# 32 COLLECTION, IDENTIFICATION AND PRESERVATION OF INSECTS

## 32.1 INTRODUCTION

This project work is related to taxonomy course of Life Sciences (LSE-07). Taxonomy deals with the collection, classification, identification and proper preservation of individual organisms. In this project work you will do the collection and identification of insects at the college campus of the study centre where the laboratory course is organised. Insects constitute approximately 90% of the total number of organisms found in the planet and occupy almost each and every possible niche. Most of the insects are harmless but form an important link in the food chain. This project work would enable you to do:

- collection
- identification
- preservation of insects.

Before you commence your work, you may read the first two Blocks of Taxonomy and Evolution Course (LSE-07) for an understanding of the need to classify the organisms and name them properly.

## 32.2 MATERIALS REQUIRED

insect Net

aspirator

ethyl acetate

killing bottle

insect box

insect pins

spreading board

step block

naphthalene powder

## 33.3 PROCEDURE

It is suggested that this project work can be undertaken in groups, each group consisting of not more than five students.

**A Insect Net**

Insect nets may be available with the counsellor in the laboratory of your study centre. Otherwise you can assemble one as described below (Fig. 32.1). Obtain the following items from the market.

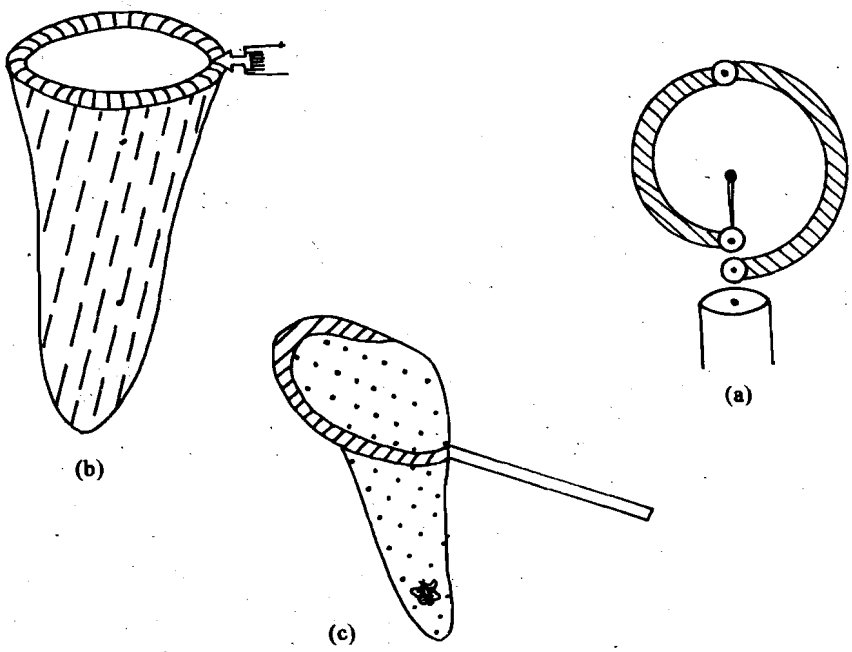


**Fig. 32.1 : Insect net (a) Bending of the iron wire into a ring, (b) Stitching of the muslin cloth into a bag, (c) Collecting a small insect by twisting the handle & forming a fold in the bag.**

(i) Iron wire (3 mm dia) — 42 to 48 inches long.

(ii) Muslin or fine nylon cloth — 1 meter long.

(iii) Light wood or bamboo— $^3/_4$ meter long for use as a handle for the net.

(iv) Canvas or linen cloth — $^1/_4$ meter.

(v) A 18" long binding wire.

1. Bend the iron wire into a ring of 12 to 15 inches diameter (Fig. 32.1a)
2. Straighten the ends of the wire so that it could fit into the grooves of the handle.
3. Bend the tips of the straightened ends so that they fit into the holes of the handle.
4. Form a hem of about 3" in the canvas or linen so that the iron-ring would pass through it.
5. Now stitch the muslin or nylon cloth in the form of a bag (the bag will take the shape of an inverted cone as shown in the Fig. 32.1b) to the canvas or linen.
6. Now fix the bent tips of the iron wire to the handle and tie it firmly with the binding wire.

