COURTSHIP BEHAVIOUR:

Courtship can be defined as the behavior used to obtain copulation with a partner, or to maintain reproductive interactions with an existing partner.

From the shimmering tail of the peacock to the chorus of frog song during the mating season, many examples exist, including the extremely elaborate bowers created by male bowerbirds and the acrobatic dance routines performed by tropical birds such as manakins.

Courtship displays are particular behavioral patterns that reappear within an individual animal in the reproductive context, with different individuals of the same species exhibiting similar behavior.

It is clear that such behavior is a central part of animal communication. Courtship is usually a complex trait with multiple components, often spanning different sensory modalities and including motor behavior as well as acoustic, visual, olfactory, and/or tactile components.

MECHANISM OF COURTSHIP:

Courtship fulfils 4 major functions. They are;

1. Mate finding,
2. Persuation,
3. Synchronization,
4. Reproductive isolation.

MATE FINDING:

For sexually reproducing animals, the location of suitable mate is necessary for their survival. Recognition of receptive partner is the first link in the chain of events leading to fertilization.

PERSUATION:

In some animals mating immediately happens when female and male meet. In few species, male is more ready than the female. After recognition of potent mate, the next barrier for male is to bring the female into close proximity which happens either by physical dance performance, singing, stunt performance etc. which is termed as persuation.

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SYNCHRONIZATION:

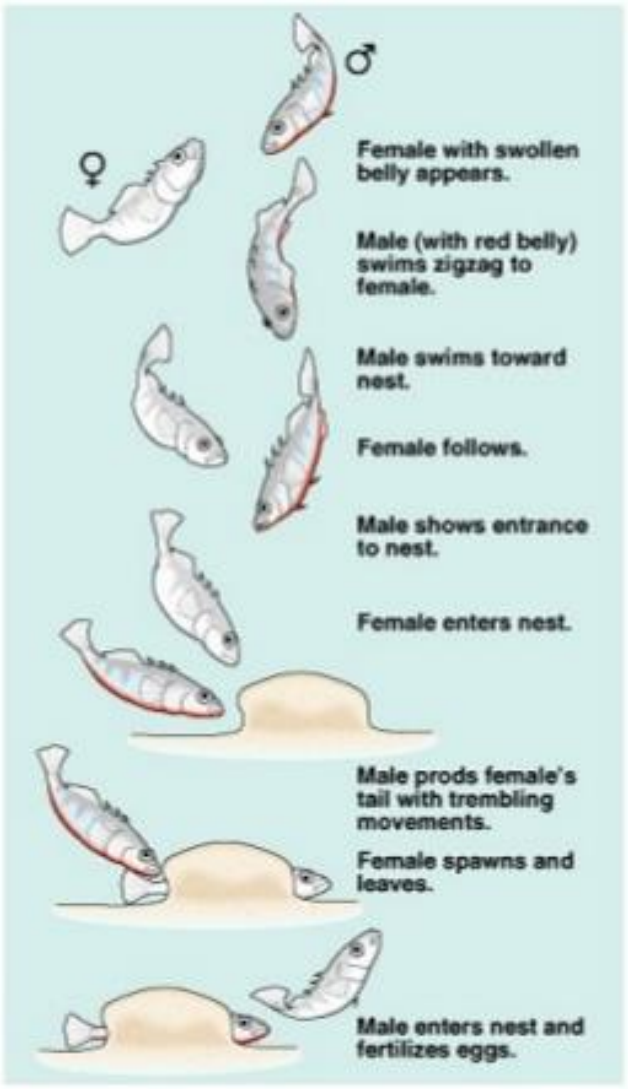
The occurrence of same behaviour in different individuals (males and females) at the same time is called synchronization.

REPRODUCTIVE ISOLATION:

The role of courtship ensures that animal mate only with a member of their own species which is called reproductive isolation.

COURTSHIP BEHAVIOUR IN 3-SPINED STICKLEBACK FISH:

- Three-spined stickleback fish (***Gasterosteus aculeatus***) is found in ponds and rivers of Europe.

