

## INSECTS

### Classification and clues to field identification and collection

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#### I. INTRODUCTION

Insects belong to the Phylum Arthropoda and class Insecta. Insects are six-legged arthropods. Centipedes, scorpions, millipedes, spiders and mites are not insects. Insects are the most numerous animals on earth today. So far about 1250000 species of animals have been identified and described in the world of which 900,000 species are insects. And among the <sup>several</sup> orders of insects, the order coleoptera (Beetles and Weevils) alone contains 200000 of the described species. Today, at least a million more species of insects are to be discovered and described. Such is the abundance of insects.

#### II. CLASSIFICATION

The classification followed here and the one more generally accepted is the classification by A.D. Imms. According to this, insects fall into 29 orders, under two major groups - the apterygotes (wingless insects) and pterygotes (winged insects).

Apterygota:

1. Thysanura
2. Diplura
3. Protura
4. Collembola

Pterygota:

- |                    |                  |
|--------------------|------------------|
| 5. Ephemeroptera   | 18. Siphunculata |
| 6. Odonata         | 19. Hemiptera    |
| 7. Plecoptera      | 20. Thysanoptera |
| 8. Grylloblattodea | 21. Neuroptera   |
| 9. Orthoptera      | 22. Mecoptera    |
| 10. Phasmida       | 23. Lepidoptera  |
| 11. Dermaptera     | 24. Trichoptera  |
| 12. Embioptera     | 25. Diptera      |
| 13. Dictyoptera    | 26. Siphonaptera |
| 14. Isoptera       | 27. Hymenoptera  |
| 15. Zoraptera      | 28. Coleoptera   |
| 16. Psocoptera     | 29. Strepsiptera |
| 17. Mallophaga     |                  |

Thysanura:

Insects belonging to this order are commonly known as 'Silverfish' or 'Fire brats'. These insects are common inside houses on walls or behind wall-pictures or behind doors. They cause considerable damage to paper and books (Fig.1).

Protura and Diplura:

Very small insects living in soil, debris or leaf mould. These are either left unnoticed or non-existent in some areas.

Collembola:

Called 'spring-tails' or 'snow fleas' because of their hopping nature, these insects may be seen in moist concealed regions - under a flower pot for example. Small and usually white.

Ephemeroptera:

Insects are small and delicate with well developed wings and long caudal processes. These are called 'May flies'. The larvae (or nymphs) are aquatic (Fig.2).

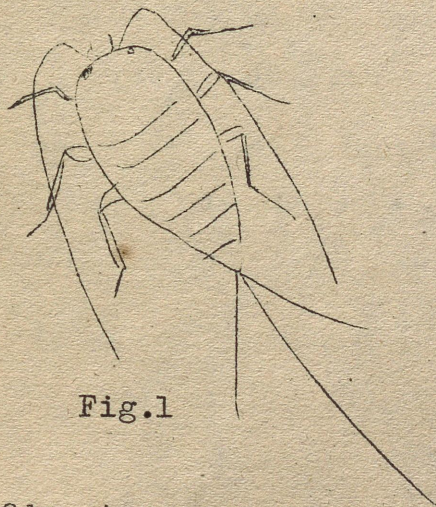


Fig.1



Fig.2

Odonata:

Commonly known as 'dragon flies' and 'damselflies'. The nymphs of both forms are aquatic. Dragonflies (fig.3) are fast fliers, larger in size than the latter and when at rest always keep wings horizontal to the body region. Damselflies are weak fliers, more colourful, and small. When at rest the

wings are held vertically up (fig.4).

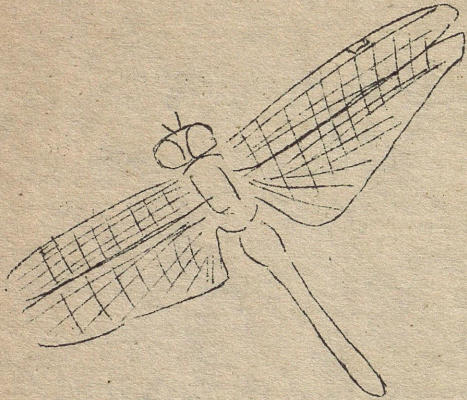


Fig.3

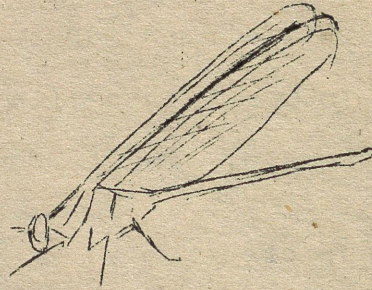


Fig.4

Orthoptera:

