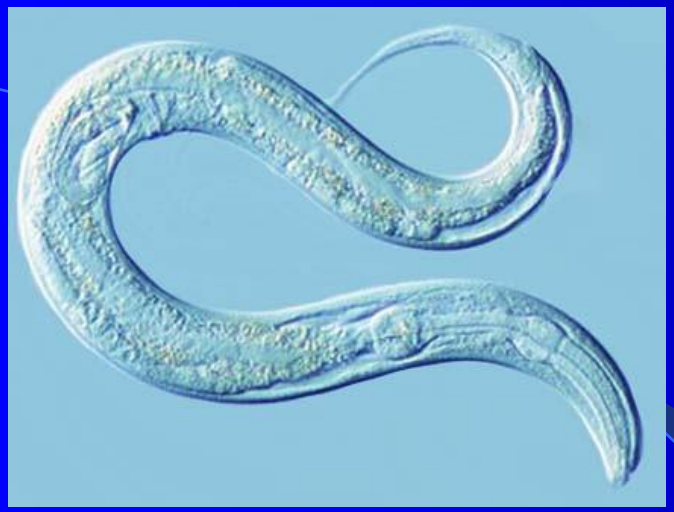
Multicellular soil fauna



Filum	Sınıf	Alt sınıf	Genel adı
Plathelminthes	*Turbellaria*		Yassı kurtlar
Aschelminthes	*Nematoda* *Rotifera*		Nematodlar (yuvarlak kurtlar) Rotatorlar (tekerlek hayvanları)
Mollusca	*Gastropoda*	*Pulmonata*	Salyangozlar
Annelida	*Oligochaeta*		Yer solucanları
Arthropoda	*Crustaceae*	*Isopoda*	Tesbih böcekleri
	Myriapoda	*Diplopoda* *Chilopoda*	Kırkayaklar Kırkayaklar
	Insecta (Apterygota)	*Collembola*	Yay kuyruklular
	Insecta (Pterygota)	*Isoptera* *Coleoptera* *Diptera (larva)* *Lepidoptera* *Hymenoptera*	Termitler Kın kanatlılar Çift kanatlı larvaları Kelebekler Karıncalar
	Arachnida	*Scorpionidea* *Araneida* *Acarina(Acari)*	Akrepler Örümcekler Akarlar

Free-living flat worms

move in the soil throughout plant roots or canal systems previously created by other living things (not active soil tillers,).

The most known examples of free-living flat worms:

Turbellaria **(flat worms),**

Nematodes **(unsegmented worms with elongated rounded body pointed at both ends)**

