

Subject	Insect Taxonomy
Lect. No.	2
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Taxonomic Characters:

A taxonomic character is any attribute of a member of a taxon by which it differs or may differ from a member of different taxon.

Kinds of taxonomic characters:

A. Morphological characters

1.General external morphology

The external characters of insects are important for the identified, these includes the variation of the part and differences in color, for example, *Coccinella septimpunctata* have seven black spots on the elytra, but another species *C. undecimpunctata* have nine.

2.Special structures (e.g. Genitalia). The genitalia in insects is very important for diagnosis the species especially male genitalia.

3. Internal morphology (Anatomy). Some internal characters in insects are very important for diagnosis the species, such as the variation number of Malpighian tube among different species.

4. Embryology. Various immature or larval stages, the embryology, and sometimes even the eggs may provide taxonomic information. The various sibling species of the *Anopheles maculipennis* complex (Malaria mosquito) were discovered owing to differences in egg structure.

5. Karyology

Chromosomal studies are active fields, yielding much information on the relationships among the sibling species. The number of chromosomes are important characters for isolated between the various species of the genus or among the species.

sibling species: Pairs of groups of closely related species which are reproductively isolated but morphologically identical or nearly identical.

B. Physiological characters

The physiological characters are important for the identification of insects; the insects with short life cycle are suitable to physiological studies; the physiological studies of insects include: -

1. Metabolic factors

2. Serological, Protein, and other biochemical differences. The modern studies of taxonomy to identify the related species include, biochemical study of the cuticle and other organs.

3. Body secretions. Some insects secrete substances which may be used to directly isolate with another species, such as the white fly secretion of dew.

4. Genic sterility factors

C. Ecological characters.

The ecological characters of insects are important for the isolation of the sibling species

- 1. Habitats:** The sibling species of *Anopheles maculipennis* Complex

Are isolated depending on its habitat

- 2. Food:** A number of sibling species were discovered as a result of discrepancies in food preference (host specificity)

- 3. Seasonal variation.**

- 4. Host reaction.**

D. Ethological characters

1. Courtship and other ethological isolating mechanism
2. Outer behavior

E. Geographical characters

1. General biogeographical distribution patterns
2. sympatric –allopatric relationship populations

Taxonomic Procedure

1. Selection of a suitable problem

The choice of research topic is of great importance, even the researcher no loose his time and effort to the study group does not represent a real problem; Here are some important considerations for the selection of research topic: -

1. Must be in the range enough to be completed within a reasonable period
2. Must be one of the most common groups are easy to get the samples
3. Group must be easy to study in the field

2. Collect the samples and take care of it

Collection and Preservation of insects

A- Collection

1. Hand picking

This method is suitable for large insects like beetles and grasshoppers. It is unsuitable for insects inflicting painful bites and stings.

2. Insect net: There are two types of insect nets.

i. Aerial net: (Butterfly net) It is useful for catching active fliers like moths, butterflies, dragonflies, flies, wasps, etc. The net consists of three parts viz., hoop, handle and porous cloth bag made out of mosquito netting material. It has a small hoop (30-40 cm) and a long handle (100 cm).

ii. Sweep net: This is heavier than the aerial net. It consists of a short handle, a large hoop and a muslin cloth bag. This is suitable for collecting leafhoppers, grasshoppers and other small insects. The net is swept over vegetation and quickly turned to fold the cloth bag over the hoop in order to prevent the escape of trapped insects.

3. Aspirator

It is a device useful to collect small insects into a vial with no damage to the specimens. It is also useful for collecting insects from the insect net or any other surface.

4. Traps: Traps can be used for collecting different types of insects.

1-Food lure trap - Flies

2-Sex lure trap – Moth

3-Water trap – Brown plant hopper

4-Brown plant hopper

5-Light trap - Positively phototropic insects

6- Sticky trap – Whiteflies

7- Suction trap -Whiteflies

5. Berlese funnel. Soil dwelling insects can be collected by using Berlese funnel

6-Sifters. It is used for many small & unusual insects which occur in trash & leaf litter

7-Beating sheet. It is a frame covered with white clothes (muslin) or light canvas which replaced underneath the plant and then jurying the plant with a stick the insects which fall may be easily picked up.

B. KILLING

Killing should be done immediately after capture. Potassium cyanide, ethyl acetate, carbon tetra chloride (carbon) and chloroform are commonly used for killing insects.

ii. Pinching the thorax

A butterfly or moth can be immobilized and killed in an emergency by giving a sharp pinch on the thorax.

iii. Killing with alcohol

Many insects can be killed by dropping them directly into 70 to 90% ethyl or isopropyl alcohol.

C- Preservation

i. Materials required

1. Paper folds (Paper envelopes): They are useful for temporary preservation and storage of large winged insects such as dragonflies, butterflies or moths. These triangular envelopes can be made from a sheet of notebook or by using absorbent type of paper used in duplicating machines.

2. Setting board (Spreading board): It is useful for spreading the wings of dead insects. It is a wooden board with a central groove in the middle.