Locusts, grass hoppers, crickets and mole-crickets come under this order. Generally all these insects have powerful and exaggerated hind legs which enable them to leap. The antennae may be long as in the long horned grass hoppers (fig.5) or short as in the locusts and short horned grass hoppers (fig.6) or in between as in the crickets (fig.7). A wide range of colours can be seen among these insects - green, brown and black usually dominating.

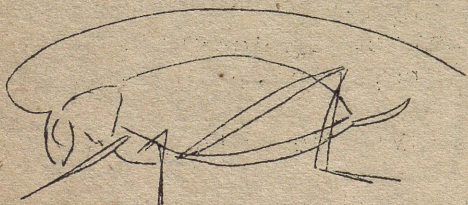


Fig.5



Fig.6

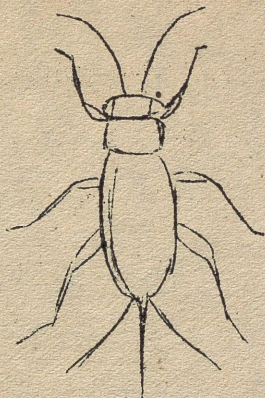


Fig.7

Phasmida:

Fig.8

The stick and leaf insects belong to this order. The stick insect is more common due to its habitat preference. This insect fig.8 usually seen on the grass gets flushed as we walk through the grass and is more often noticed than its cousin the leaf insect which prefers a denser canopy of broad leaves which it closely resembles.

Dermaptera:

Commonly called the 'Earwigs' . These insects are reputed for their habit of entering one's

ears and puncturing the drum though it is not so. Small insects either black or brown in colour, soil dwelling. Their tail end bears a forceps like structure and the fore wings are reduced to shields under which the hind wings fold (fig.9).

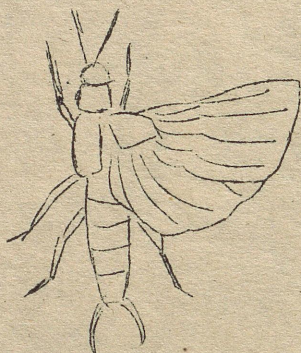


Fig.9

Embioptera:

Insects belonging to this order are called 'embids' generally. These are small sooty brown or black insects living in silk-lined tunnels underground (Fig.10). These insects are often seen under lights. The females are wingless.



Fig.10

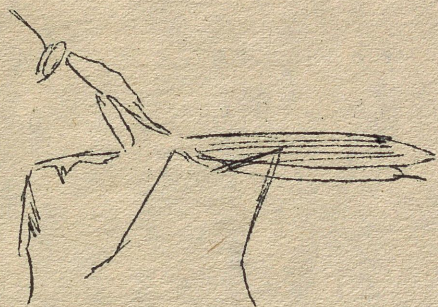
Dictyoptera:

Fig.11



Fig.12

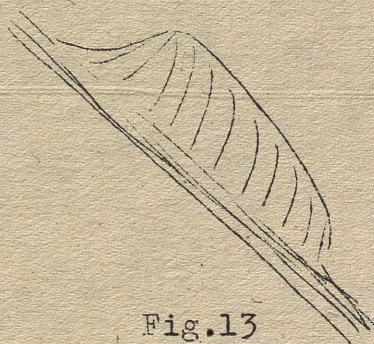


Fig.13

Cockroaches and praying mantises come under this order. The forelegs are enlarged and modified for grasping the prey in praying mantises (fig.11). In both cases the eggs are laid in a hard capsule called the ootheca which may be placed any where as in the case of cockroaches (fig.12) or plastered to a branch or hard surface as in the praying mantises (fig.13) Cockroaches can feed on almost anything while the praying mantises feed on insects including its own kind.

Isoptera:

The termites or white ants that come under this order are varied in their habits. Some build the anthills while others live in trees or soil. These are not truly ants.

