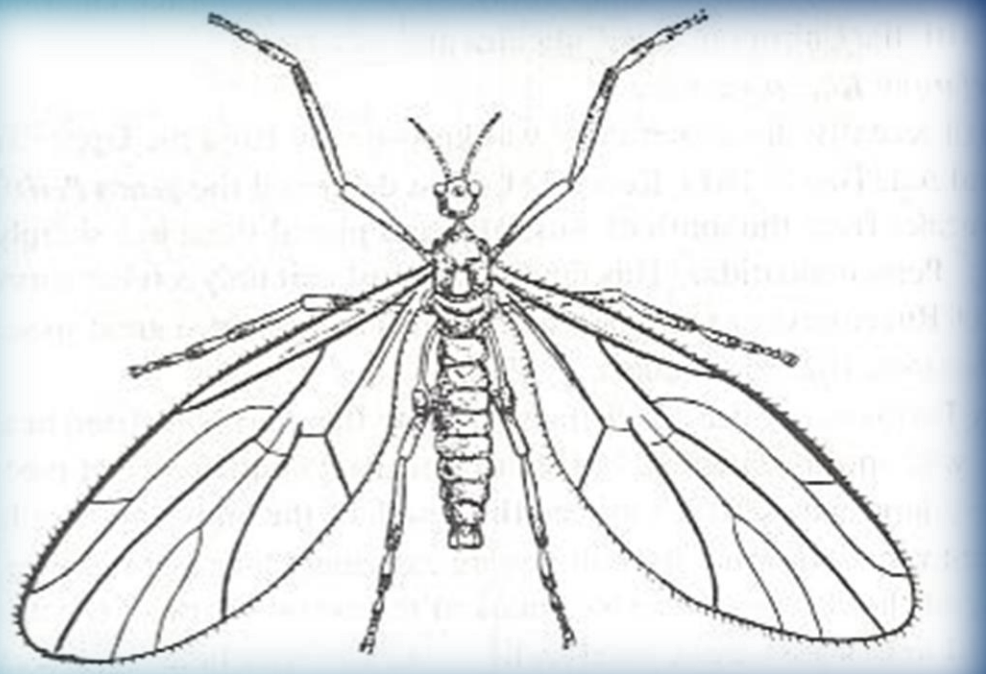
ERENKÖY IŞIK FEN LİSESİ

MACROINVERTEBRATES AND BIOINDICATORS OF RIVER GÖKSU

Diptera



General Information

- **Dipteran** (order Diptera), any member of an order of insects containing the two-winged or so-called true flies.
- One of the largest insect orders, it numbers more than 120,000 species that are relatively small, with soft bodies.