3. Relaxing container: Setting or mounting an insect should be done within a day after killing. Otherwise the insect will become stiff and brittle. Stiffness in the dead insect can be removed by placing it in a relaxing container. High humidity inside the relaxing container permits water to be reintroduced into the specimens thus making them flexible. Fill a container with sand to 1/4th of its capacity. Saturate the sand with water. Add a few drops of carbolic acid or formaldehyde to prevent mold growth. Keep the dried specimens in a small open box or in an uncovered petri dish to avoid direct contact of the specimen with moist sand. Close the lid tightly and allow them to remain for a day or two until they become flexible.

4. Pins: Common pins are undesirable for pinning insects. Pins used for pinning insects should be slender, hard with a pointed tip and a small head. Pure nickel pins or nickel plated one's resist rusting.

ii. Methods of preservation

1. Pinning

It is the best and most common method to preserve hard bodied insects. They will dry and remain in perfect condition on the pins without requiring any further treatment.

S. No.	Insect groups	Pinning region
1.	Grasshoppers, crickets, preying, mantids and cockroaches	Pronotum
2.	Bugs	Scutellum
3.	Stick insects	Metanotum
4.	Beetles and weevils	Right elytron
5.	Earwigs	Right tegmen
6.	Dragonfly, damselfly, antlion, green, lacewing fly, moths, butterflies, bees, wasps, ants and true flies	Thorax

2. Double mounting

Pinning is troublesome in smaller insects. Very small insects cannot be pinned because most of the body parts of the insects will be lost during pinning. For such insect's double mounting can be followed.

i. Staging: The stage is a narrow rectangular piece of pith or cork. The small insect is pinned correctly with a micro pin to the stage. Later the stage is pinned in the insect store box with a bigger pin.

ii. Carding: A rectangular (5 x 8 mm or 5 x 12 mm) white card or celluloid bit may be used as stage. On the stage instead of pinning, the insect specimen is stuck on it by using transparent or stain free adhesive. A spot of good glue or white gum can also be used. The insect should not be embedded in the glue and only minimum quantity of the glue should be used. After mounting, the card is pinned to the insect storage box with a large pin.

iii. Pointing: The insect specimen is glued to a card or celluloid bit into a triangle of 10 mm height and 5 mm base. Bend down the tip of the card to form a small surface to which the insect is stuck. Apply a drop of glue or adhesive by touching the point to the glue and to the thorax of the insect to be mounted. Press the right side of the specimen against angled and glued card tip. A bigger pin is inserted at the midpoint near the base for pinning the card with the insect to insect store box.

3. Liquid preservation

Soft-bodied forms (nymphs, larvae and many adults) shrivel when mounted dry. Such insects can be preserved in preservative fluids like ethyl alcohol (70%) and formalin (4%). All these preservatives are highly volatile. Screw cap vials are satisfactory if the caps are tight fitting. Seal the stopper with paraffin wax and properly label.

4. Setting

Setting insects is essential to study the wing characters. It affords a better look to the preserved specimens. Wings of moths, butterflies, dragonflies and damselflies are set on either side. In grasshoppers, wings on one side alone are set. Setting boards are used for setting insects. Setting should be done before the insects become stiff.

D- Labelling- Characters:

1-Any collection should have a locality label giving particulars about date and locality of its capture.

2- label is usually having the name or initials of the collector and the habitat or host from which the specimen is collected.

3- Labels should be small, (12 x 6 mm) neat and made of stiff paper.

4-Labels may be printed or hand written with micro tipped pen.

5-They are inserted beneath the insects at $1/3^{\text{rd}}$ height from the base.

6-If more than one label is used then the label should be parallel. All labels should be oriented so that they read from left side.

E-Display:

Insect store boxes: Commonly wooden boxes of dimension 45 x 30 x 15 cm are used as insect store boxes for displaying preserved insects. The box should be

1-light in weight, airtight

2-moisture proof with a well-fitting hinged lid. A cell is provided inside to keep repellents.

3-Cork sheets are glued to the inside of the top and bottom of the box to permit pinning.

4-Glass topped boxes can be used for displaying insect collections but the color of the preserved insects fades due to constant exposure to light.

After collecting insects. We work in different groups of insects

Museums:

1. Survey collections

Species are huge insects and confined to a specific geographic area such as Iraq

Such as the animal fauna of Iraq Fauna of Iraq Fauna.

2. Identification collections

Is the group in the large experiment stations and Agriculture quarantine, and reliable in the diagnosis of insect species are scattered in the vicinity of these stations

3. Research collections: Insect groups and are more accurate, which aim to collect samples for analysis of appropriate comprehensive taxonomic .. We have owned an individual or a State or universities, and deposited in the great museums.

4. Type collections: A group of original types that described for the first time when they are discovered and is referenced to determine whether it was one of the types that the study match the ideal model or different from him. These types are deposited in major museums

Identification and taxonomic discrimination:

Is the basic work of each work, and may be diagnostic at the species level difficult in groups with large numbers. It has now become impossible for one person that is doing reasonably well supported diagnoses of all insect groups, and this has taken some museums and institutions of global responsibility assumed diagnosis of insects.

Steps of Identification:

1. Preliminary key to orders and families

This step is important for the work of the novice category, and preferably be obtained from simple in General textbook or Handbooks.

2 . Key to genera and species. Can be relied upon in the diagnosis Monograph.

3.Reference to recent catalogues Can rely on Catalogue and like that on the Revision.

4. Back to the lists of references current and references of the original description of Zoological record.

6. Comparison with types and other authentically determined. Specimens at the museums.