Psocoptera:

Minute insects which are white or creamy and called the 'book lice'. These are seen under books, between pages in bird cages and insect preserving boxes where they cause considerable damage. Winged as well as wingless forms exist.

Mallophaga:

These are insects which are ecto-parasites on birds and hence called 'bird lice'. Creamy white insects seen between feathers especially on poultry birds. They feed on the broken particles of feathers and skin of the birds.

Siphunculata:

The head louse and body louse of man fall in this order. Small black or whitish insects with their legs modified for clinging.

Hemiptera:

A very large order broadly divided into 2 sub-orders viz., Homoptera and Heteroptera based on their wing structures. All these insects have elongated mouth parts for piercing and sucking.

Homoptera

wings membranous (fig.14)  
Cicadas, leaf hoppers,  
Tree hoppers, cuckoospits,  
aphids, scale insects,  
mealy bugs and white flies  
come under this sub order



Fig.14

Heteroptera

wings partially membranous  
(fig.15)  
water skaters, water boatmen,  
giant water bug, water  
scorpions, stink bugs,  
assassin bugs, plant bugs etc.,  
come under this sub order.



Fig.15

Thysanoptera:

These are minute insects called 'Thrips'. Thrips may be seen on leaves as well as on flowers of plants. The wings are fringed along each margin (fig.16). Economically important as pests.

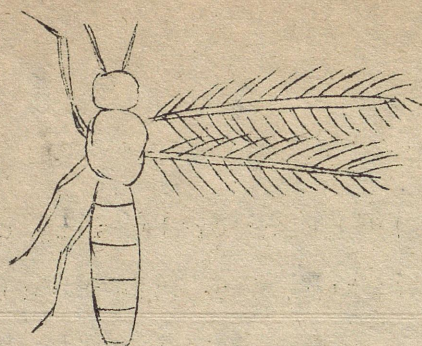


Fig.16

Neuroptera:

Ant lions, green lace wings and mantis flies come under this order. Ant lions are commoner the larvae of which live in conical pits in the soil (fig.17). All these are insectivorous by nature. The wings are roofed over the body at rest.

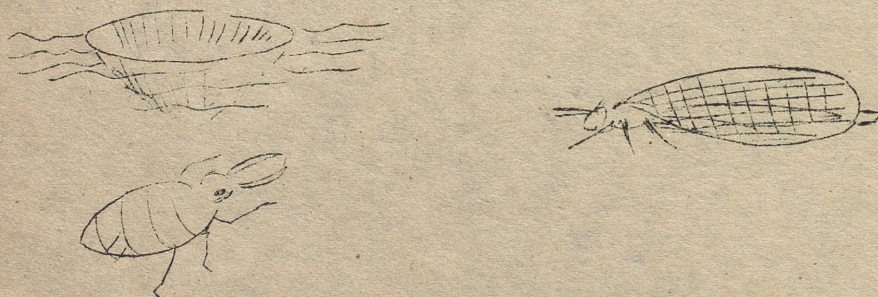


Fig.17

Mecoptera:

'Scorpion flies' are distinguished by the elongate face and an upward curved abdomen resembling a scorpion (fig.18). Insects are generally brown.

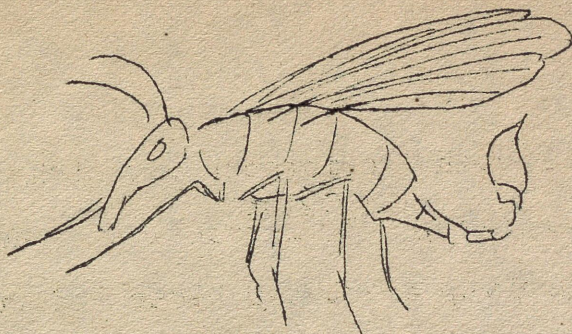


Fig.18

Lepidoptera:

Butterflies and moths come under this order.