Genereal Information

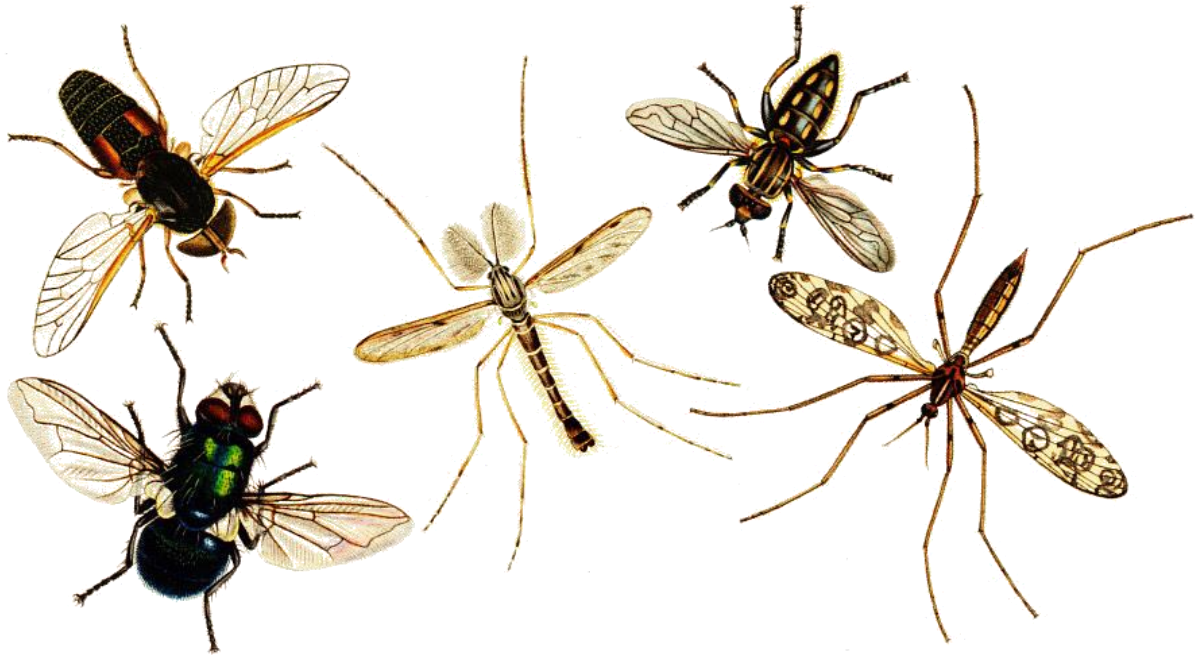
Holometabola

- Complete development (egg, larva, pupa, adult)
- The Diptera have traditionally been divided into three suborders:
- Nematocera (flies with multisegmented antennae)
- Brachycera (flies with stylate antennae)
- Cyclorrhapha (flies with aristate antennae)

	North America	***Worldwide***
Number of Families	**108**	**130**
Number of Species	**16,914**	**~98,500**

Classification

- Kingdom Animalia (Animals)
- Phylum Arthropoda (Arthropods)
- Subphylum Hexapoda (Hexapods)
- Class Insecta (Insects)
- Order Diptera (Flies)