Keep the following points in mind while preparing the net.

(i) A detachable ring is quite useful as the bag then can be easily replaced when it is torn, wet, dirty or to be changed for one of another material.

(ii) The meshes of the cloth should be as large as possible — but small enough to hold insects to be captured.

(iii) The bag should be about two to two and a half times as deep as the diameter of the ring or slightly shorter than the arm.

(iv) The net is made in such a way that it should be as light as possible having the least possible air resistance but reasonably strong and durable.

The net can be used to collect small as well as large insects. In case the captured specimen is large twist the handle quickly, lapping the bag over the rim and you could observe the specimen enclosed in the bottom of the bag (Fig. 32.1c). Grasp the region of the bag enclosing the specimen with one hand and with the other hand insert the open end of the killing bottle to push it into the net upwards till the specimen is

enclosed by it. Withdraw the bottle from the net and close with the lid. Small insects can be easily removed from the net either using a killing bottle or an aspirator. While collecting active or stinging specimens like bees and wasps, insert the fold of the net containing the insect into the killing bottle until the specimen is stupefied.

**B Aspirator**

An aspirator is a simple suction device used for collection of small insects. The most commonly used aspirator is described here. (Fig. 32.2).

*Materials required*

A vial of glass or transparent plastic

Two holed rubber stoppers

Two glass tubes

A rubber tubing

A small piece of muslin cloth.

1. An aspirator is a vial of glass or preferably transparent plastic. To the open end of the vial fix a tightly fitting rubber stopper to avoid crushing of small insects which otherwise may crawl between the stopper and the wall of the vial.

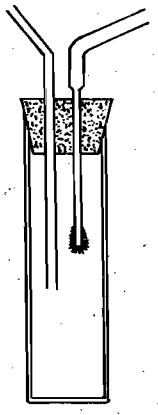

**Fig. 32. 2 : An aspirator**

2. Insert the two glass tubes through the stopper.
3. Attach a rubber tube to the outer end of the suction tube for sucking through the mouth. Cover the other end of this tube which remains in the vial with a piece of muslin cloth to prevent insects from entering the tube.

For collecting small insects place the outer end of the intake tube near an insect and suck through the rubber tube. This suction creates a partial vacuum in the vial thereby drawing the insect through the intake tube. When the aspirator is not in use plug the outer end of the intake tube with cotton to avoid the escaping of insects caught in the vial. You may empty the contents of the vial into a killing bottle to silence them.

**C Killing Bottle**

The killing bottles are prepared with killing agents which kill the insects immediately without affecting their colours or unduly hardening them. Although potassium cyanide is a widely used killing agent, because of its extremely poisonous nature, we describe here a killing bottle with ethyl acetate as a killing agent. (Fig. 32.3)

*Materials required*

An empty glass bottle with lid, preferably a horlicks bottle.

cotton

blotting paper

ethyl acetate

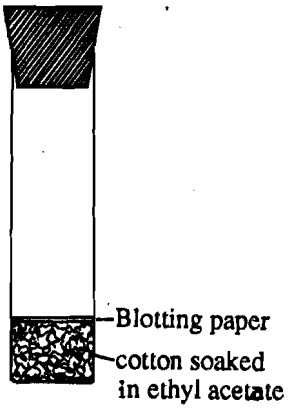


**Fig. 32.3 : Ethyl acetate killing bottle.**

Ethyl acetate is an effective killing agent for insects. You may use an empty horlicks bottle to prepare a ethyl acetate killing bottle. Place a wad of cotton soaked in ethyl acetate at the bottom and cover it with a piece of blotting paper for preventing the direct contact of the specimens with the chemical. Pour a few more drops of the killing agent over the blotting paper to make the bottle more effective. At the end of ech day take out the insects collected in the bottle for preservation. If you are not taking them out at the end of the day, then place absorbent cotton soaked in a few drops of the killing agent over the collected material and close the bottle tightly. The specimens remain in a relaxed condition for some days if kept in this way. The bottle may be charged with a few drops of ethyl acetate on each day of collection. Label your killing bottle as POISON and keep it away from the reach of others especially children.

