CHAPTER 5

Reproductive Behaviour

Introduction

Sexual reproduction in both male and female animals is associated with certain types of behaviour that mark readiness and yearning for the mate. Most animals have different breeding seasons when every condition for their reproduction is normal. It is associated with different signs displayed by both males and females to secure a mate. In most animals, the male may be ready at all times, while the female only responds or displays interest during the **heat period.**

Courtship

This can be described as a fairly temporary or permanent relationship between male and female animals, usually for mating purposes. Different species of animals show different methods and signs unique to them.

Courtship in fishes

In the Tilapia, courtship occurs between a mature male and female. The male makes a nest pit at the muddy base of the water. The male then moves, and leads a mature female to the nest pit. As they both come around each other in the nest, the male continues to butt the female at the genital opening. When she later releases the eggs, the male then secretes sperm cells to fertilize them. This type of fertilization is external.

Courtship in Toad

The male toad attracts the female by making a croaking sound. When the female carrying the mature eggs hears the masculine voice, she approaches the male. The male then mounts on her back and gets attached by means of secretions from the nuptial pads on its forelimbs. During this period, the female secretes the eggs and the male releases sperm to fertilize them. This fertilization is also external.

Courtship in Agama Lizard

The male agama lizard displays its bright colour to the female to attract it. The female in response to the approach, takes up a â€˜soliciting postureâ€™ by raising up the tail and the an terior region and assumes a position at angle 45Â°. The male now gradually comes around her and the two fuse up the genital organs. This is internal fertilization.

Courtship in Birds

In the domestic fowls, the cock displays its bright colour. The comb and wattle also brighten. When the cock crows, the female on â€˜heatâ€™ gently approaches with a feminine sound. The cock dances around her, while the female may willingly give in or runs to be chased by the male. When the male catches up with her, it mounts her, and mating commences.

In turkeys, the male spreads out its feathers, dances around while approaching the female with characteristic sounds from its throat, and retracts its neck.

The male peacock displays by spreading out its colourful tail in the shape of a semi circular fan as it calmly shows one side, then the other and gradually advances towards the female.

Courtship behaviours in animals

Examples of courtship behaviours include the following: pairing, territoriality, seasonal migration and display.

Pairing

Pairing occurs when mature male and female animals leave their fold in twos and go elsewhere together alone. For instance, winged termites pair up and eventually start a fresh colony in which the female becomes the queen and the male becomes the king. Fishes, toads and mammals including human beings, exhibit pairing as well.

Display

An animal that is interested in mating may carry out various attractive exhibitions to lure the female into mating. These activities are called **displays.** Birds are very good at display, see Fig. 5.1

(a) The male birds usually display with their beautiful feathers. For instance, the turkey, cock or peacock, use their long, large, beautifully coloured tail feathers, which open like a fan to display to the female. Such male birds may also dance round the female. The cock may scratch the ground during the action. Also, some male birds such as pigeon may attract a female with their sonorous songs.

(b) The male cricket attracts the female by making shrill noise with

their outer wings.

(c) The winged termites are usually seen at the beginning of the rainy season swarming at night especially near electric bulbs.

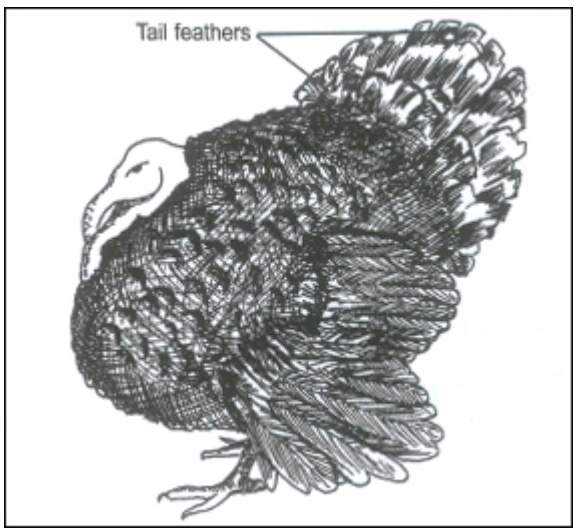

Fig. 5.1. A turkey displaying to the female.