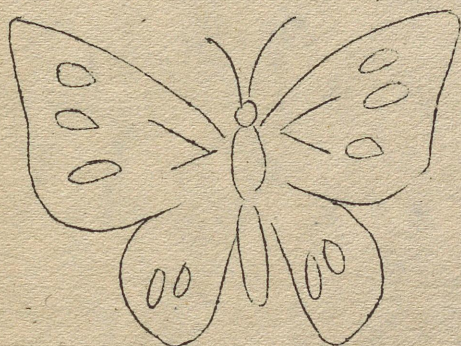


Fig.19

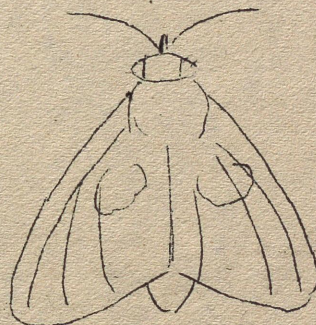


Fig.20

Butterflies(fig.19)

Diurnal(day fliers)  
wings held upright  
at rest  
striking colours  
antennae plain

Moths (fig.20)

Nocturnal (Night fliers)  
wings held covering body  
or roofed over body at  
rest  
less colourful  
antennae with hairs

These insects are pollinating agents since their chief food is nectar.

Trichoptera:

Small mothlike insects with long antennae called 'Caddis flies' (fig.21). The larvae are aquatic making for themselves a tubular house, of trash material under water, which is dragged along while moving about.

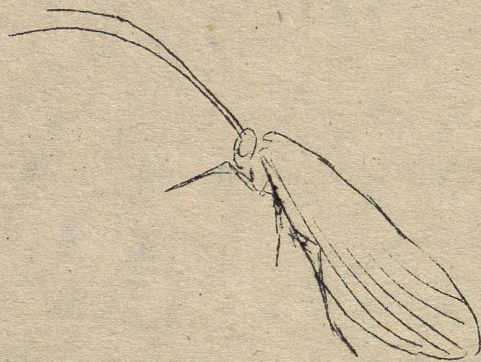


Fig.21

Diptera:

The true flies. Have only one pair of developed wings. The hind pair is reduced into knobs or halteres (fig.22). Mosquitoes, crane flies,

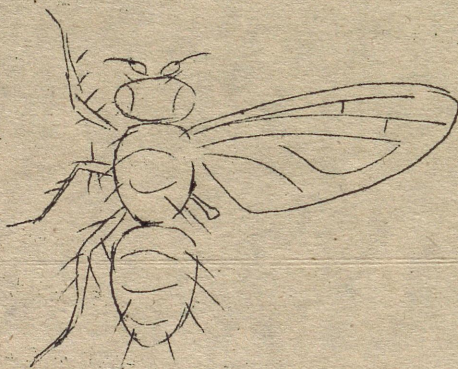


Fig.22

horse flies, cattle flies, fruit flies, robber flies and drosophila come under this order.

Siphonaptera:

The 'fleas'. These are very small black, laterally compressed insects seen on dogs cats and birds. The legs are modified for leaping (fig.23) and the mouth parts aid in sucking blood from the host.



Fig.23

Hymenoptera:

The wings are membranous. Wasps (fig.24), Bees (Fig.25) and Ants belong to this order. These insects are very active and many of them carry well developed stings. Social behaviour is recognised in ants, honey bees and some of the wasps.

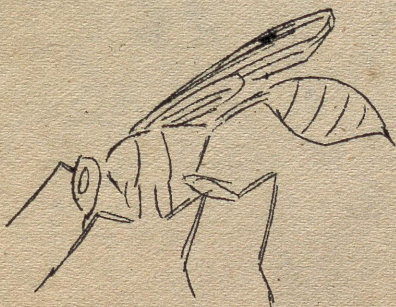


Fig.24

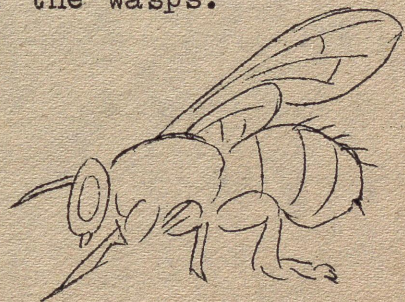


Fig.25

Coleoptera:

Beetles and weevils come under this order. Beetles have a hard body and hard forewings or elytra. All forms of beetles (fig.26) including the water beetles have these characters. The weevils however are distinct by the presence of an elongated snout (fig.27). There is a wide range of size, shape and colour in this order of insects.