Do not leave the insects for too long in the killing bottle. Remove them from the bottle before they get dirty or damaged. Also do not overcrowd the bottle with insects. Further, you may use separate small killing bottles for collecting a few specimens in each one of them. Overcrowding of bottles with tough and fragile as well as small and large insects may result in the damaging of all of them.

**D Relaxing Insects**

For proper mounting, the hard bodied insects must be in relaxed condition. This keeps in the proper dispplay of their body parts of taxonomic importance. If the insects are mounted immediately after they are killed, then there is no need to relax the specimens. But the insects become dry and stiff if left in the killing bottle for a long time. Under these circumstances the insects must be first relaxed in a relaxing box or in a similar apparatus. A plastic container (2' × 1') may be used as a relaxing box. Place at the bottom of the container a thin sheet of synthetic sponge or any other porous material of 2 to 4 cm in thickness. Saturate the sponge with water. In one corner of the container place a cottonwad soaked in 10 to 15 ml of ethyl acetate to prevent the formation of mold. Also you may place a sheet of blotting paper on the inside of the lid of the container to avoid condensed water to fall over the specimens.

Leave the insects in the relaxing box in a petridish or in envelops. The time required for relaxation depends on the size or type of specimens. Most specimens are satisfactorily relaxed by leaving them one night in the box. Do not leave the specimens for too long a period in the relaxation box to avoid damage and discoloration to them.

**E Mounting**

The hard bodied insects are mounted on entomological pins. These are standard pins made of steel and do not rust. They are available in a variety of sizes and thickness. But these pins are quite expensive and beyond the reach of students. The students can prepare home-made entomological pins with sewing needles and coloured beads. You may buy thin sewing needls, heat the eye end of the needle on a spirit lamp flame and insert the heated end into a coloured bead. The bead forms the head of the needle. You may make 50 such entomological pins.

Mounting can be done by any one of the following methods, depending upon the size structure and group of insects.

(i) *Direct Mounting*

Freshly pinned specimens are best pinned. The pin should pass through the body of the insect without damaging it. Since there are different ways to insert pins through the insects depending on the group to which it belongs, pins should pass through the correct points in the insect body (Table 32.1 and Fig. 32.5). The pin is always inserted vertically through the body or sloping very slightly in such a way that the front part of the body is very slightly raised. The specimen is then pushed up the pin until its back is about $1^1/_2$" from the top so that the pin can be easily grasped with fingers or pinning forceps. Also while handling one should be able to hold the pin freely without the fingers having any direct contact with the insect. Further all the insects should be uniformly mounted so that it becomes easy to compare and examine the specimens as well as it improves the appearance of the insects in the box. Uniform mounting of the insects is done with the help of pinning blocks or step blocks as they are called (Fig. 32.4). A pinning block is made of hard-wood or plastic in which the holes of desired depths are drilled.