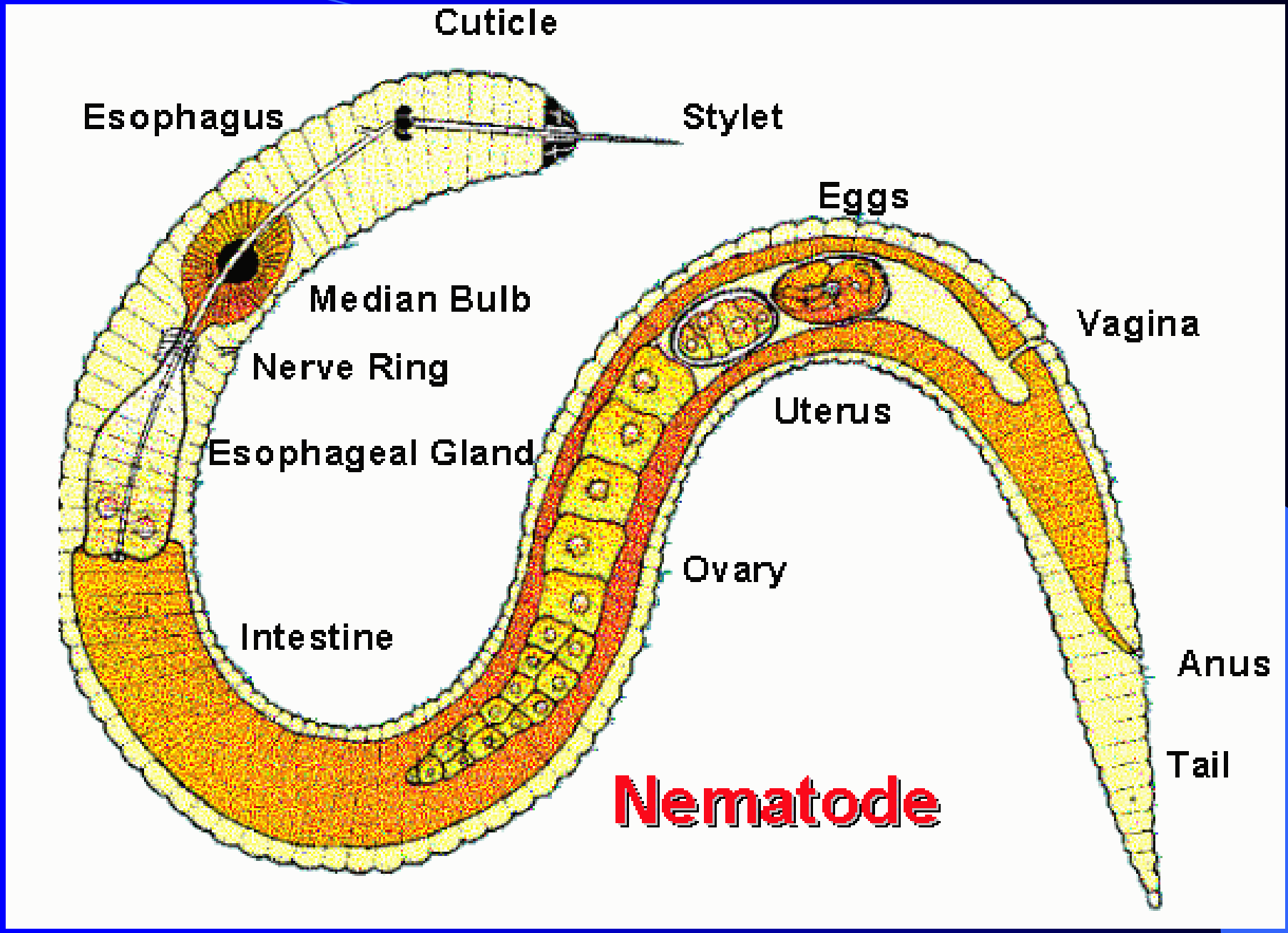
Turbellaria

Aschelminthes

Nematod

Nematodlar (Kıl Kurtları)

- **Nematodes are the most common soil organisms following protozoa (in the respect of numbers)**
- The majority of nematodes with more than 10,000 species are aquatic and parasitic creatures.
- Most of them are microscopic and transparent organisms (usually having a size between 0.3-1.5 mm).
- Genarally living in 10 cm dept of soil surface
- Population densities are around 10^6 m^{-2}. However, this number may increase to 20 x 10^6 m^{-2} - 30 x 10^6 m^{-2} in pasture and forest soils
- Found in high numbers, especially where plant roots are concentrated.


Cuticle
Esophagus
Stylet
Eggs
Median Bulb
Vagina
Nerve Ring
Uterus
Esophageal Gland
Ovary
Intestine
Anus
Tail
Nematode

Nutrition habits

Nematodes feed on;

