the experimenter (Scott, 1972).

In order to arrive at meaningful information about the organization of

behaviour, the following conditions must be met (Scott, 1972)

- (1) The problem must be one which is suited to the sensory and motor capacities of the individual e.g. manipulation tests are appropriate for primates, raccoons, but highly inappropriate for hoofed animals
- (2) The animal must be motivated in some way to perform the task
- (3) The animal must be confident and secure in the situation in that emotional reactions, particularly those of fear, can easily disrupt adequate behaviour.
- (4) Many species are capable of solving highly complex problems by the use of stereotyped behaviour patterns. The way in which such complex behaviour is organized can only be determined by experiments in which heredity and previous experience are systematically varied and controlled.

**Table 1:** The Organization of behaviour

Level of organization	Unit	Effect of behaviour
Ecological	Population	Localization, Territoriality, etc
Social	Society	Socialization, Dominance, Leadership, etc
Organismic (Psychosocial)	Individual	Behavioural adaptation, learning, psychological organization and intelligence
Physiological	Organ system	Internal changes, physiological adaptation
	Organ	Sensory and motor capacities
	Cell	Transmission of stimuli, motion
Genetic	Gene	Primary stimuli and responses, trait complexes

Source: Scott, 1972.

## CHAPTER FOUR

### AGGRESSION

This takes a variety of forms from a brief exchange of signals, through intense, injurious encounters between two individuals to large scale fighting and mass killing. Actual fighting is just one of the number of ways through which animals resolves conflicting interest.

Animal hostilities could be divided loosely into encounter over resources and combat over outcomes. In the first case two males may struggle over mating with available females while in the second case a predator is successful if it catches and kills a prey and the prey benefits if it escapes. The fitness of both parties (that is there chances of surviving and reproducing) is dependent critically on how these conflicts are settled. This brought about the evolution of ways of increasing their chances of benefiting after the conflict. Where struggle is over limited resources, the participants (using the same resource, say food or shelter but otherwise not interacting) may actively appropriate available resource by becoming more efficient at locating and exploiting it; this is termed **non-aggressive scramble competition** (exploitation competition) (Huntingford, & Turner, 1987). This is different from interference competition where one form hampers another form by poisoning, attacking, or killing and eating the competitor. Territoriality is a common expression of interference.

Alternatively, competition may be avoided through mutual avoidance, either in space or in time. If two troops of green monkeys meet, they both change directions and move away from each other. Small species of humming bird are able to exploit good food patches by feeding at dawn and dusk when larger competitors are not foraging. This is termed **non-competitive feeding strategy**.

Aggression generally refers to a situation where physical coercion is used in response to a conflict. The diagnostic criterion mostly adopted for aggression is immediate consequence of the behaviour (the delivery of potentially harmful stimuli to another animal). The injurious stimuli may take the form of direct physical damage, but may include the delivery of aggressive threat displays. The initiation of an attack is different from protection against such offence – defence (behaving differently, retreating, showing submissive posture, keeping a low profile and trying to escape). It is difficult to draw a line of demarcation at any point of the continuum from attack through offensive and defensive threat and submission to escape; yet it seems an abuse of language to include escape under aggression. Therefore, this word is

often replaced by the term Agonistic behaviour, which refers to system of behaviour patterns having the common function of adaptation to situations involving physical conflict (Huntingford and Turner, 1987)

Aggression is basically an innate adaptive mechanism in animals. Learning is no prerequisite for it, although it probably has an influence on the intensity and detailed expression of aggressiveness.

## FIGHTING BEHAVIOUR IN ANIMALS

Fighting between members of the same species is almost universal among vertebrates. And most of the intraspecific fights occur in the breeding season, and is therefore called reproductive fighting. However, some fighting has to do with dominance relationships in the groups and it's not linked with the breeding season.