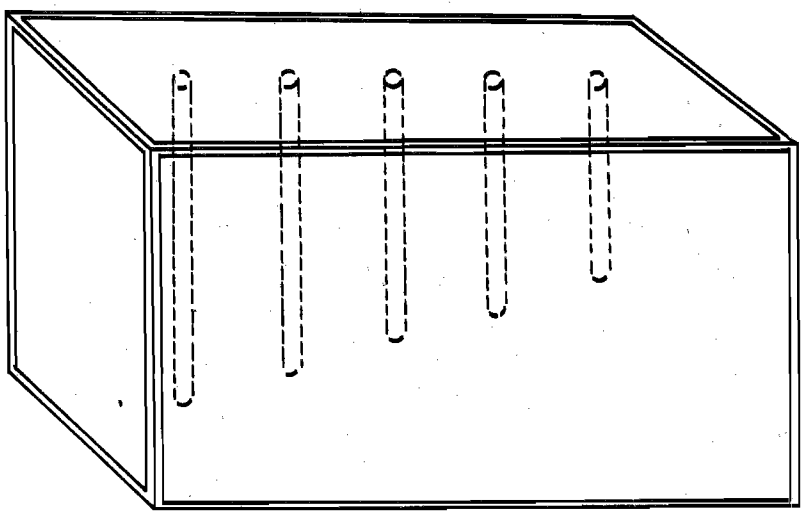

**Fig. 32.4 : A pinning block.**

**Table 32.1: Method of pinning of insects belonging to different orders.**

| Insects | Point of pinning |
|---|---|
| 1. Orthoptera | Insert pin through the right side of the pronotum near its posterior edge; long axis of the body should be nearly at right angles to the pin but with the head of the insect downward; set the abdomen drooping below the wings (Fig. 32.5a and b). |
| 2. Dermaptera (Earwigs) | Insert pin through the anterior part of right elytron (Fig. 32.5c). |
| 3. Phasmida (stick insects) | Insert pin through posterior most part of the metanotum in the midline (Fig. 32.5d). |
| 4. Odonata (Dragonflies) | Insert pin in the midline of the thorax between the bases of hindwings (Fig. 32.5e). |
| 5. Hemiptera (Bugs) | For those specimens having large scutellum, insert pin through scutellum near its anterior margin just to the right side of the midline; but in those with small scutellum or covered by the enlarged pronotum (e.g., Notonectidae), it is inserted through pronotum near its anterior margin just to the right of midline. (Fig. 32.5f) |