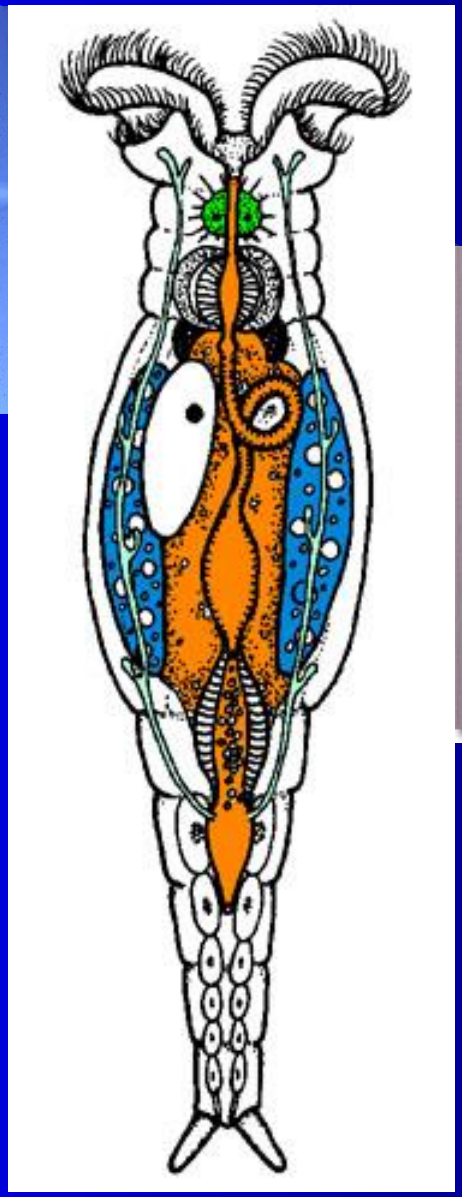
- the metabolites of living plant roots (beet nematodes),
- fungi and algae,
- bacteria,
- protozoa, rotator and other nematodes,
- decaying substances.

Ecological roles of nematodes

- The species feed on plants and algae cause significant damage in agriculture (root pathogenic nematodes, especially in cereals (wheat, barley, corn etc)
- Nematodes are significant due to their predatory (controlling) effect on soil microfauna responsible for the formation of soil organic matter.

Rotators

- small aquatic multicellular organisms of the phylum Rotifera.
- they have a ring of cilia resembling a wheel
- they are active only if there is a sufficient water in the soil.
- They usually live in forest litter floor rich
- Population intensity may reach to 10^5 m^{-2}.
- 100 rotator species recorded living in soil, so far.
- Their size can change between 0.42 - 2 mm .
- Some rotators can feed on protozoa ve algae.