Different species fight in different ways. Firstly, the weapons used differ. Secondly, it is relatively rare to see two animals engaged actually in 'mortal fight' and wounding each other. Such fights, in fact, are often highly ritualized and more nearly resemble a tournament than a mortal struggle. If fighting were to lead to death or serious injury to the loser, fighting would have grave disadvantages for the species. Most fights take the form of 'bluff' or threat. The effect of which is much the same as that of actual fight: it tends to space individuals out in that they mutually repel each other. Not all threat is visual. Many mammals deposit 'scent signals' at places where they meet or expect rivals. Sound may also have a threat function. Reproductive fighting is always aimed at a special category of individuals.

## FUNCTIONS OF FIGHTING IN ANIMALS

It serves the function of 'spacing out' the individuals or groups in the area they occupy. This creating reserves out of the available space for them. The fighting of an individual is usually restricted to a limited area – **territory**. In most species the defended area is stationary e.g. Bitterling males defend an area around a freshwater mussel defends an area against other males. In ground – breeding birds such as gulls, terns and lapwings spacing out appears to be part of the defence of the brood against predators. Fighting in short, secures for each the minimum territory required to support its existence, prevents overcrowding and promotes the distribution of the species.

Fighting also arises from competition for mates, and thus serves to select the stronger and fitter individuals for propagation of the species. In other words it assists in pair formation and safe (more successful) breeding. It reduces disturbance

and also ensures adequate supply of food for young. Territorial behaviour/defence may regulate population. However, it should be noted that size of territories are modified by birds in relations to food supply.

## TERRITORIES

All wild animals at some point during their life cycle, exhibit a fixation for a territory (an area which contains all the immediate necessities for existence). There seems to be inverse relationship between sizes of territories and availability of resources. Among migratory birds, individuals have a strong attachment for their natal territories, returning every year to breed in the same areas (territorial homing tendency).

Most animals spend most of their lives in a given area (**home range**) but this is not synonymous with the term territory. The basic difference between a home range and a territory is that the home range is not defended against intruders of the same species while a territory is. This is because the home ranges of several individuals or group of the same species may overlap.

## SOCIAL HIERARCHIES

The **Peck – Order**: Animal species living in groups sometimes fight over other issues apart from females and territories. Individuals may clash over food, favourite perch, or possibly for other reasons. In such cases learning often reduces the amount of fight. Each individual learns by bitter or pleasant experience, which of its companions are stronger and must be avoided, and which are weaker and can be intimidated. In this way the 'peck-order' originates, where each individual in the group knows its own rank.

The status of an animal on the 'peck-order' may depend on age, size and fitness, sex, rank of mate and reproductive state. The peck-order in birds such as hens or pigeons is linear. This means that there is a dominant bird A which can peck any other without being pecked, B which can peck all but A, C which can peck all but A and B till the end of the order. Such a system ensures that in times of hardship the strongest members of the group are the first to have access to food. An individual soon learns its position in such a hierarchy through fighting or trials of strength, but once determined the situation is usually accepted and so there is less aggression (Neal and Neal, 1978). In mammals the relationships are seldomly linear but there are often dominant males or females as the case may be.

## PREDATION

This is the phenomenon by which one animal feeds on another animal after catching and/or killing it. The animal that feeds on another is the predator while the animal consumed is the prey. A relationship is thus established in a community between these groups of animals. It is estimated that lions (*Panthera leo*), for instance removes about 8 percent of game animals annually in the East African national parks (Ewusie, 1980).

Predators are aided in their mode of life by the high development of their senses and their organs for catching and holding prey species. Predator birds like Owls or Eagles have hooked beaks and acute eyesight. The prey species have also evolved methods of escaping being preyed upon. Like predators some of them have sharp eyes and acute sense of smell, but often they are adapted to high speeds in running, flying or swimming (Ewusie, 1980).