The female attracts the male by releasing a scenty hormone (i.e. **pheromone).** The two termites then pair up. They first shed off a wing each, and later, the second, first by the male, followed by the female.

Fig. 5.2 Courtship posture of male and female lizards.

(d) The female lizard curves its back and raises up its tail. The male lizard wags its tail, nods its head and shows its brightly coloured head and body to the female lizard.

(e) The he-goat chases the she-goat hotly and in the process makes a peculiar noise.

(f) Display takes various forms in human beings. These include, voice, beauty, behaviour, facial expression, dressing, decoration and the

use of perfumes to attract members of the opposite sex.

Territoriality

Some animals exhibit territoriality – that is, claiming exclusive control or ownership over a particular territory or nesting area. The territory may be a part of a roof, a small area in the woods, on a field or in someoneâ€™s garden. The male bird may display by singing to defend its territory, i.e. **auditory display.** The male cock and robin may stick out their red breast or **visual display** of territoriality. The male Tilapia often bites, struggles or fights for the possession of the female.

The male *Agama* lizard exhibits territoriality. In an Agama lizardâ€™s territory, there is usually one adult male to a number of female lizards and young males. It may become aggressive as soon as an intruding male lizard enters its territory. It exhibits its bright coloured head and body, nods its head, expands its gular fold and scares off the other male lizards.

Seasonal migration

Seasonal migration is common in certain birds such as swallows, storks, cattle egrets; fish e.g. barbels, mudfishes, eels and salmons. Migration is the travelling, over short or long distances embarked upon by certain animals especially fishes, birds, and some insects. The journey is usually with regards to breeding and for egg-laying purposes.

Migration in fish

Many tropical fishes deliberately undergo seasonal migration. Some fishes, e.g. barbels and mudfishes search for their special breeding grounds. They leave the deep waters and move up-stream into shallow waters at the start of the rainy season. Other forms of fish migration include local migration, i.e. from mid stream to the shallows near the bank, or even long or a complicated journey from freshwa ter to sea-water and vice versa by salmon and eels. See Fig. 5.3b