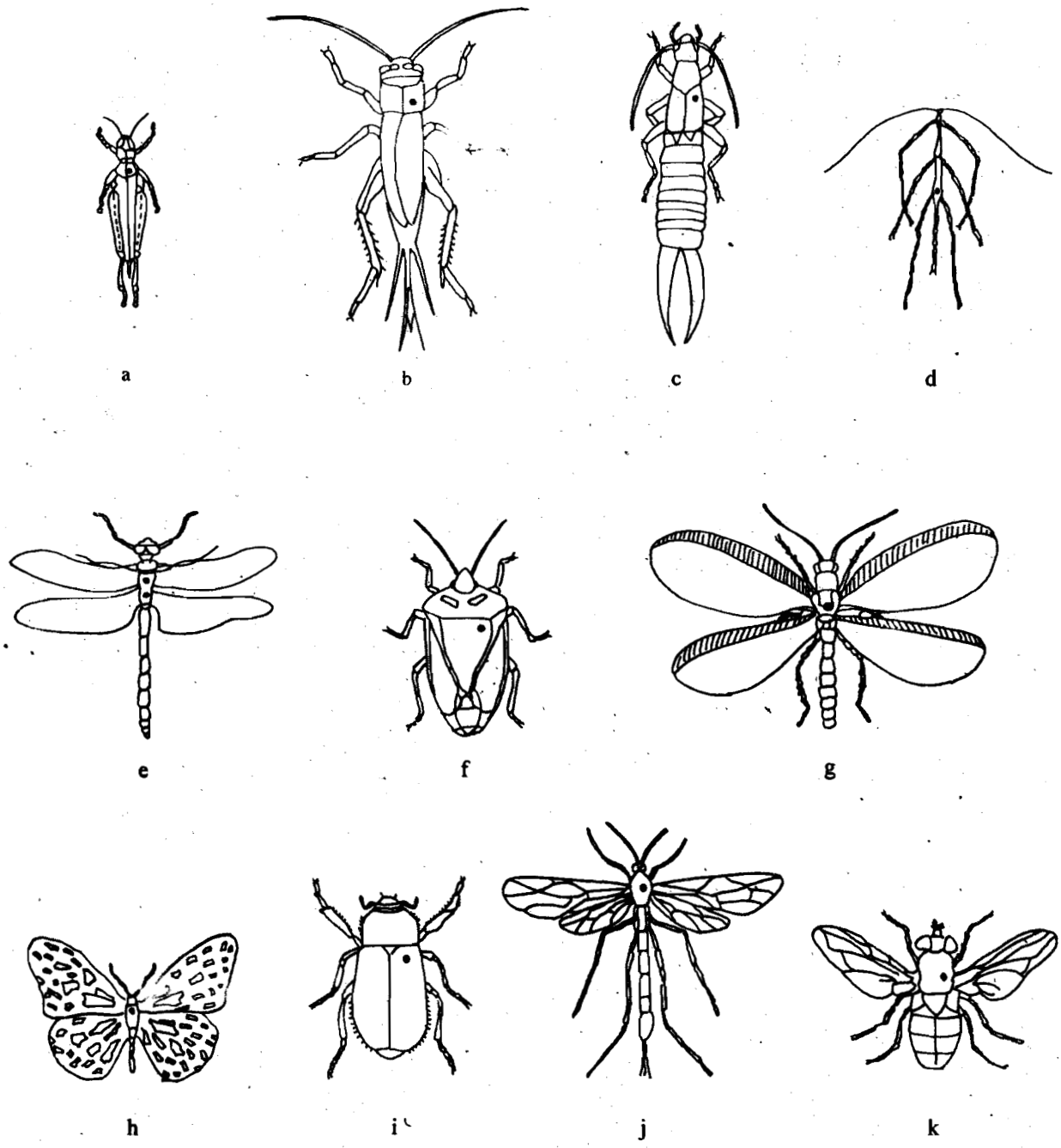


**Fig. 32.5 : Correct method of pinning insects. (a) and (b) Orthoptera (c) Dermaptera (d) Phasmida (e) Odonata (f) Hemiptera (g) Neuroptera (h) Lepidoptera (i) Coleoptera (j) Hymenoptera (k) Dipter**

| | | |
|---|---|---|
| 6. | Neuroptera (Antlions) | Insert pin vertically through the middle of the thorax. Mecoptera and Trichoptera are also similarly pinned (Fig. 32.5g). |
| 7. | Lepidoptera (Butterflies and moths) | Insert pin vertically through the middle of the thorax (Fig. 32.5h). |
| 8. | Coleoptera (Beetles) | Insert pin near base towards inner edge of right elytron (Fig. 32.5i). |
| 9. | Hymenoptera (Ants, Bees,Wasps) | Insert pin directly through thorax to the right of midline (Fig. 32.5j). |
| 10. | Diptera | Insert pin at the right of the midline of thorax near base of wings with its point emerging in front of right mid coxa (Fig. 32.5k). |

(ii) *Point mounts*

You may display the small dried insects by the procedure of point mounting. You may either attach the specimen to the tip of a small triangle of thin card using a small quantity of adhesive and then support the broad end of the card with an entomological pin. Prepare thin stiff cards by cutting it to the shape of a triangle (6 mm long, 2 mm wide at base and 0.5 mm wide at its apex), but the size may vary depending on the size of the insect. Quick-fix is a quick drying adhesive that can be used for mounting small and medium sized insects. The insects are best attached to the points at the side of the thorax below the wings or margin of the tergum and above or between the bases of the legs. This kind of attachment allows the study of all important taxonomic characters.

iii) *Spreading*

The best mounts of insects are those which make the taxonomic study of all important body parts quick and easy. For this purpose, you have to display the head, wings, legs and abdomen of the insect properly. You may have to provide supports for keeping certain body parts in proper order till the specimens are dried and retained in the desired condition. This is best done in freshly killed specimens when their internal parts are soft to take the pin and appendages are pliable. The wings of insects are spread into the desired position with the help of a spreading board (Fig. 32.6). The spreading board is also used for setting other insects. You can use their paper strips to press the wings on the spreading board and the specimens are allowed to remain in this condition till they get dried and retain the desired position.

Do not leave the spread insects in the open. They will be damaged by other insects such as ants. Leave the spreading board in empty insect boxes or other containers. The drying of the specimens is also necessitated to prevent the growth of fungus over them.