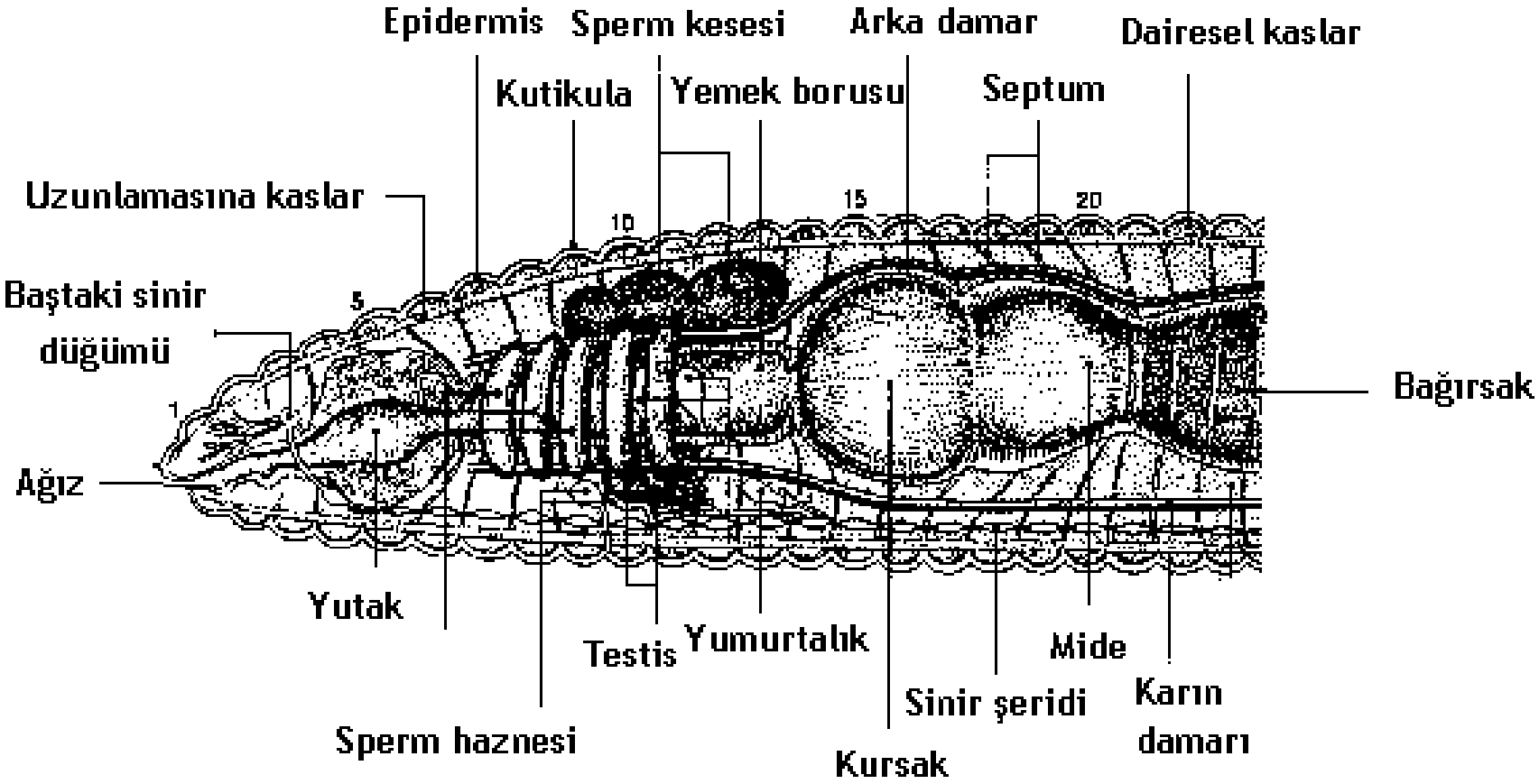


Earthworms (Oligochaeta)

Earthworms (Oligochaeta)

- Earthworms are placed in the *Lumbricidae* family of the *Oligochaeta* class of the Annelida branch, known as ring worms, which includes 36 families worldwide.
- Soil earthworms feed on plant debris (dead roots, leaves, grasses, manure) and soil.
- They built tunnels to mix minerals and organic residues in soil.
- The extensive channelling and burrowing by earthworms loosens and aerates the soil and improves soil formation and drainage as well.
- The numbers of earthworms are in the range of 100-400 / m^2 in the forests of tropical regions .

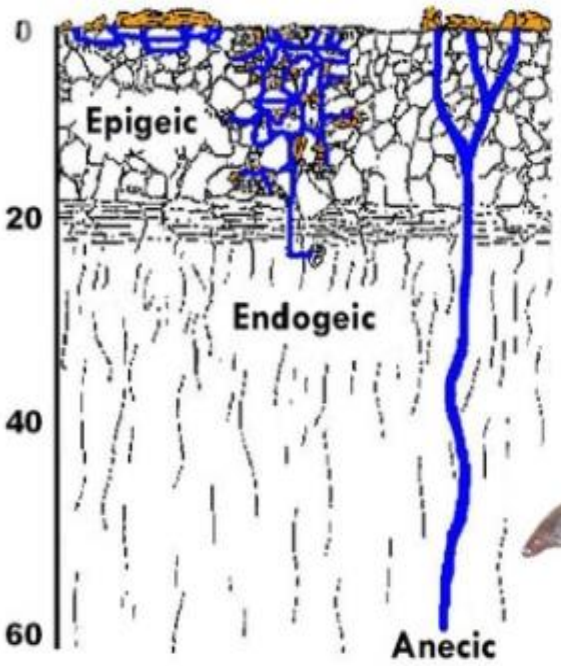
Anatomy of earthworms



Factors effecting earthworms in soil

- Human effect (soil management, agriculture, soil sealing, polution)
- Climate (only desert conditions are extreme for earthworms)
- Plant litter characteristics (food type)
- Other soil characteristics such as temperature (15-27 C optimum), humidity, aeration, pH organic matter content etc.