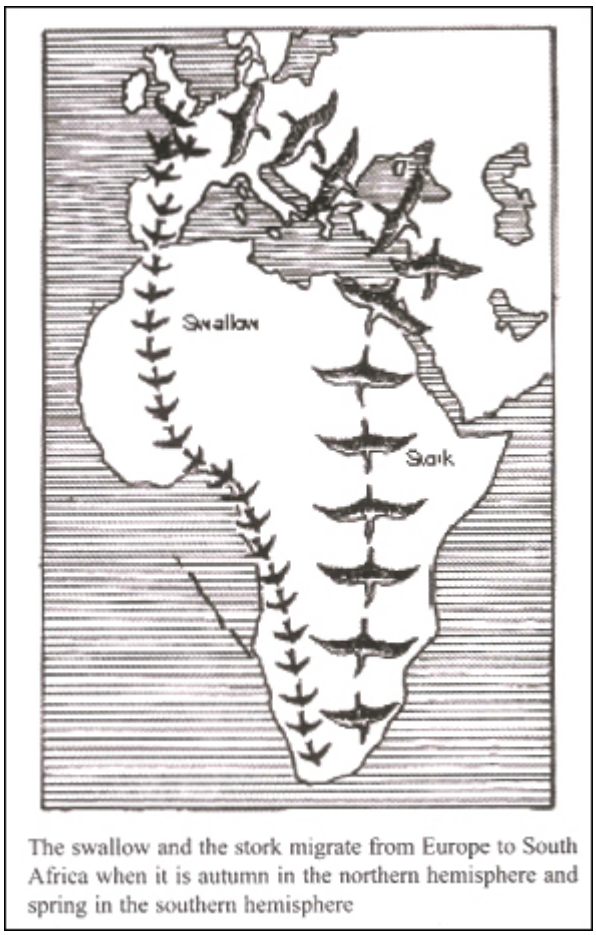

Fig. 5.3A Bird migration route

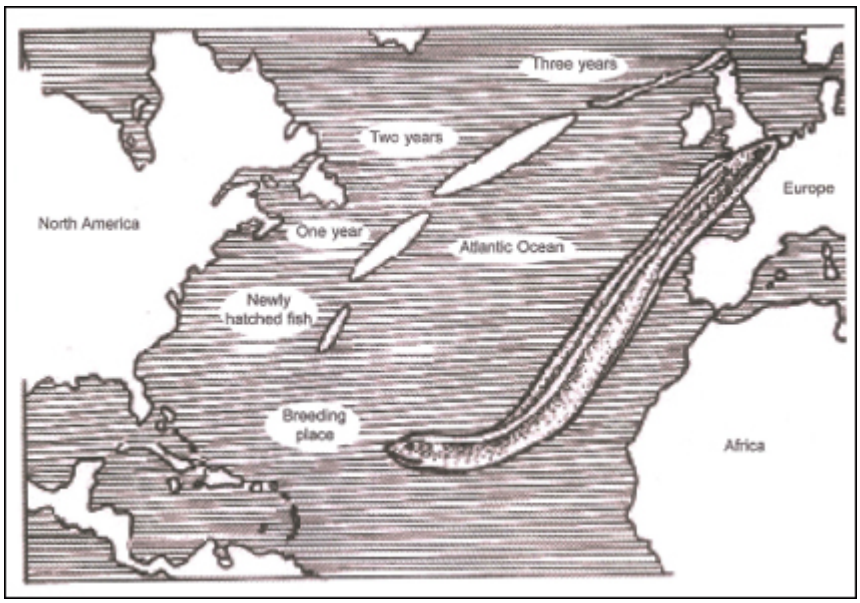

Fig. 5.3b Eel migration

Migration in eel

Eels live in freshwater, e.g. lakes and rivers in Europe. At old age, they move down-stream into the sea in search of their spawning places. They then swim into the Atlantic ocean to breed in the Sargasso sea. It takes them two years to swim back to Europe, where they eventually

die.

Migration in birds

Scientists have identified that migration occurs in birds also. Some birds fly over long distances. For instance, both swallow and stock migrate from Europe to South Africa over 8,000 kilometres. See Fig. 5.3A. The cattle egrets migrate from the northern parts of Nigeria to the southern states during the dry season every year.

Birds usually migrate to where food is more abundant, and the temperature is warmer. Night flying birds seem to be guided by the stars and moon. Those which fly by day are aided by the sun. Some are even said to be guided by the earthâ€™s magnetic field.

Pollination in plants

Pollination is the first phase in sexual reproduction of flowering plants. Pollination is the process by which mature pollen grains are transferred from a mature anther to the mature stigma of a flower. It may be to the same flower or another flower of the same or re lated species.

Types of pollination

There are two types of pollination (a) self pollination and (b) cross pollination. Self pollination is the process by which mature pollen grains are transferred from the anther of a flower to the stigma of the same flower or a flower on the same plant. Cross pollination is the transfer of mature pollen grains from the anther to the stigma of another flower of the same, or closely related species, e.g. flambouyant and *Hibiscus.*

Agents of pollination

The wind and insects such as butterfly, moth and bees are the most common agents of pollination. Other agents are water and animals such as snails, birds and bats. All these agents ensure that cross pollination occurs in plants. Many plants show various structural adaptations which relate them to each agent of pollination.

Features of cross-pollinated flowers

Many flowers exhibit various features which assist in making cross pollination possible, and self pollination impossible. cross pollination is more advantageous than self pollination because of the following reasons.

1. It creates a variety by bringing together usually good characteristics from two different individuals.
2. It results in more abundant and viable seeds, and better adapted

individuals.

3. More virile seedlings are produced from it. Some of the devices which ensure cross-fertilization are dichogamy, unisexuality and self-sterility.

(a) ***Dichogamy:*** This is a condition in which the stamens and carpels of a bisexual flower ripen at different times. It exists in two forms i.e. **Protandry** and **Protogyny**

Protandry: This is a condition in which the stamens ripen before the carpels, so that pollen grains are dispersed to flowers of other plants which have mature stigmas to receive them at that time. Protandry is more common than protogyny. It occurs in the compositae, e.g. sun flower, *Salvia* and *harmattan lilly.*

Protogyny: This is a condition in which the stigmas (carpels) mature before the stamens of the same flower or those of other related flowers.

