FACTORS FOR INSECTS ABUNDANCE

Measures of dominance

1. **More number of species:** In the animal kingdom more than 85 per cent of the species belongs to insect group. Total number of insects described so far is more than 9 lakhs.

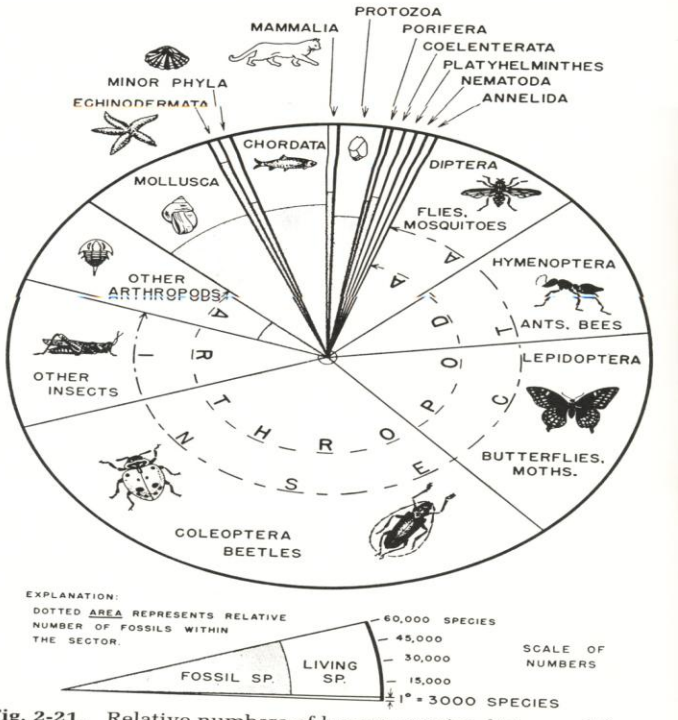


Fig. 2-21. Relative numbers of known species, living and fossil, of various phyla. (From Muller and Campbell, 1954, with permission of *Systematic Zoology*).

2. **Large number of individuals in a single species:**

   e.g., Locust swarm comprising of 10^9 number of individuals, occupying large area.

3. **Great variety of habitats:** Insects thrive well under varied conditions.

4. **Long geological history:** Insects were known to occupy this earth for more than 350 million years, which is a good track record. This has given the insects great variety of adoptions under different conditions.

Reasons for dominance

1. Capacity for flight: Insects posess wings, which is the lateral extension of exoskeleton. Insects are the earliest animals and the only flying invertebrates. Flight is used for the following purpose.

i. To seek food, mate, shelter and oviposition sites

ii. To colonize in a new habitat and also to exchange habitat.

iii. To escape from enemies and unfavourable conditions.

iv. To migrate (i.e. for long distance travel e.g. Locusts)

2. Adaptability or Universality: Insects are the earliest groups to make their life on the earth and to occupy vast habitats of soil and water.

i. Found in wide range of climatic conditions, from -50°C to 40°C.

ii. ***Psilopa petroli*** found in crude petroleum well.

iii. ***Ephydra*** fly living in great salt lake.

iv. Every flowering plant providing food for one or many **Phytophagous** insects.

v. Even the decomposing materials serving as food for many **Saprophagous** insects.

vi. Many **Carnivorous** insects are parasitic on other animals and insects.

3. Size: Majority of insects are small conferring the following physiological and ecological advantages.

i. Exploitation of numerous ecological niches inaccessible for other animals.

ii. Less **space, food, time and energy** requirements for development and sustaining life.

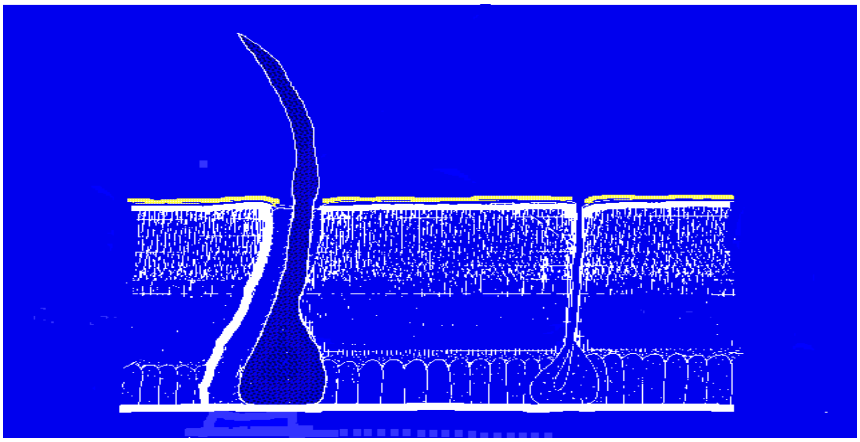
iii. Energy Utilization maximum.

iv. Less gravitational effect.

v. Muscular action and tracheal respiration more effective.

vi. Easy escape from enemies.