A predator that exclusively searches for a rare species could easily starve. Therefore predators prey on relatively abundant species, and switch to other species when the original prey becomes rare or an alternative prey species becomes more abundant. This phenomenon is called '**predator switching**'. In vertebrates the underlying mechanism of predator switching is the formation of a 'search image'. For predators, search images develop when an important item becomes common enough to deserve attention. Further, images fade when the item becomes so scarce that the cost of searching for it outweighs the benefit.

Generally, predators live on the annual surplus produced by prey species. These influence seldomly causes serious reduction in succeeding breeding populations. No predator except man is capable of exterminating a prey species. Herbivorous animal populations tend to increase in number toward self destruction (when it exceeds carrying capacity). This enhances prey availability to predators. Thus the populations of the predators also swell. The predators continue to prey on the herbivores. When the populations of herbivores decline significantly due to increased predation, prey species are harder to obtain. This results in a collapse of predator populations (a natural chance for the herbivorous populations to grow). This natural relationship between the prey species and predators is termed "**prey – predator relationship**".

## FOOD AND FEEDING HABIT

What an animal depends on for nourishment is its food. How the animal obtains it and the methods of handling it constitute the feeding habit. Animals that

feed exclusively on plants are herbivores. Those feeding on animals alone are carnivores while those subsisting on both plants and animals are omnivores. The study of the food and feeding habit of animals is more or less the feeding ecology of wild species. This involves studying

- (1) Habitat of animals
- (2) Habitat composition (in terms of food, water, cover, salt lick, etc)
- (3) Quantity of these resources with time. This may be done using a range of sampling techniques which reveals information like percentage species composition; relative densities; dominance; spatial distribution; productivity, and percentage utilization of species;
- (4) Time sequence – this entails answering the following questions:
  - (i) How many times/day does the animal come to the feeding area?
  - (ii) What does the animal take?
  - (iii) When does it feed?
  - (iv) How many bite does it make/time?
  - (v) What part of the item does it take?
  - (vi) How does the animal obtain/handle the food?

## CHAPTER FIVE

### SOCIAL BEHAVIOUR IN ANIMALS

Behaviour in simple terms is a movement in response to a stimulus. Learning is the capacity of an organism to change its behaviour pattern as a result of experience. The study of social behaviour therefore means to investigate cooperation between two or more individual animals. This cooperation obviously serves some end. Relationship may be between animals of the same species or of different species. All animals are known to be social. Even solitary species are interested in their neighbours, if only to be able to avoid them, and at sometime in life a solitary animal must relate with another for the continuity of the species through reproduction.

Group size varies among species of animals. It has been observed that in many species group size varies with food supply or intensity of predation.

#### MERITS OF GROUP BEHAVIOUR

- (1) Detection of predator – Group living is of great importance in the detection of predators. As so many individuals are involved in scanning the environment in all possible direction there is immense probability that any predator around would be discovered. Then such information when passed to other members of the herd facilitates coordinated escape. This is termed '**selfish herd**' effect. Mixed species group minimizes food competition while maintaining antipredator advantages. Impala (*Aepyceros melampus*) and Olive baboon (*Papio anubis*). Impala has good ability to detect scent/smell in addition to good ears while baboon has good eyesight.
- (2) Defence against predators – Animals, especially young ones, within social groups have lower probability of being preyed upon by predators even when cornered by predators.
- (3) Social facilitation or sympathetic induction — This is a situation where an animal is influenced into doing an act just by others doing it (activities like sleeping, walking, alarm, etc). This synchronizes the activities of the members of a group such as to prevent them from scattering in the pursuit of diverse functions.
- (4) Huddling reduces the rate at which animals lose water or warmth. Procurement of food – there is vast opportunities of obtaining food. Again group life increases the effective availability of prey. For instance group foraging may flush more insects per bird than solitary foraging. Group living

may also increase area monitored for food and the ability to defend the feeding area or even catch

- (6) It prevents overlap in foraging areas
- (7) Contrary to the idea that food sizes should decrease with decreasing predator size (though there are exceptions) group size heightens the size of prey that can be captured
- (8) Locomotion – moving in groups may reduce cost of locomotion. This may be due to reduced resistance in the medium where movement is done. An example is the v-shaped movement in cattle egret (*Bubulcus ibis*). Another method is a situation where animals take turns in leading the group.
- (9) It facilitates the production of healthy offsprings.
- (10) Living in groups, especially amongst higher vertebrates, facilitates the passage of experiences and inventions of individuals to other members.