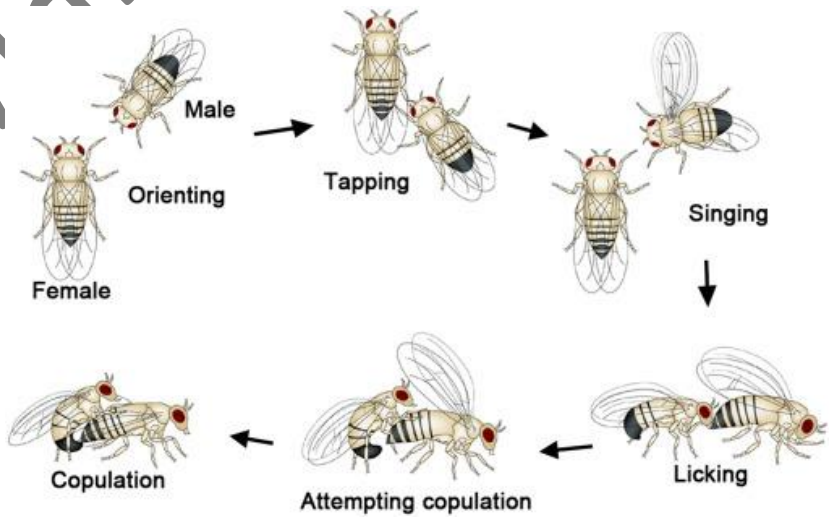


- Male is bluish-black in colour with bright red belly while female is silvery in colour.

- Male finds a place in sandy bottom where there are weeds.
- Male builds a tunnel-like nest in sand among weeds and defends territory around the nest.
- Then male swims near the surface over the nest to invite females.
- Other males are attacked and chased away aggressively.
- Male swims upward from below and stabs the female from below with his dorsal spine.
- When response of female is positive both of them swim in zig-zag fashion towards the nest.
- If female likes the nest it enters inside and male follows.
- Male places his head against the tail fin of female and quivers, which provokes the female to release eggs.
- Male then deposits his sperms over the eggs and female is chased away.
- Male then swims again to the surface to solicit another female.
- Up to 5 females can be made to lay eggs in his nest by the male.
- Male then guards the eggs and oxygenates them by fanning with fins till they hatch.

COURTSHIP BEHAVIOUR IN DROSOPHILA:

- Male and female come together within 2 mm of each other and then male circles around her.
- Female is discriminatory and wrongly approaching males are kicked off.
- Male vibrates one wing during circling which stimulates the female.
- Vibration of the wing produces sound as well as air current which act on the antenna of female.
- This is followed by touching with front tarsi and genitalia licking.
- Mating occurs after about 3 minutes by male mounting the female.
- Often mounting occurs but mating is unsuccessful. Courtship of wingless male is not accepted by female.



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MIMICRY

Mimicry, in biology, phenomenon **characterized by the superficial resemblance of two or more organisms that are not closely related taxonomically.** This resemblance confers an advantage—such as protection from predation—upon one or both organisms by which the organisms deceive the animate agent of natural selection.

When a perfectly harmless animal resembles in its colour and shape, with a well-protected species, the phenomenon is called mimicry. It occurs when one species resembles another for its own benefit.

The concept of mimicry was first given by H.W. Bates in 1862. Usually, those species are mimicked which are poisonous or distasteful and have a few natural enemies. Mimicry is widespread particularly among butterflies and moths. It is also found in various birds and some mammals.

TYPES OF MIMICRY:

1) Protective mimicry
2) Aggressive mimicry
3) Batesian mimicry
4) Mullerian mimicry
5) Automimicry
6) Other types of mimicry

PROTECTIVE MIMICRY:

- When the mimicry provide protection to the mimic, it is called protective mimicry.
- It involves Concealing and Warning mimicry.
- In **Concealing mimicry,** the organisms either search a background that matches their colour or change their colouration to fit the background. Example- walking stick insect, *phyllium*, leaf fishes etc.
- In **Warning mimicry,** harmless and non-poisonous organisms resemble itself to forms which are distasteful or poisonous. Example- poisonous coral snake is mimicked by non-poisonous Scarlet king snake

AGGRESSIVE MIMICRY:

— It is shown by certain carnivorous forms.