(b) ***Unisexuality:*** Some plants bear only male or female flowers. Both are not on the same plants. Examples of such plants are pawpaw or holly. They are said to be **Dioecious** *plants.*

Monoecious plants: These are unisexual flowers in which both the female and male flowers are present on the same plant. However, both may be found at different heights on the same plant, e.g. maize (*Zea mays*).

(i) In maize, the male flower (the feathery structure) is at the top and the female silky stigma is found below in the axils (i.e. the tarsels). The male flower usually ripens before the female.

(ii) Female flowers are borne above the male flowers, e.g. in Castor oil plants. Here pollen grains can only be received by the stigma of other flowers.

(iii) Male and female flowers are usually borne at different periods by the same plant, e.g. oil palm.

(c) Self sterility: Some plants make themselves sterile. Presence of pollen on their stigmas is injurious to their continued development. For instance, they may wither and fall off. However, when pollen grains come from other plants, fertilization can occur in such plants. Examples are passion flower and tea.

Advantages and disadvantages of self pollination

Self pollination occurs in a bisexual flower whose stamens and carpels ripen simultane ously. It is common among cereals. It involves male and female flowers from the same plant. The main advantage is that it ensures that pollination occurs in a bisexual flower. The dis advantages are as follows: repeated self pollination leads to the production of weakened individuals; the individuals produced seem to be less adapted to their environments.

Some of the conditions which favour self pollination include the following:

1. *Cleistogamy:* This is a condition in which ripe pollen grains are deposited on the stigma which becomes ripened later. This occurs among closed flowers, i.e. bisexual flowers which never open at all.
2. *Homogamy:* This is a condition in which both anthers and stigmas ripen at the same time.

self pollination occurs in plants where the male flowers are borne above the female ones in the following ways:

(a) A slight wind may blow ripe pollen grains from a mature anther onto any ripe stigmas below.

(b) Ripe pollen grains may be transferred to ripe stigmas of the same flower by an insect searching for pollen or nectar.

(c) When mature, the stigmas are pushed out of the corolla tube. They may be brushed against the anther and collect pollen on the longer filaments.

(d) Where the filaments are longer than the stigmas, the filaments may recoil to touch the mature stigmas.

(e) Where the styles are longer than the filaments, the styles may bend to make the stigmas touch the anther.

Features of wind-pollinated flowers

Examples of wind-pollinated flowers include, maize, rice, millet, grasses and sugarcane. Wind-pollinated flowers are also regarded as anemophilous flowers. They have the following features in common.

(i) The flowers are dull in colour. The perianth (i.e. calyx and corolla) is usually tiny, pale green and inconspicuous.

(ii) The sizes of the flowers are usually small and inconspicuous but they are often borne in large inflorescences, e.g. cereals, sugar-cane and coconut.

(iii) They have neither scent nor nectar.

(iv) They are not bilaterally symmetrical but are radially symmetrical.

(v) The stamens have pendulous and long filaments with loosely attached or versatile anthers which can swing easily in the wind. Each explosive anther contains a large quantity of light, powdery and smooth pollen grains. Most of the pollen are liable to wastage while only a small proportion may reach a receptive stigma.

(vi) The stigmas are usually large, branched and feathery. This provides a wide surface on which floating pollen grains may be caught. Styles are long and they project out of the flower. These assist in trapping any floating pollen in the air.

Features of insect-pollinated flowers

Insect pollinated flowers are also called *entomophilous* flowers. Many of them have the following characteristics.

(i) The petals of the flowers are usually brightly coloured. Other parts of the flower may also be brightly coloured in some other plants, e.g. bract in *Bougainvillea* and *Poisettia,* or sepals as in *Caesalpinia pulcherimma* and *Mussaenda* or spathes as in bananas.

(ii) The flowers are usually large and conspicuous. They may consist of small florets which are grouped into a head as in the compositae, e.g. sunflower. They may also be enclosed in a large and conspicu ous inflorescence, e.g. *Ixora* and *Salvia*

(iii) Many have sweet smell or scents. Those that are pollinated at night tend to be more strongly scented to attract the nocturnal insects.