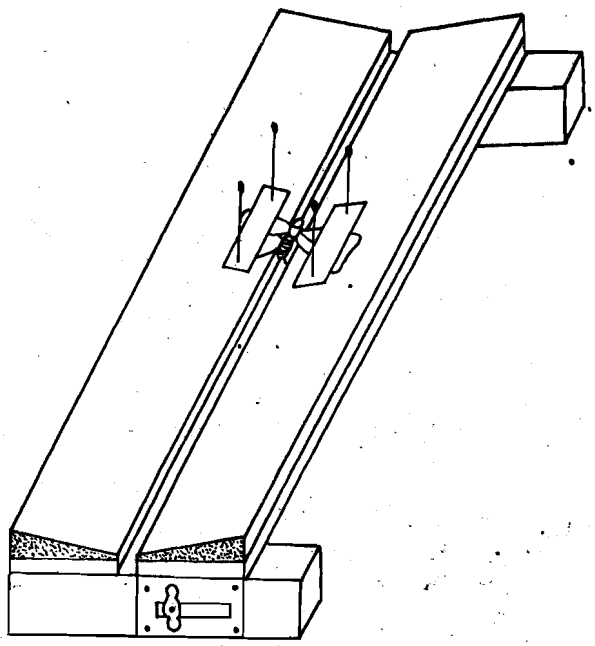

**Fig. 32.6 : Spreading board**

## F Methods of Identification

Once you have collected the insects and sorted them out, tentatively identify them upto order. You have to take the help of your academic counsellor for identifying insects. He will help you to identify them upto generic level if possible. There are different methods employed for identifying an organism. The important methods are

(i) From literature

(ii) Use of taxonomic keys

(iii) Pictures

(iv) Direct Comparison

(v) Combination of different methods.

i) *From Literature*

The basic function of an identifier is to compare the specimens with the published descriptions of the species. This is a very tedious task involving hundreds and thousands of comparisons. There is need to skip over the great bulk of the species which are not closely similar to the specimen which is being identified. This is further facilitated if the keys are available in the group.

ii) *Keys*

This is one of the most commonly used methods of identification. A key is essentially a printed information-retrieval system into which one puts information regarding a specimen-in-hand and from which ones gets an identification of the specimen to whatever level the key is designed to reach. In the absence of the originally identified specimens of the species utilised for comparisons, the published description becomes the only tool. In larger groups with many species, it is the most tedious task to compare specimens with hundreds or thousands of published descriptions. This task can be solved if the keys to the main group are available. The main purpose of the key is to facilitate identification. It is a tabular device designed for rapid identification and based on the most convenient characters which are usually arranged dichotomously. You may refer to LSE-07 (Taxonomy & Evolution Course) for a discussion on taxonomic keys.

**Preservation of Identified Insects**

Some of the important tips are mentioned below and which, if followed will certainly minimise the risk of their damage.

i) The insects should be correctly set and labelled. These should then be kept in wooden boxes (size according to requirement). Care should be taken that the cork sheet which is used as a base for pinning the insects to the box is thick enough to hold the pins deep and firmly attached to the bottom of the box. The larger specimens should be supported on either side with ordinary pins to avoid their possible damage due to swinging.The specimens on double mounts should have one additional pin passing through the pith, a little behind the specimen and the points should be supported by two pins, one on either side of the triangle, to prevent their damage due to circular motion.

   Do not overcrowd the specimens in a box as it always increases the chances of their damage.

ii) A sheet of cardboard cut to fit the inside of the box should be kept over the top of the pinned specimens and the space between this and the lid of the box should be filled with cotton.

iii) The box containing pinned insects must be fumigated. The most effective fumigant is prepared by dissolving 10 gm of naphthalene powder in 50 ml of petrol to which is then added 0.1 ml of phenol to prevent growth of mould. A cotton swab soaked in little quantity of this fumigant is firmly fixed in one corner of the insect box.

   Loose naphthalene crystals should not be kept in the insect box as they can damage the specimens on striking.

**For this Project Work**

**NOTE:** Collect a minimum of twenty insects belonging to various orders and identify them correctly.