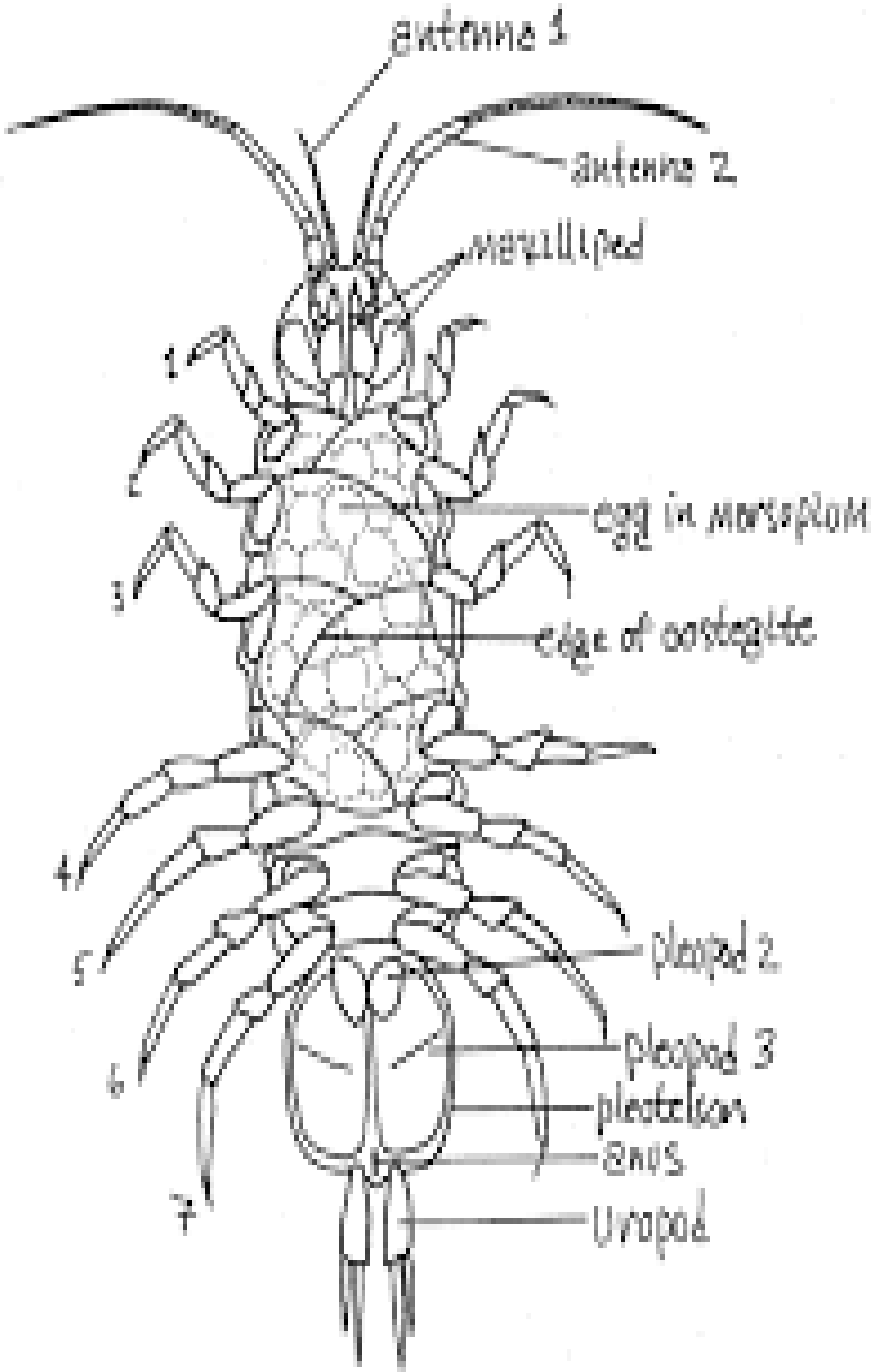


Asellidae

General Information

- Known as one of the largest families of freshwater isopods as they can exist in both epigean and hypogean fresh water habitats in North America and Europe.

- They can be found in habitats ranging from clear streams to stagnant ponds, but generally they prefer to occupy the benthos of rivers in the slow moving areas rather than riffles.