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— In Aggressive mimicry, a predator or parasitic species resembles other non-threatening species or object in order to gain the access to pray or host.

— Example- The sea dragon- Phyllopteryx, Spiders, fire flies etc.

BATESIAN MIMICRY:

— It is form of protective mimicry in which a species that is edible or harmless closely resembles an inedible or harmful species and therefore is avoided by predators.

— Example- Monarch butterfly and Viceroy butterfly. The Monarch butterfly is inedible and viceroy butterfly is edible.

MULLERIAN MIMICRY:

— Mullerian mimicry occurs when two or more distasteful or poisonous organisms resemble each other.

— Mullerian mimicry was discovered by Fritz Muller.

— Example-Cuckoo bee and yellow jacket wasp

— This mimicry is used by the yellow jacket wasp to enter honey bee colony and feed on honey as yellow jacket wasp resembles honey bee.

AUTO-MIMICRY:

— Automimicry or intraspecific mimicry occurs within a single species, where an animal mimics parts of its own body.

— Example-

i. Several **pygmy owls** bear **'False eyes'** on the back of their head to fool predators into believing the owl is alert to their presence.

ii. Some butterflies e.g. **Common tit** has a **'false head'** which misdirect predators.

OTHER TYPES OF MIMICRY:

a) **Sexual mimicry:** when male or female of a species mimics the other sex, it is known as sexual mimicry. Example- In European yellow tailed moth, the male mimic the females to gain protection from predators.

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b) **Conscious mimicry:** when an animal behaves as if they are dead when in danger is known as Conscious mimicry. Example- The American Opossum- Didelphus, when attacked by enemy poses as they're dead.

c) **Egg mimicry:** when eggs of a bird are similar in size, colour and appearance to other birds is known as Egg mimicry. Example- Egg of Cuckoo is closely resemble to egg of Crow.

CAUSES OF MIMICRY:

1. **Natural selection:** According to Weismann, the natural selection is the only known factor in the production of mimicry.
2. Sharp sudden mutation and its preservation by natural selection.
3. Due to the direct action occurred upon the organism by food, moisture, cold etc.
4. Due to physiological response, such as colour sensation.

SIGNIFICANCE OF MIMICRY:

- The main significance of mimicry is to protect the animals against enemies.
- Mimicry used for self-defence which increases the survival value of organisms.

ALTRUISM:

Altruism can be described precisely as an interaction between the animals in which an individual benefits other at a cost to itself. It can also be defined as sacrifices of owns wellbeing for benefit of others.

For an altruistic act to be performed there should be at least two individuals, one who performs the altruistic act and another who receives the benefit.

There are some ethologists who describe mutual relationship as the altruistic behavior, but these two are clear apart from each other in principles. **The mutualism is intended for self-profit itself whereas the altruism is highly intensified for benefit of other at a cost to self.**

Altruism is rarely seen in nature. There is no such altruism exist which doesn't acquire a bit of selfishness. The pure altruism is rarer than that of altruism itself.

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TYPES OF ALTRUISM:

As altruism involves interaction of two or more than two animals so it can be **inter-species or Intra species.** When we talk about Inter species altruism there a concept of social organization of both species because social behavior itself involves the altruistic behavior of an individual and when we elaborate the Intra species altruism we must tell that where they live and how they have relationship with each other.

The altruistic behavior in animals can be of three types, namely:

- Intra species altruism,
- Inter species altruism,
- Reciprocal altruism.

INTRA SPECIES ALTRUISM:

- This type of altruistic behavior of animals involves only a single species.
- The altruist who performs the altruistic behavior and the receiver, who receives the benefits, should be of same species.
- It can be seen in the animals that live in group like wild water buffalo who live together for searching food and water.
- While these buffalos are grazing together and then if a tiger or a lion attack on any one of them, then the some of them who are powerful an already have an encounter like this in their group, moves to help that one.
- Sometimes they win and sometimes they are unable to save their groupie as this process reduces the chance of survival of that one who had made a move to help that one hence disproves the "Theory of Natural selection given by Darwin".
- This is very well seen in case of social insects like ants and honey bees.
- When the colony or hive is in danger, they don't think to sacrifice their lives for the well-being of society.