#### DEMERITS OF GROUP BEHAVIOUR

- (1) Being in a group, thus means that there is potential competition for food. This is severe in carnivores.
- (2) Within a group it may be easier for a few individuals to monopolize opportunities for breeding. In many species competition among adult males result in a dominance hierarchy among the males.
- (3) Females too may compete with one another for opportunities to reproduce as in the wild dogs
- (4) In gregarious birds where subordinates are distributed at the periphery of the group, the subordinates interrupt their feeding activities in search of predators.
- (5) Reduced fertility – one result of population density is reduced fertility, for instance, flower beetles (*Tribolium confusum*) eat their eggs when the population density is too high. In mammals over population results in a kind of stress which eventually leads to a population crash long before there is a food shortage (Eibl – Eibesfeldt, 1970).

#### SOCIAL STRUCTURE AMONG LARGE ANIMALS

There is a great variation in the social life of species of large mammals. In spite of the great variation in social relationships between species of large mammals there are obvious patterns in their social life. Species may be territorial or not, solitary or gregarious. If an animal species congregate in groups, this may be small

or large, contain one or both sexes, and include all or certain age groups. Association between the sexes may be short lived or permanent, monogamous, mixed or polygamous. All these attributes make up a behavioural pattern referred to as social structure. Categorizations of the social structure observed in large African mammals are as follows -

#### **FAMILIES:**

- (1) **Extended Families:** - A small group of individuals closely related at the parent/child/sibling/cousin level and consisting of more than one adult of each sex.
  - a) **Matriarchal** - This refers to a situation where a few closely related females form the core of a group in which leadership is vested in a dominant female. For instance, the oldest female dominates the group in the Elephant (*Loxodonta africana*) family. Males form bachelor groups with loose social ties in Elephants while that in Lion (*Panthera pardus*) are very cohesive. Males form long term association with females in lions while this is not the case in Elephants. Young males leave family at maturity but females sometimes (Lions) or always (Elephants) remain
  - b) **Patriarchal** - Leadership is provided by a dominant male as in Gorilla (*Gorilla gorilla*). Socialize together without hostility. Offsprings usually leave family sometime after maturity.
- (2) **Harem Family:** - This is a long-term association between an adult male and the same group of females from whom it excludes other males (as in Zebra) females form a strong social unit. Offsprings remain with family until they attain maturity. Excess males form bachelor groups. The size of the family is dependent on the level of predation.
- (3) **Pair Family:** - There is absence of marked sexual dimorphism. Within a pair (a male and a female) there exist a strong bond that last for many years at least. Male and female cooperate in rearing the young, which remain with the family until it reaches maturity. There is prolonged period of sexual immaturity in this forms of socialization. Older offsprings frequently help in the rearing of their siblings. All animals in this category are most likely territorial in nature. Examples of animals having this type of social structure include Oribi (*Ourebia ourebi*), side striped jackal (*Canis adustus*) and many duikers.

## PACKS AND HERDS

There are so many variations of packs and herds but the two terms may be used to describe any more or less permanent association of animals of the same species containing males, females and young of all ages.

### (a) Mixed sexes

(i) Herds – These contains herbivorous animals of all ages, and both sexes associate in consistent, cohesive groups with well-developed hierarchical order.

They are non-territorial in nature. Some (mostly aged) males form bachelor groups as in Buffalo (*Syncerus caffer*).