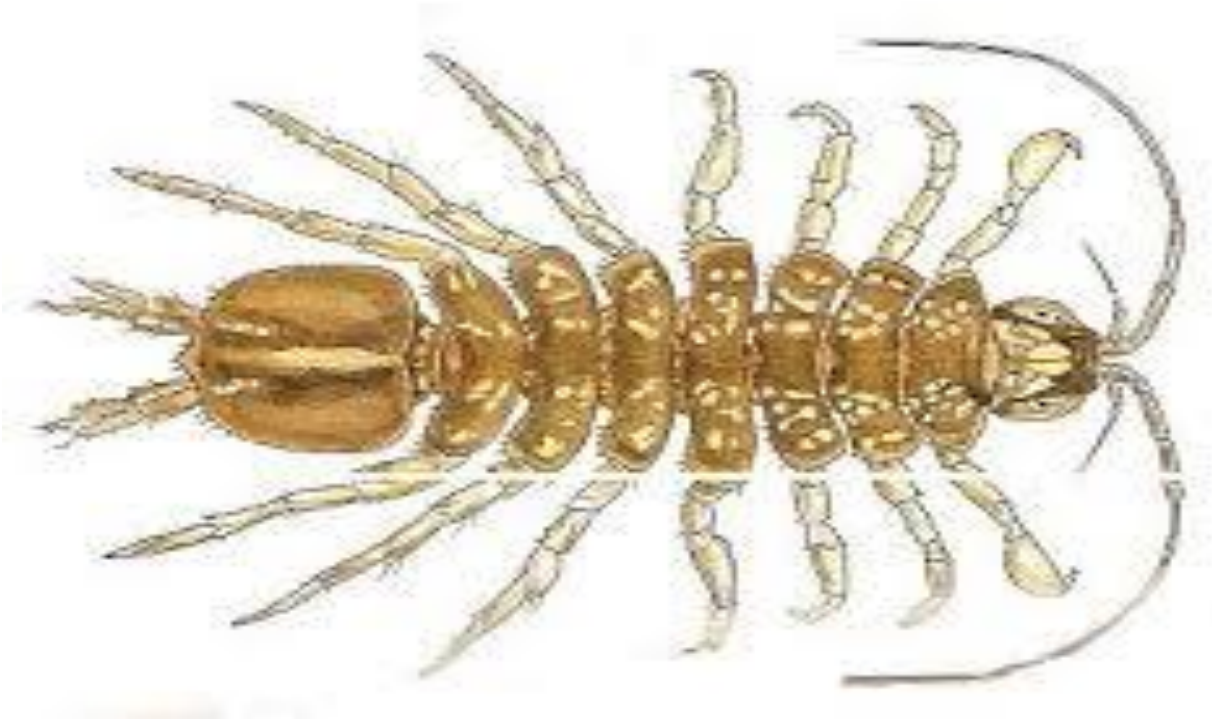

antenna 1
antenna 2
maxilliped
1
egg in marsupium
3
edge of oostegite
4
5
pleopod 2
pleopod 3
6
pleotelson
anus
7
uropod

General Information

- The basic color pattern is quite similar in all the species.
- There is a median zone which may or may not be mottled.
- Lateral zone which is mottled with yellowish.
- In marginal zone, they are usually more lighter.

Classification

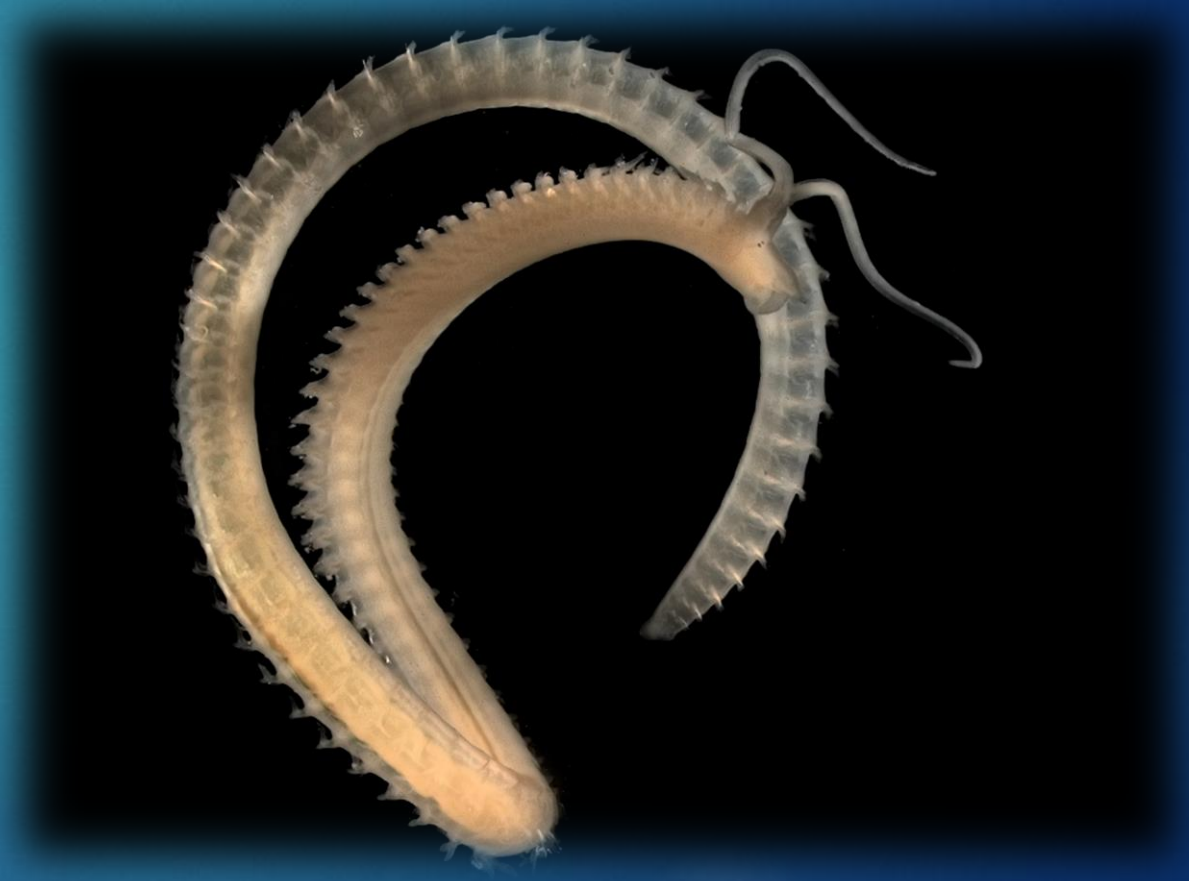
Kingdom: Animalia
Phylum: Arthropoda
Subphylum: Crustacea
Class: Malacostraca
Order: Isopoda
Suborder: Asellota
Superfamily: Aselloidea
Family: Asellidae