INTER SPECIES ALTRUISM:

- As the name reveals it is the interaction between the animals of two completely different species in which an individual of a species is benefited by an individual of another species.
- The earlier encounters of both species are not necessary.
- They may or may not know each other but at the time when anyone of them needs help the other do.

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- Psychologically, the one who helps the member of the other species must be powerful than the predator so that it can save the other individual and itself also.
- Like in case of baboons that helps the other wild animals like Impala, wild dogs, and so many other animals also, always moves in group when they save someone to reduce the chances of being harmed by the predator.

RECIPROCAL ALTRUISM:

- It is the special type of the altruism in which the receiver who had received the benefit, in future returns the benefit to the altruist.
- It may also be defined as the exchange of the benefits between the animals.
- It mostly occurs in the related species of the animals as it is necessary that the recipient and altruist must encounter more than one, only then the returning or exchange of the benefit would become possible.
- For the better exchange of the benefit between receiver and altruist they must have an excellent recognizing ability for each other.
- Being social is necessary for multiple encounters, and multiple encounters between them increase the probability of reciprocity hence altruistic act.
- The reciprocity is similar to mutual type of biological interaction in which two individuals are benefitted by each other.

MECHANISM OF ALTRUISM IN ANIMALS:

1. Direct mechanism
2. Indirect mechanism

The mechanism deals for the causation that how and by which means altruism can occurs among animals. The direct and indirect mechanism account that the altruistic behavior can directly provide benefit to receiver and indirectly also.

DIRECT ALTRUISM:

The direct altruism comprises all the altruistic acts which are directly linked to receiver and the receiver directly gets benefit from the altruist.

More likely it occurs when the no. of receivers is less so that it can directly reach to intended receiver.

Direct altruism includes sacrifice of own food, guarding and protection.

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INDIRECT ALTRUISM:

The indirect altruism consists of set of all the altruistic acts which benefits other but the action is not directly related with altruist and receiver.

Usually in this set of mechanism the no. of receivers is more, that is why the altruistic act is not related to receiver individually.

Indirect altruism includes warning signals, alarm calls etc.

KIN SELECTION:

Kin selection, a type of natural selection that considers the role relatives play when evaluating the genetic fitness of a given individual.

It is based on the concept of inclusive fitness, which is made up of individual survival and reproduction and any impact that an individual has on the survival and reproduction of relatives.

Kin selection occurs when an animal engages in self-sacrificial behaviour that benefits the genetic fitness of its relatives.

British evolutionary biologist **W.D. Hamilton** first proposed the theory in **1963** and noted that it plays a role in the evolution of altruism, cooperation, and sociality; however, **the term kin selection was coined in 1964 by British evolutionary biologist Maynard Smith.**

EXPLAINATION:

- Kin selection theory is also known an **Inclusive Fitness Theory.**
- Kin selection forms the genetic basis of explaining the concept of altruistic behaviour in animals.
- Kin selection speaks about **the genes** that cause an animal to sacrifice its life for the well-being of their society.
- For any animal to sacrifice its own life for well-being of their colony, it should have close **relatedness both physically and genetically.**
- Kin selection is little deviation from Natural selection concept of survival of fittest.
- According to the Inclusive Fitness Theory, the altruistic gene or behaviour will be favored among all.
- According to Hamilton's rule, **Br-C>0** where B is benefit of recipient, C is cost of actor, r is co-efficient of their relatedness.

In social groups and colonies, almost all of them have genetic relatedness with each other. All the animals do possess similar set of genes and alleles.

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When one among them is in trouble or when the entire colony is in trouble, each one in that group will be ready to sacrifice their lives just to maintain physical fitness and integrity of the group.

Similarly, the chances of one group of animals helping the other group is relatively very less as they have very less or no genetic relatedness among them. This forms the basis of kin selection among animals.

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