(ii) Packs – This refers to carnivorous animals formed into groups capable of overcoming large prey. Animals in this category may be territorial like the striped hyaena (*Hyaena hyaena*) or not as in hunting dog (*Lycaon pictus*). Group members cooperate with themselves, and intricate greeting rituals exist among them

### (b) Single Sex – This includes nursery herd, bachelor group and territorial male.

There is a wide variation between species in the size and firmness of groups.

## SOLITARY INDIVIDUALS

This occurs in solitary species where member of both sexes adopt lonely life coming together only for mating purposes. Association for long periods usually only exists between mothers and young. Animals in this category may or may not defend territories. Examples in this category include *Tragelaphus scriptus* (bushbuck), *Panthera pardus* (Leopard), *Acinonyx jubatus* (Cheetah) and *Diceros bicornis* (black rhinoceros). Solitary species are usually aggressive in nature.

## COURTSHIP

Social behaviour is the study of cooperation between two or more individual animals. It is assumed that this cooperation serves some end. One of such acts of cooperation is the phenomenon courtship. This simply refers to all activities, display, communication that facilitates copulation between animals. Sometimes it involves preparation of ground for offsprings.

Courtship commonly involve conspicuous dancing display or posturing by males, and sometimes females. Other activities between mates such as nesting, pairing and greeting ceremonies may also be considered as part of courtship since they facilitate mating. In some cases mutual stimulation is a prerequisite, and the male and female perform identical role, while in other cases, one partner must

stimulate manoeuvre, or appease the other partner.

Every successful courtship ends up in mating. And for mating to take place the following conditions have to be met.

**Synchronization** – mating behaviour in all animals except man and, perhaps some of the apes, consist of immediate reactions to internal and external stimuli. Synchronization involves the timely release of the male and female gametes in response to appropriate stimuli. For instance Oysters (*Ostrea edulis*) semen containing large number of sperms at certain time of the year. For attainment of copulation there is the need for simultaneous readiness of the male and female reproductive organs as well as adequate response by the respective sexes to the initial and successive stimuli along the courtship process.

**Persuasion and Appeasement:** Persuasion refers to all stimuli directed towards stimulating the other individual to courtship while appeasement stimuli are made to avoid the natural aggressiveness in body contacts.

**Orientation:** In courtship the stance of each of the sexes differs from species to species. And this is very important in attraction and copulation. There are postures taken to attract a mate by specific species of animals. At copulation the male and female assume certain postures without which the male organ and or semen may not enter the female organ or come into contact with the female sexual product (egg).

The above conditions ensure reproductive isolation. Species do not ordinarily interbreed due to the fact that the various signals serving attraction, persuasion, appeasement and synchronization, are very different from one species to another. Furthermore, the tendency to react to such signals is specific, every animal is innately equipped with the tendency both to give and to react only to the signals of its own species.

It can be generalized (except perhaps in the highest mammals) that all signaling behaviour is immediate reaction to internal and external stimuli. In this respect there is a world of difference between animals and man. The signaling behaviour of animals can be compared with the crying of the human baby, or with involuntary expressions of anger or fear in humans of all ages. We are aware that such 'emotional language' in man is different from deliberate speech. The 'language' of animals is of the level of our 'emotional language'. Isolated individuals (of animals) still perform as others.

## FUNCTIONS OF COURTSHIP

- (1) It brings two partners together.
- (2) It synchronizes the activities of mates.
- (3) It overcomes reluctance against body contact.
- (4) It prevents interspecific mating.
- (5) It appeases the male aggressiveness.
- (6) It facilitates reproduction (through successful mating) while avoiding waste of energy in seminal release at times outside mating period/season.
- (7) It overcomes the problem of interference in gregarious species.