(iv) Insect-pollinated flowers, e.g. *Hibiscus* and flamboyant, have nectar – a sweet juice which is the liquid food for many of the insect pollinators, e.g. honey bee, moth and butterfly.

(v) Each flower has a peculiar shape or complicated arrangement, as floral parts have mechanisms for moving the essential parts against the visiting insects, e.g. *Crotalaria* and *Salvia.* The arrangement in each flower ensures that pollen grains are released and made to rub off on the body of the insect which in turn rubs the pollen on receptive stigmas on its visits in many cases in search of nectar. Such insects include the bees and butterflies.

Some flowers have long, narrow co rolla tubes, e.g. moon-flower and *Jacaranda.* Insects with long proboscis, e.g. moths and butterflies can only reach the nectar. Through the process, they spread the pollen grains on the stigma.

(vi) The stamens are conspicuous. They occur in definite numbers. The anthers are relatively small, compact and firmly attached to the filaments. Mature anthers produce small quantities of pollen grains. The pollen grains are usually heavy, rough edged and spiky or sticky. These features ensure that wastage is greatly reduced. These also ensure that they are attached to a visiting insect.

(vii) The stigmas are often flat, broad, lobed or rounded with sticky surfaces. The gummy nature helps pollen to be trapped easily on the stigmas. The differences between wind-pollinated and insect-pollinated flowers are listed in Table 5.1 below.

Table 5.1 Comparison of wind-pollinated and insect-pollinated flowers

Wind-pollinated (anemophilous) flower	**Insect-pollinated (entomophilous) flower**
1. Flowers are usually small and inconspicuous	Flowers are large and conspicuous

Wind-pollinated (anemophilous) flower	Insect-pollinated (entomophilous) flower
2. Petals are dull	Petals are brightly coloured
3. They have no scent and no nectar	Scent and nectar are usually present
4. Pollen is dry, light, smooth and less numerous	Pollen is sticky, heavy, rough-edged and more numerous
5. Stigma is usually large and feathery	Surface of stigma is sticky, broad or rounded
6. Flowers have no special shape	Flowers have peculiar shapes, e.g. Crotalaria and Salvia

Pollination in an insect-pollinated flower

The flower is flamboyant (*Delonix regia*). Its agent of pollination is a large butterfly with a long proboscis. The flower has a number of adaptive mechanisms for attracting the pollinator to it.

The flower has sweet smell and bright red-coloured petals and sepals. The insectâ€™s attention is further directed by a special petal or honey guide, the labellum. This stands upright from others and it is more brilliantly coloured. The flower also has a nectary. In an attempt to reach this petal, to search for nectar, the insect lands on the stigma which is sticky. The head or body which is likely to be dusted with sticky pollen grains from the last flowers rubs on the sticky protandrous stigma, thus pollination occurs.

As the butterfly tries to suck the nectar at the base of the petal with its proboscis, the body also involuntarily gathers pollen grains from the flower. The insect flies to another flower and deposits some pollen to effect cross pollination. After this, the yellow petal curls over and so prevents further pollination in Pride of Barbados (*Caesalpinia pulcherimma*) is similar.