Earthworms according to their address



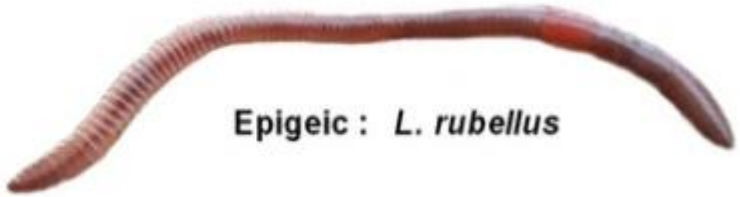


Diagram courtesy of the Science Learning Hub. Figure adapted from Fraser and Boag, photos of earthworms copyright Ross Gray.

Epigeic Earthworms (living near surface)

- Epigeic earthworms live in areas containing high amounts of organic matter.
- They live at or near the soil surface and feed on leaf litter, decaying plant roots or dung.
- These earthworms do not form permanent burrows.
- Epigeic species tend to have dark skin colour (pigmentation).
- The pigmentation acts as camouflage as they move through the leaf litter. It also helps to protect them from UV rays.
- Being close to the ground surface exposes the earthworms to predators so their muscles are strong and thick in proportion to their length, allowing for quick movement.
- Being so close to the surface also makes them vulnerable to stock treading in intensively grazed paddocks.
- Epigeic species tend to be small (1–18 cm in length).

Endogeic Earthworms (living below surface)

- Their niche is the top 20 cm depth of soil.
- Endogeic earthworms eat large amounts of soil and the organic matter in it, although species sometimes come to the surface to search for food.
- They form shallow semi-permanent burrows.
- Endogeic earthworms have some pigmentation.
- Their muscle layers are not as thick nor do they move as quickly as epigeic earthworms.
- Endogeic species range in size from 2.5–30 cm.

Anecic Earthworms (living in deep soil)

- Anecic earthworms live in permanent burrows as deep as 3 m below the soil surface.
- They collect food from the soil surface and ingest organic matter from the soil. Anecic earthworms form extensive burrows that extend laterally and vertically through the subsoil.
- Their burrows can be up to 2 cm in diameter.
- Introduced anecic earthworms have little pigmentation (because they live deep in the soil, and being so pale, they are often referred to as milk worms.
- These deep-burrowing species are also the longest, ranging from 3 cm up to a very large 1.4 m.

Why earthworms are important

- Worms built tunnels and burrows introducing water and air into different soil layers and improves soil aeration and water drainage.

- Worms can eat as several times much as their own weight of soil and organic litter every day and expel them so that soil microorganisms can feed on this feces.

- Worm feces also stick soil particles and improve soil aggregation which is a great support for soil structural formation
- Worm feces are rich in nutrient and help to improve soil fertility and plant nutrition

TERMITES

Soil dwelling termites dig nests in the ground that have a significant impact on the soil environment. Activities of termites can result in accumulation of organic matter and enrichment of nutrients and minerals in the soil.

White ant or termite?

- Although they are famous as ‘’white ants’’ and resemble ants in appearance, they are actually more closely related to cockroaches than ants.