Fig.26



Fig.27

Plecoptera:

These are called stone flies. The larvae are found in water. These insects are very rarely seen (fig.28). There are a few orders which have been deliberately excluded from describing as they are less significant and occur very rarely under tropical conditions such as Grylloblatodea, Zoraptera and Strepsiptera, which is a parasite on other insects.

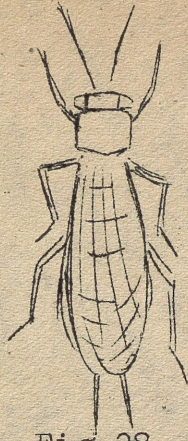


Fig.28

### III. RECOGNISING THE IMMATURE STAGES OF INSECTS

Butterflies and moths: Larvae are called Caterpillars

(1) Caterpillars with hairs.

-Tiger moths (fig.29)

-Lymantrid moths (fig.30)



Fig.29

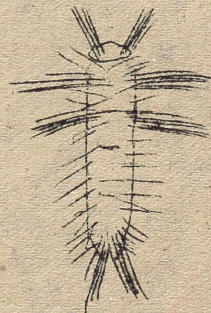


Fig.30

(2) Caterpillars with a 'horn'  
at the tail end (fig.31)

-Hawk moths



Fig.31

(3) Caterpillars in bag like structures (fig.32)

-Bag worms (Psychids)

caterpillar  bag/case

Fig.32

(4) Caterpillars with long crab-like legs

-Crab Caterpillar

(5) Caterpillars moving in 'loops' or loopers

-Geometrid moths (fig.37)

Beetles:

-White grubs (fig.33) - Chafers and Rhinoceros

beetles

-flat heads/borers (fig.34) - long horned beetles  
and jewel beetles.

-emitting light - fire flies/glow worms.

Bugs, Cockroaches, Grass hoppers and Praying mantises:

The young are called 'nymphs'. They resemble the adults in shape generally though the colour may vary considerably and the wings are in the form of 'pads' (Fig.35)

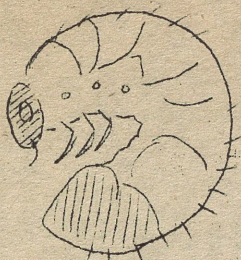


Fig. 33



Fig. 34



Fig. 35



Fig. 36



Fig. 37

#### IV. DEFENCE MECHANISMS IN INSECTS

1. Stings: Most of the wasps and bees can sting. Wasps don't die after a sting. Bees do. Only females can sting.

2. Urticating hairs: Hairy caterpillars when handled can cause reddening and irritation of skin due to allergic substances contained in the hairs.
3. Bites: Most beetles and the water bugs can inflict a painful but harmless bite.
4. Acidic secretions: Some insects can eject a hot acid which can burn <sup>or</sup> / stain the skin. One example is the bombardier beetle (fig.36).
5. Regurgitation: Most caterpillars 'vomit' or regurgitate the food when picked up.
6. Strong odours: Most bugs and few beetles give off a very bad and persistent odour when handled.
7. Mimicry: Many butterflies mimic other species of butter flies which are distasteful to birds or other predatory animals. Flies mimic some of the wasps.
8. Camouflage: Stick insects, leaf insects, some of the caterpillars and long horned grass hoppers look like leaves or bark or branches.
9. Others: The larvae of citrus butter flies can produce a pair of 'horns' from the head when handled. Some beetles 'drop dead' when touched.

## V. INSECT COLLECTING, PINNING, and PRESERVING

Collecting equipment:

1. Nets
2. Killing bottles - a tight closing bottle with potassium cyanide crystals over which a layer of plaster of paris is laid. Bottle should be labelled 'poison' clearly.
3. Other killing agents - Chloroform, Ethyl acetate.
4. Forceps, glass vials etc.
5. Insect boxes.