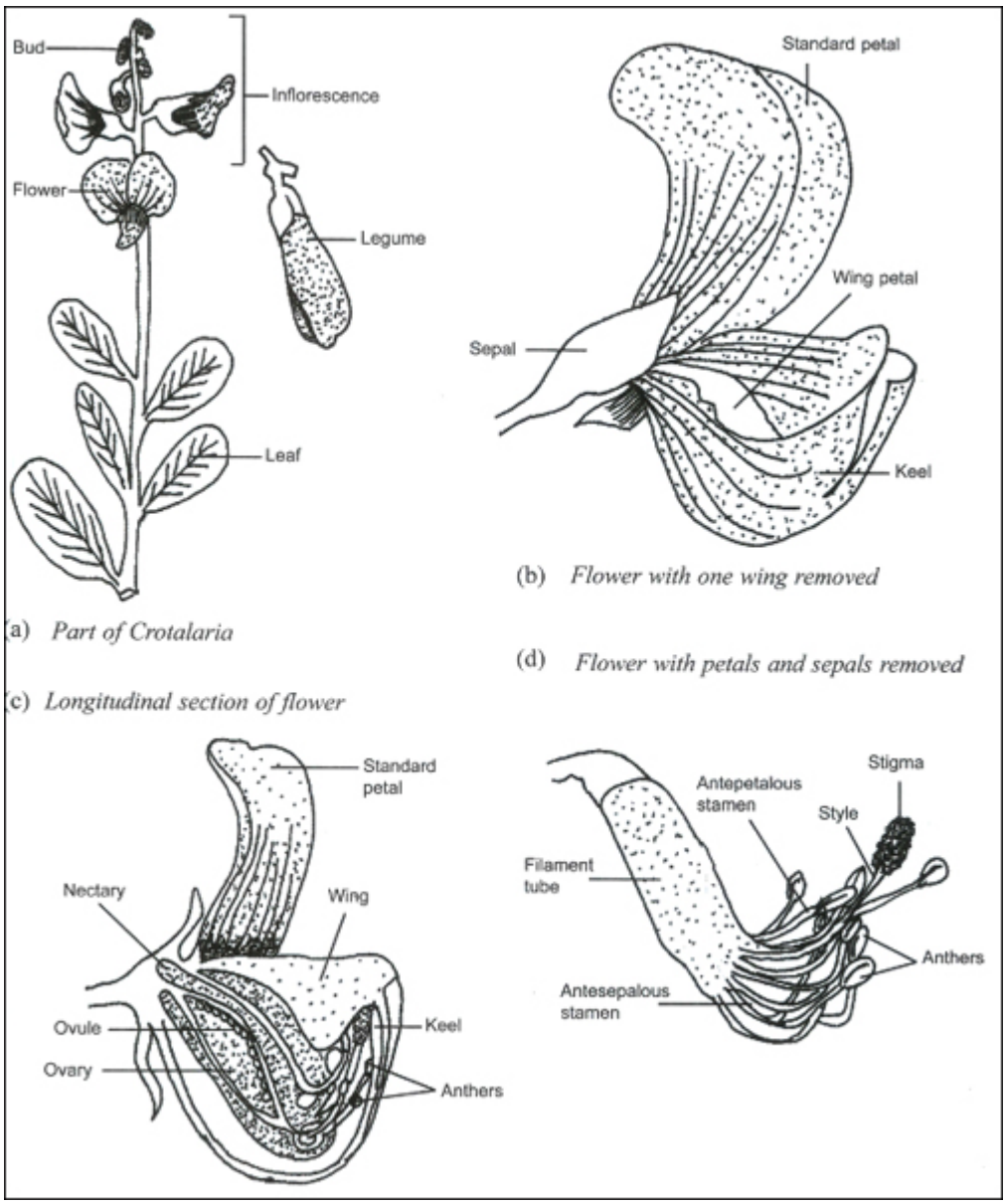

Fig. 5.4 An insect-pollinated flower (Crotalaria sp.)