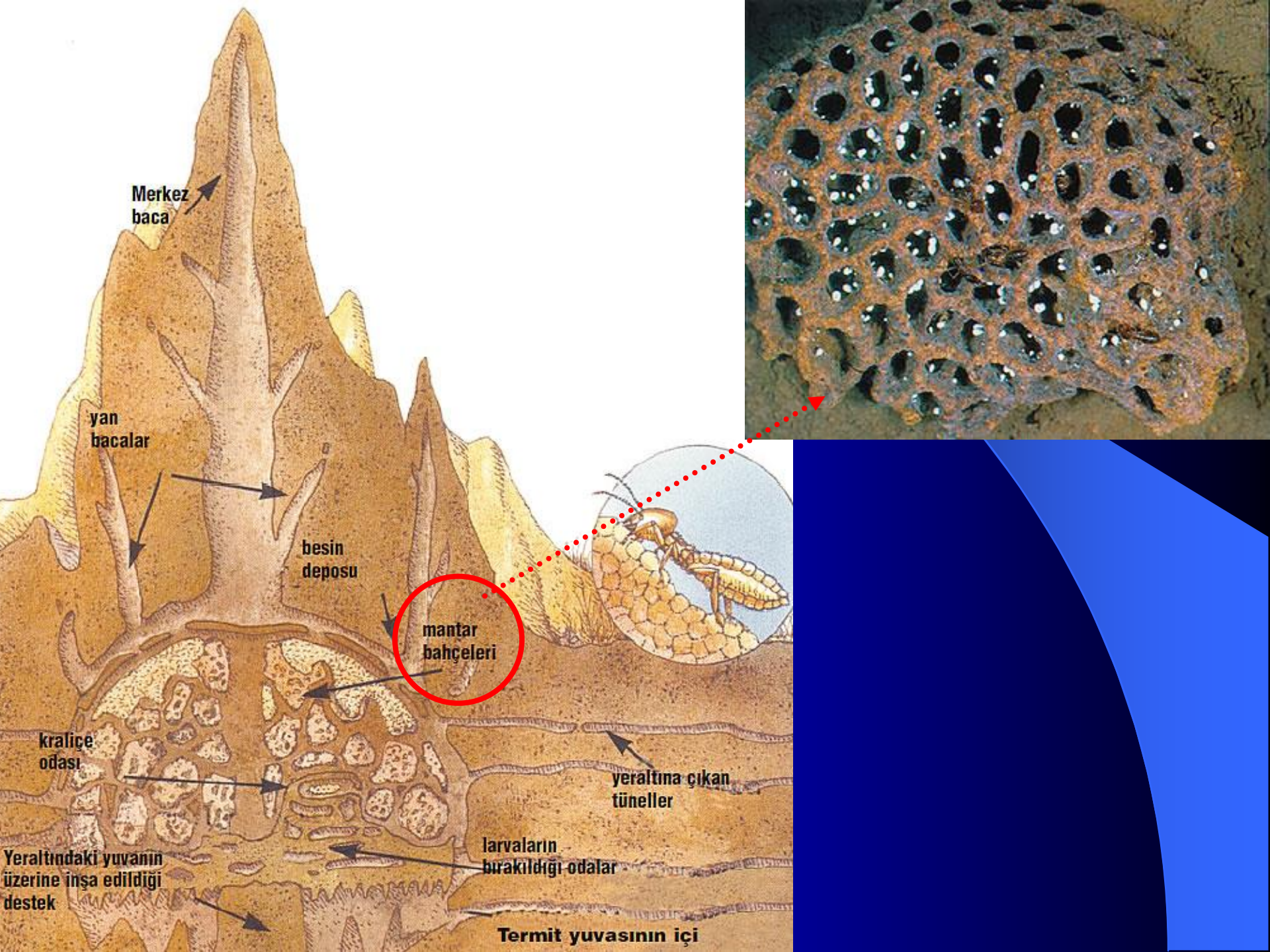
- Because ants are placed in the *Hemiptorodea* order, where bees are also placed, and termites belong to the *Orthopterodea* order where cockroaches belong to the *Isoptera* order.

- Plants grow faster around termite colonies.
- Animal populations around termite colonies are also higher.
- These are all related termite activities stimulating nutrient flow and water drainag

- Termites are important since they decompose cellulose, which is very difficult to break down and destroy in nature, and produce large amounts of CO_2 and CH_4, thanks to flagellated protozoa living in their digestive system.

- If termites are not existed, there woud be huge plant waste accumulations in the nature making life impossible!

Termite Engineering Miracles


Merkez baca
yan bacalar
besin deposu
mantar bahçeleri
kraliçe odası
yeraltına çıkan tüneller
larvaların bırakıldığı odalar
Yeraltındaki yuvanın üzerine inşa edildiği destek
Termit yuvasının içi

Karıncalar (Formicoidae, Hymenoptera)

- Although not related to termites, they are social insects like them and form regular communities. The activities of these creatures are common, especially in mixed and coniferous forests
- Ants feed on insects and are particularly effective in consuming forest pests. Ant species also engage in beneficial activities for the soil, such as building underground galleries, loosening the soil and moving from one place to another.
- Seed and grass collecting species may create a negative effect in the nature.
- In semi arable rural areas, (where vegetation is weakened by overgrazing) remaining weed is collected by ants, which may cause an increasing water erosion.

Weaver ants