## ANIMAL COMMUNICATION

Communication among animals is the activity or process of expressing ideas and feelings or of giving information to other animals. This is done through various means such as vibration of body parts, wing buzzing, pounding of chest, hitting/ beating of objects with body parts, stare, baring of teeth, flicking of feathers, spreading of wings, raising of body features (crest, fold, hairs or mane, tails and head), dance (waggle dance in bees), presentation of posterior end (genitals), odours/excretions, marks, calls/sounds and various postures. The information passed from one or more individuals to others include location of food, warning against predator(s), readiness for contact, distress, call for care/attention, identification of poisonous substances and threat.

A courting bird makes a perceptible display. It opens out its feathers, adopts specific postures, sings, and frequently offers the female food or other items. One dog greets another, wagging its tail, or growls and bares its teeth at a stranger. A threatening cat humps its back and hisses but purrs (makes a low continuous sound) when in a friendly mood. Behaviour patterns of this kind have communication functions, and their effectiveness is often enhanced by visible, morphological features (feathers, mane, etc) (Eibl-Eibesfeldt, 1970).

A wide variety of signals are employed by different species to distinguish mates, offspring and in the case of social animals the lower - or higher – ranking individuals. In some animals special secretions or scents are used to impart a personal odour to part of the environment or to other members in the group. This scent marking has communicative functions in that a scent contained in the urine identifies the animal and announces its presence to prospective intruders of the same species. The higher the social relationship of an animal, the more the utilization

of the systems in the establishment and maintenance of individual relationships. Signals serve to coordinate the movement of flock members and also may warn of approaching danger/predators.

In the group living species (contact species) where individuals are well acquainted with each other, touching the body serves greeting function. Grooming behaviour patterns clearly indicates readiness for social contact, and this frequently culminates in greeting ceremonies. For instance chimpanzees (*Pan troglodytes*) also shake hands like man and they bow when greeting others (Eibl – Eibesfeldt, 1970). Animals within a group frequently maintain vocal contact. These calls, which serve to maintain cohesion of groups, are called **contact calls**. Many animals learn to recognize the call of their partner individually.

Animals have evolved numerous alarming calls to alert the conspecifics about the presence of a predator. Gregarious aquatic animals warn conspecifics by the release of chemical substances serving the function of alarm.

Female dogs in oestrus apparently secrete a substance (pheromones) that attracts males from miles around. Male fireflies use flashing light to attract females.

An intruder or loser of a fight appeases the owner of a territory or the victor respectively by assuming submissive postures that are usually the opposite of threat. Animals that behave submissively are permitted to come closer to conspecifics than those who show a threat/aggressive posture. Some vocalizations have appeasing effects such as the muttering calls of polecats and the squealing of young rats. When a rat bites another too hard during play, the later will squeal upon which the former will gently groom its fur (Eibl – Eibesfeldt, 1970).

## GLOSSARY

- Anthropomorphism** – is interpreting animals' behaviour in terms of human behaviour. In psychological terms it is related to the human mental process of projection. The human observer sees the animal as a human being and finds his own motives reflected in the animal's actions. This is not necessarily false, but it should be noted that it is only an hypothesis, and every scientist must consider the alternative possibility, that the animal may be responding in ways which are entirely its own.
- Appetitive behaviour** – the specific search for a releasing situation. This refers to actions taking to elicit a particular response.
- Behaviour** – is the overt expression of the coordinated life processes of the animal.
- Circadian rhythms (literally means "about a day")** – is the biological clocks of animal activities.
- Community** - This refers to collections of species occurring in a common habitat or environment and interacting as a society. Some communities are identified by the form of the environment or habitat in which they occur (Rock pools, Lakes etc). Other communities are recognised by the dominant species in the association. There is no fixed size for a community.
- Conditioning** - type of learning where the animal associates a response with a certain stimulus as a result of reinforcement, which is the practice of rewarding or punishing an animal when it responds successfully or unsuccessfully respectively.
- Contact calls** – these are calls, which serve to maintain cohesion within groups.
- Displacement activities** – when there is conflict between two or more strong behavioral tendencies (attack or flight in the face of opponent, threaten or court an individual), an animal may do neither of them. Instead it takes a third, seemingly irrelevant option. The aggression is redirected at an insignificant object nearby or the animal may suddenly start to preen its feathers. This is termed displacement activity. It may also mean doing with another object or demonstrating as would be done with the opponent 'if it only dared': threat.
- Ethogram (Action Systems)** – this is the precise catalogue of all the behaviour patterns of an animal. To have this catalogue functional units of behaviour (that are neither too small nor too large).
- Expressive movements** – these are behaviour patterns that have become differentiated into signals.

