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Entomological Curation: Collecting and Preserving Adult and Immature Insects

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Abstract

Insect collection and preservation are fundamental skills in entomology, essential for taxonomic studies, ecological research, and agricultural pest management. This paper describes the standard methods used for the collection and preservation of insects, including their immature stages such as eggs, larvae, pupae, and nymphs. Various collection techniques are reviewed, including the use of sweep nets, aspirators, Berlese funnels, traps, and aquatic nets. Preservation methods are categorized into three major approaches: dry preservation through pinning and spreading, wet preservation in preserving fluids such as ethyl alcohol and formaldehyde, and microscopic slide preparation for small and soft-bodied specimens. The significance of proper insect labelling and display practices is also discussed. These methods form the basis of scientific insect collections maintained by institutions for research, education, and biodiversity documentation.

Keywords: Insect collection, Entomological methods, Insect preservation, Pinning, Berlese funnel, Killing agents, Immature stages, Entomological pins, Slide preparation.

1. Introduction

Insect collection is not merely a hobby or a passion for a few; it is a critically important scientific activity for taxonomists, biologists, and agricultural students. Insects constitute more than 80 per cent of all known animal species on Earth, playing vital roles in ecosystems as pollinators, decomposers, predators, and herbivores. For agricultural scientists, understanding insect diversity and pest species is central to developing effective pest management strategies.

A well-maintained insect collection serves as a permanent reference for species identification, helps document biodiversity, and is indispensable for research in systematics, ecology, and applied entomology. However, the scientific value of a collection depends entirely on the quality of collection techniques and preservation methods employed.

This paper provides a comprehensive overview of the standard methods used in insect collection and preservation, covering collection materials and equipment, types of collection approaches, killing agents suitable for adults and larvae, and the three major preservation methods including dry, fluid, and microscopic slide-based techniques. Special attention is given to the preservation of immature stages and the importance of accurate labelling.

2. TYPES OF INSECT COLLECTION

Insect collection can be undertaken for different scientific purposes, and accordingly, different types of collection strategies are employed:

- **General Collection –** No specific insect species or group is targeted. Specimens are collected broadly to build a diverse reference collection.
- **Targeted Collection –** A specific species or group of insects is targeted, based on a defined research objective.
- **Casual Collection –** There is no specific interest to obtain a particular specimen; the insect may be found and collected accidentally.
- **Fositmal Collection –** Insects are collected based on a specific, standardized sampling protocol.
- **Qualitative Collection –** The primary interest is to determine only the presence or absence of a particular species in a given area.
- **Quantitative Collection –** The number of samples is estimated or counted for further statistical estimation and population studies.

3. MATERIALS AND METHODS

3.1 Insect Collection Equipment

- **Insect Net (Sweep Net / Aerial Net) –** Consists of a 75 to 125 cm long aluminium or wooden handle with a fibre grip at the end, a strong wire rim of 30–40 cm in diameter, and a cloth bag attached to it. Used for sweeping vegetation and capturing flying insects.
- **Aspirator –** A device used for capturing small insects. The basic design includes a two-vial system with a tight-fitting cork through which metal tubes are passed. Insects are sucked into the vial by drawing air through a rubber hose while pointing the other tube at the insect.
- **Berlese Funnel –** Used to extract insects from soil samples, leaf litter, or dung. A light source placed above the funnel forces insects downward due to negative phototropism (–ve phototropism), causing them to fall into a collecting jar containing preserving fluid (Ethyl Alcohol).
- **Traps –** Devices that attract and retain insects. They can be designed based on light attraction (light trap), chemical attraction (pheromone trap), or colour attraction (yellow sticky trap).
- **Aquatic Net –** Used for collecting aquatic and semi-aquatic insects. They are long and heavy-handled with square to triangular, thick wire hoops capable of withstanding water resistance.
- **Camel Hair Brush –** Used for carefully handling small sedentary insects such as aphids, scale insects, and immature stages including eggs and grubs, without causing damage to the specimen.

- **Insect Killing Bottle –** A sealed bottle containing a killing agent used to rapidly kill collected insects while preserving their external morphology.
- **Entomological Pins –** Special rust-proof stainless steel pins used for pinning insect specimens. Pin size is selected based on the size of the insect.
- **Hand Lens –** A portable magnifying device used to examine small insects or insect body parts during field collection.
- **Spreading Board –** Used for displaying butterflies and moths with their wings spread and set in the correct position. Consists of a plywood base with a longitudinal central groove and cork on either side.
- **Insect Storage Box (Schimmel Box) –** The standard insect storage box measures 34 cm in length, 30 cm in width, and 10 cm in height. The inner base is lined with cork to allow insertion of entomological pins.
- **Naphthalene Balls –** Solid white balls composed of crude oil, coal tar, and other chemicals. Placed inside storage boxes as a preservative to protect pinned specimens from attack by dermestid beetles and other insect pests.