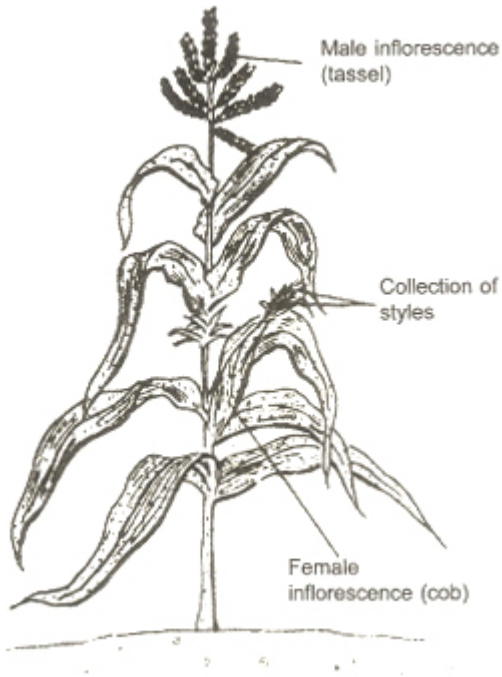

Fig. 5.5 Male and female inflorescence

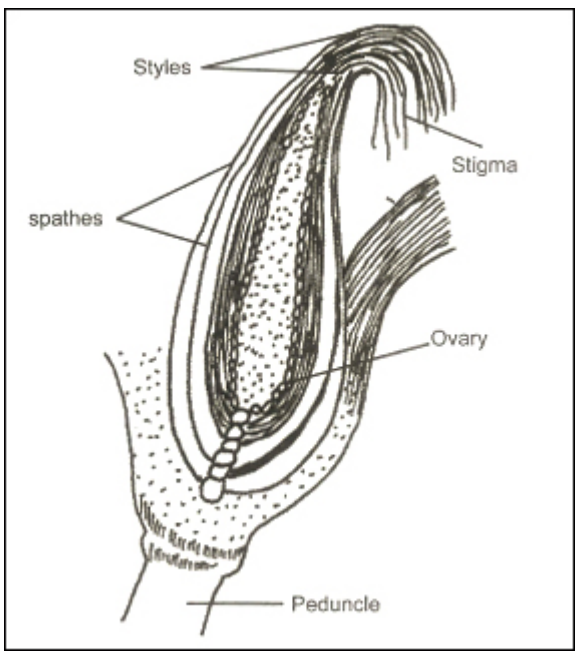

Fig. 5.6a Female florets of maize

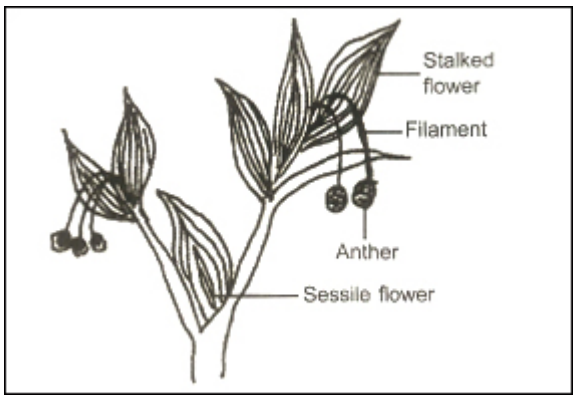

Fig. 5.6b Male florets of maize

Pollination in Crotalaria

Crotalaria is an insect-pollinated flower. It is a complete and irregular flower. It has a complicated structure. It consists of five brightly coloured petals, a standard petal, two side petals called wings and two anterior pairs of petals called keel. (Fig. 5.4c)

The insect pollinator is the bee. It is attracted to the flower by its scent, presence of nectar as well as the bright colour of the petals. The flower is protandrous and cross pollination occurs in it. The bee is initially attracted to the flower by the bright standard yellow petal. The insect lands on the wing petals.

The honey guidelines direct it to the nectary. The keel becomes depressed by the weight of the bee on the wing. Through a narrow opening, the ripe sticky pollen grains are released from the stamens onto the hair on the under-surface of the bee.

When the bee tries to reach the nectar below in another mature *Crotalaria* flower, the pollen grains on the hairy body of the bee gets rubbed off on the sticky stigma which relatively protrudes longer than the stamens thus pollinating it. This usually occurs in an older related flower with mature stigma. After obtaining the nectar, the bee leaves the flower and the keel closes up to enclose the stigma. *Wind-pollinated (anemophilous) flowers* Maize (Zea mays) is an example of a wind pollinated flower. It is dull and scentless and so, it does not attract insect pollinators.

Maize plant bears both male and female flowers, i.e. it is monoecious. The male flower is terminal and it is borne above the female flowers which are below it. (*See Fig. 5.5*). The male flower exists in the much branched inflorescence called tassel. Female flowers are borne below the male flowers. They are found in the leaf axils. The female inflorescence is the cob but it appears on the outside as a long, silky thread (the style). Neither the male nor the female flowers have petals or sepals. Both occur in pairs of one fertile and one sterile.

The male floret consists of two bracts (pales), three stamens with long, slender filaments and large anthers. These hang out of a pair of leaf-like glumes as the stamens ripen. Each anther is versatile and can produce large quantities of light pollen grains. In a maize plant,

pollens are shed before the stigmas are mature. Hence, cross pollination is always occurring.