4. Exoskeleton: Insect body is covered with an outer **cuticle** called **exoskeleton** which is made up of a cuticular protein called **Chitin**. This is light in weight and gives strength, rigidity and flexibility to the insect body.



EXOSKELETON CROSS SECTION

Uses: i.Act as external armour

Ii.Provides space for muscle attachment

Iii.Prevents water loss

5. Resistance to desiccation: Insects minimise the water loss from their body surface through the following processes.

I. **Prevention of water loss:**

i. Lipids and polyphenols present in the **Epicuticle** acts as water proofing.

ii. **Was layer** with closely packed wax molecules prevents escape of water.

iii. **Spiracles** are closed to prevent water loss.

iv. In the egg stage **shell development** prevents water loss and desication of inner embryos.

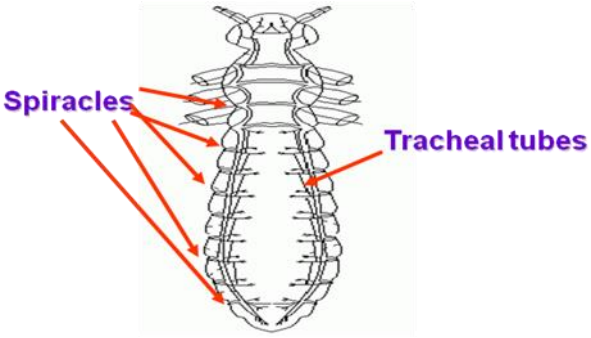
II. Conservation of water

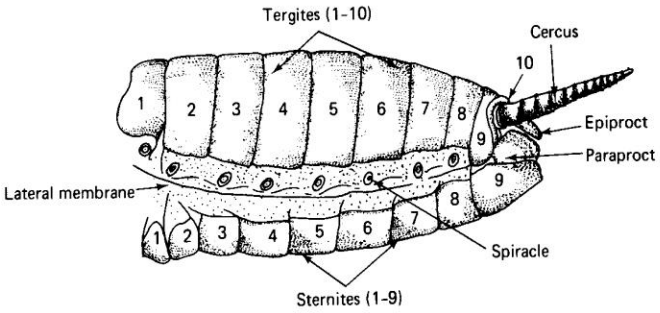
i. Capable of utilizing **metabolic water**

ii. **Rectal resorption** of water from faeces.

iii. Terrestrial insects use less quantity of water to remove the nitrogenous waste (**Uric acid**) which is water insoluble.

6. Tracheal system of respiration: This ensures direct transfer of adequate oxygen to actively breathing tissues. Spiracles through their closing mechanism admit air and restrict water loss.





7. Reproductive potential: Reproductive potential of insect is high due to the following reasons:

i Egg laying capacity (**fecundity**) is high. e.g., Queen termite lays 6000 - 7000 eggs per day for 15 long years.

ii. Development period is short. e.g., Corn aphid produces 16 nymphs per female which reaches the adulthood within 16 days. There by one generation is completed within a short period of 16 days, which favours greater genetic changes in the insect population, like quicker development of insecticide resistant strains.

iii. Careful selection of egg lying sites and protection of eggs.

iv. Exhibits parental care like **progressive provisioning** (e.g. bees) and **mass provisioning** (e.g. Wasps)

v. Presence of special types of reproduction other than oviparity and viviparity.

* **Polyembryony:** Development of many individuals from a single egg. e.g. parasitic wasps.

* **Parthenogenesis:** Reproduction without male or without fertilization, e.g. aphids

* **Paedogenesis:** Reproduction by immature stages. e.g. certain flies.

8. Complete metamorphosis: More than 82 per cent of insects undergo complete metamorphosis (**Holometabolous insects**) with the following four stages.

i. **Egg:** Inactive, inexpensive, inconspicuous and embryo develops inside.

ii. **Larva:** Active, feeds, digests, grows and store food.

iii. **Pupa:** Inactive, internal reorganisation and resist adverse conditions.

iv. **Adult:** Active, reproduce and disperse

As the larval and adult food sources are different, competition for food is less.

9. Defense mechanisms: By using the following defense mechanisms, insects escape from the enemies to increase their survival rate.

i. **Behavioural:** Thanatosis - insects pretends as if dead. e.g. some beetles.

ii. **Structural** e.g. hardened forewings of beetles known as **elytra** protect the beetles from predation of birds.

iii. **Colourational:** Presence of protective colours. e.g.Stick insects

iv. **Chemical:** Presence of defensive chemicals. e.g. Bees producing venom

10. Hexapod locomotion: Insects uses 3 legs at a time during locomotion, while the remaining 3 legs are static, which gives greater stability.