3.2 Killing Agents

3.2.1 Killing Agents for Adult Insects:

→ **Liquid agents –** Ethyl acetate, Carbon tetrachloride, Ether, Chloroform, Ammonia, Benzene.

→ **Solid agents –** Calcium cyanide, Sodium cyanide, Potassium cyanide.

3.2.2 Killing Agents for Larvae and Immature Stages:

→ **Heat –** Larvae are dropped into hot water and left until the water cools completely.

→ **Chemical methods –**

→ XA Mixture – Xylin & Ethyl Alcohol

→ KAAD – Kerosene & Ethyl Alcohol

→ Glacial Acetic Acid + Dioxane

4. METHODS OF PRESERVATION OF INSECT SPECIMENS

Insect specimens are preserved by one of three standard methods, depending on the type and size of the insect:

4.1 Preserving Insects Dry (Pinning Method)

Dry preservation through pinning is the most widely used method for hard-bodied adult insects. Entomological pins are inserted through specific body positions depending on the insect group, as standardized in the following table:

Table 1. Standard pinning positions for different insect groups.

Insect Group	Standard Pinning Position
Butterflies, Moths & Dragonflies	Central position of the thorax
Flies, Bees & Wasps	Right of the middle of the thorax
Bugs (Hemiptera)	Right of the middle of the scutellum
Grasshopper	Pronotum
Beetles (Coleoptera)	Elytra (right elytron)

Spreading the Insect: A pinned insect with wings should be spread on a spreading board made of plywood with a longitudinal central groove and cork on either side. The wings are held in position using strips until the specimen dries completely.

Relaxing Dried Specimens: Dried and hardened specimens can be re-softened by placing them on cotton moistened with a little Carbolic acid in an air-tight jar for 24–48 hours before spreading.

Mounting Small Insects: Insects too small to pin directly are mounted using one of two techniques:

→ **Pointing –** Elongated triangular pieces of light cardboard are used, on which the insect is glued.

→ **Staging –** Cubes of thermocol are used as an alternative to triangular cardboard for mounting very small specimens.

4.2 Preservation in Fluids

All soft-bodied insects and immature stages (larvae, nymphs, eggs) can be preserved in **70% Ethyl Alcohol** or **4% Formaldehyde (Formalin)**. Specimens are placed in labelled glass vials or jars filled with the preserving fluid and sealed tightly to prevent evaporation.

4.3 Preservation on Microscopic Slides

Microscopic slide preparation is used for very small insects such as mites, thrips, scale insects, and other microarthropods. The specimen is prepared by spreading it on a glass slide with 1–2 drops of glycerine (a clearing and mounting medium) and covering it with a cover slip. The slide is then sealed and labelled for permanent microscopic examination.

5. INSECT LABELING

Insect labeling is an extremely important step in the maintenance of a scientific collection. A label must accompany every specimen and should include the following information:

- Scientific name of the insect (genus and species)
- Host plant or association
- Locality of collection (village, district, state)
- Date of collection
- Name of the collector

Labels are written or printed in small font and pinned below the specimen on the same pin. Without proper labelling, a specimen has no scientific value regardless of the quality of its preservation.

6. DISPLAY AND STORAGE OF PINNED INSECTS

The most commonly used container for displaying pinned insects is a **Schimmel Box** — a wooden box with an inner base lined with see sheet cork, which allows pins to be inserted firmly. The standard box size is 34 cm × 30 cm × 10 cm. Pinned specimens are arranged systematically in the box by order, family, and species.

For long-term protection of the collection, **Naphthalene balls** or **Paradichlorobenzene (PDB)** are placed inside the storage box to repel dermestid beetles and other pest insects that may damage the specimens.

7. CONCLUSION

The collection and preservation of insects is a precise, methodical process that requires the appropriate use of equipment, killing agents, and preservation techniques. Different insect groups demand specific methods — hard-bodied adults are best preserved by dry pinning, soft-bodied and immature stages in fluid preservatives, and micro-insects on microscopic slides. Accurate labeling is indispensable to the scientific utility of any collection. A well-maintained insect collection serves as an invaluable resource for biodiversity documentation, taxonomic research, and agricultural pest management studies. Students and researchers in entomology must develop proficiency in these fundamental techniques as the foundation of all subsequent scientific inquiry.

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