The female floret is enclosed by a pair of glumes. In addition, the fertile ones are further covered by a pair of pales. It consists of one carpel that is made up of an ovary, a long silky style and a feathery stigma. It also has a pair of lodicules per female floret.

Lodicules swell to open the covering bracts (the glumes and pales). The stamens and styles are thus released. The cloud of powdery pollen grains are shed and blown out of the anthers as they sway in the wind. These float and drop onto the long, massed silky stigmas of the cob of the same or other plants. This way, wind and cross pollinations are achieved.

Suggested Practicals

1. *Observation of courtship behaviours in animals*

   Observe the courtship patterns of male and female animals in your surrounding (home and school). The animals may include chicken, turkey and *Agama lizard.*

   Record and discuss your observations. These observations may include

   (a) The aggressive nature of males to intruders;

   (b) territorialism in lizards;

   (c) chasing strategy of cocks; and

   (d) how the he-goat pursues the she-goat around the vicinity.

2. *Observation of flowers and modes of pollination*

   Bring various flowers to class. Study the flowers all over again:

   (a) Relate the position of the stigma and stamens to the type of pollination.

   (b) Note the nature of the corolla and their relationship with the stamens and stigmas.

   (c) Suggest the type of pollination which occurs in each flower: maize, *Hibiscus* and *Crotalaria,* with reasons.

Summary

1. Courtship behaviour is exhibited by ani mals so as to make mating or sexual reproduction possible. Examples include pairing, display, territoriality and migration.
2. Pollination is the transfer of pollen grains from the anther to the stigma in flowers. It is the first phase of sexual reproduction in flowering plants.
3. There are two types of pollination in flowering plants: self and cross pollination.

4. Some of the common external agents of pollination are wind, insects and other animals such as snails, birds and bats.
5. Flowers exhibit various features which ensure cross pollination. These include self-sterility, unisexuality and dichogamy.
6. Some flowers exhibit features which ensure self pollination. These include

   (i) simultaneous ripening of both the pollen and stigma.

   (ii) transfer of pollen to stigma by insects in a single visit.

   (iii) when styles are longer than stamens, the former coil back to reach the stamens.
7. Wind-pollinated flowers have no scent and nectar. They have numerous, light and dry pollen grains. The flowers are very tiny but the stigmas are relatively large and feathery.
8. Insect pollinated flowers are usually brightly coloured, scented, large and conspicuous.

Objective Questions

1. Reproductive behaviours in animals include all the following **except**
   A. pairing
   B. display
   C. territoriality
   D. seasonal migration
   E. pollination
2. Which of the following statements is not true?
   A. Male crickets attract females by making shrill noises.
   B. Male *Tilapia* often bites, struggles or fights for the possession of the female
   C. There is only one type of pollination
   D. The agents of pollination are wind, insects, water and some animals.
   E. Beautiful colours and sweet smell of flowers attract insect pollinators.
3. All the following features ensure cross fertilization **except**
   A. homogamy
   B. protandry
   C. protogyny
   D. unisexuality
   E. self-sterility
4. Which of the following statements is not true of self pollination?
   A. Cleistogamy in certain closed flowers.

B. Some plants bear only male or female flowers.

C. In some flowers, the styles are longer than the filaments making them coil back.

D. Filaments are longer than styles.

E. Insects transfer pollen grains to the stigma of the same flower.

5. Which of the following statements is not shown by wind-pollinated flowers?

A. No scent and nectar

B. Flowers are usually small and inconspicuous.

C. Flowers are borne on large inflorescence

D. Pollen grains are heavy, rough-edged and sticky.

E. Stigmas are branched or feathery

Essay Questions

1. Describe the following courtship behaviours with relevant examples:

(a) display

(b) territoriality

(c) pairing

(d) seasonal migration in birds and fish.

2. (a) Define pollination

(b) List the features that aid self-pollination.

(c) List five features of cross-pollinated flowers

3. Tabulate the major differences in the characteristics of wind and insect-pollinated flowers

4. Describe the mechanism of pollination in a named insect-pollinated or wind-pollinated flower.