- Gynandromorph** – an animal whose body is part male and part female in appearance. Sometimes the front half may be male and the back (rear) half including the sex organs, may be female. The behaviour, however, goes according to the head end, despite a completely inappropriate set of sex organs in the rear.
- Habituation** - the means by which an animal learns to ignore certain stimuli important in its life.
- Home range** – Ground over which an organism travels to obtain its food.
- Imprinting (Socializing)** – permanent associations formed early in life.
- Insight learning (Reasoning)** – it is the ability (of an animal) to respond correctly the first time it encounters a certain situation. It enables an animal to solve a new problem without trial and error.
- Intelligence** – is the ability of an animal to learn to adjust successfully to certain situations. It is sometimes defined as the organization of behaviour (the ability to learn from experience and to solve problems). Ranking of intelligence in descending order is Primates, Carnivores and Ungulates.
- Intention movement** – Social animals are sensitive, to even the slightest signs, to movements of very low intensity. These low intensity movements, such as passive, incipient walking or jumping, are termed intention movements. Many social signals are derived from such intention movement.
- Intraspecific threat signals** – are all those behavioural and morphological characteristics that serve to reject conspecifics.
- Iteroparous** – (Birds and Mammals) reproduce on two or more occasions in their lives.
- Learning** – this is used as a matter of convenience to describe a widespread phenomenon in animal behaviour: that when an animal is placed in the same situation and stimulated, its later behaviour is affected by what has happened before.
- Localization** – this may be defined as the behaviour process where an animal becomes attached to a particular spot on the earth's surface.
- Motivation (drives or tendencies to respond in a particular manner)** – this is the internal state of an animal that causes immediate behavioural response. The hypothalamus is the part of the CNS which controls many types of behaviour. Apparently, both inhibitory and stimulatory centers are located in this gland and function in behavioural control. Endocrine gland secretions are also involved in certain behavioural responses, especially sexual

activities. Stimuli that are effective in triggering a certain behavioural response are called releasing stimuli.

**Pheromones** – are ecto-hormones (chemical messengers acting outside the body). When they produce physiological effects in the same manner as internal hormones they are called primers. Those inducing physical behavioural response/effect are classified as primary stimuli or releasers.

**Primers** – see pheromones.

**Ritualization** – whenever it is advantageous for the incidental behaviour of an animal to be understood by another, selection operates to transform the behaviour pattern in question into a conspicuous signal. This modification of a behaviour pattern is called ritualization. In other words it is the process by which a once adaptive behaviour is reduced to having a signaling function. In other words – this refers to the evolutionary process whereby a behaviour pattern becomes increasingly effective as a signal. The process generally starts when some movement, some anatomical feature or some physiological trait that is functional in quite another context acquires a secondary value as a signal.

**Sociobiology** – Loose or changing association or a tight family unit: An animal has to relate and like with other animals around it. The study of the origins and the basis (biological) for such social behaviour is called sociobiology.

**Semelparous** – reproduce only once in their lives

**Submissive gesture** – this is the appeasement gesture made by the loser of a fight to appease the victor.

**Territory** – an area that contains all the immediate necessities of life that is defended by the animal.

**Trial and Error** – this is an extension of conditioning. It occurs when an association is built-up between a certain action and a reward or punishment.

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