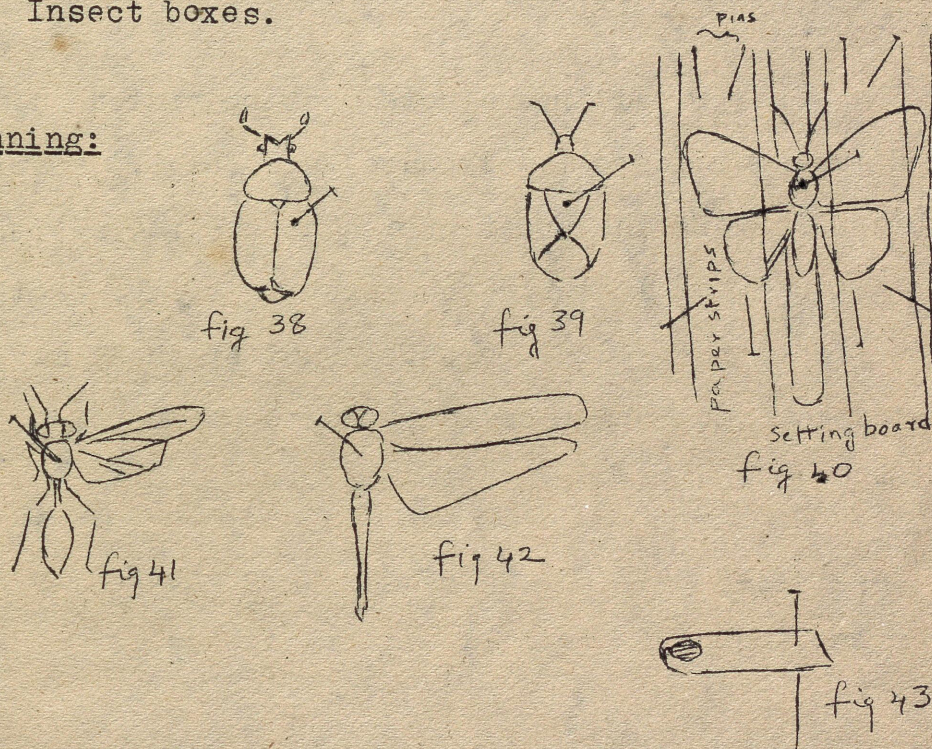
Pinning:

Fig.38 - 43

Beetles(fig.38), Bugs(fig.39), Butterflies and moths (fig.40), Wasps(fig.41), dragon flies(fig.42) and smaller insects (fig.43).

(Smaller insects may be stuck using water soluble gum to a piece of card and pinned through as in figure ).

All insects should carry a label. Date of collection. Place of collection. Host plant and name of the collector should find a place on each label. The label is put below the insect on the pin.

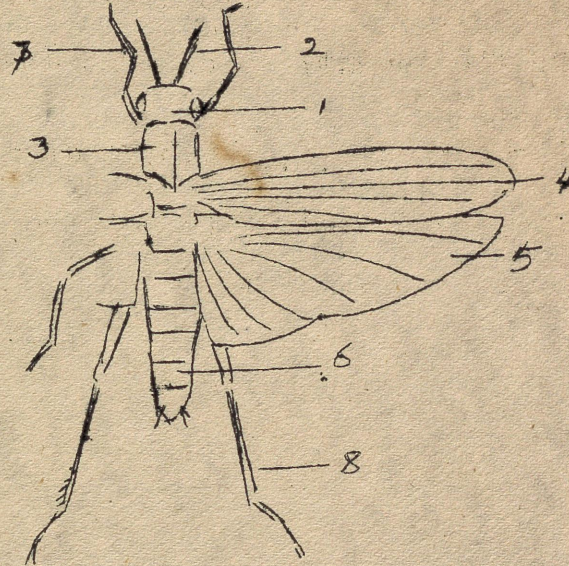
It is always better to use insect pins than ordinary pins in pinning insects.

Preservation:

The pinned dry insects must be protected from damaging insects (book louse) and fungi. Keeping the boxes in moisture proof areas and keeping naphthalane balls (moth balls ) inside the boxes is ideal. Moth balls can be pinned inside the boxes. A hot pin head may be thrust into a moth ball and allowed to set before pinning into the insect storage box.

Smaller insects and flies may be preserved in 70 percent alcohol. Formaldehyde is not good.

## VI. INSECT STRUCTURE (fig.44)



1. Head 2. Antenna 3. Thorax 4. Forewing  
5. Hindwing 6. Abdomen 7. Foreleg 8. Hindleg

## FURTHER READING

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