Pleopoda

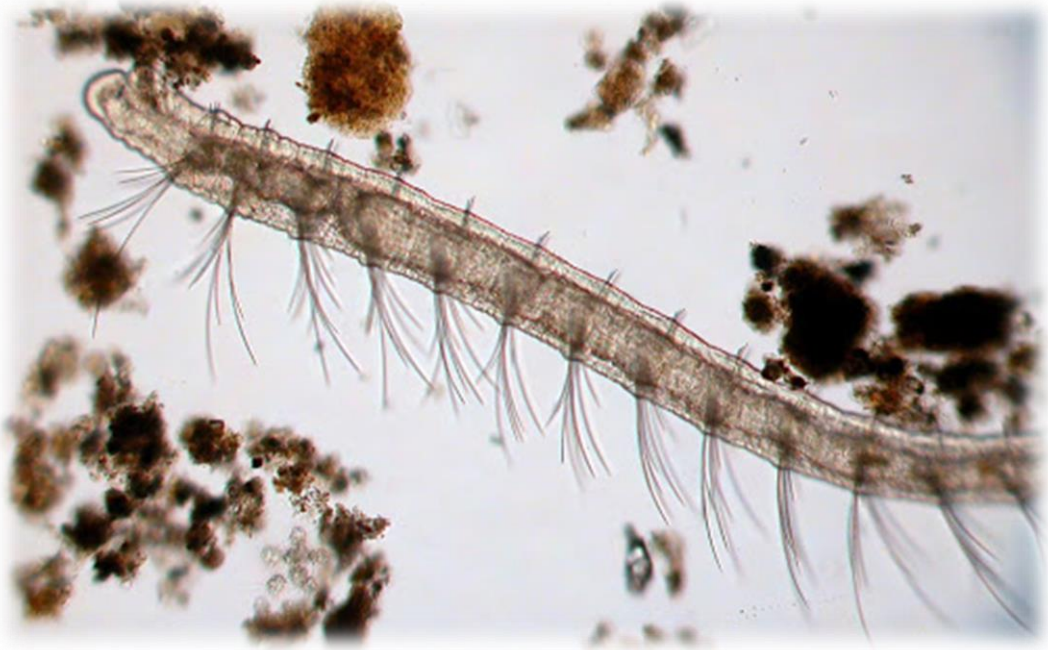
Uropoda

Naididae



General Information

- Naididae is a family like sludge worm.
- They are key components of the benthic communities of many freshwater and marine ecosystems.
- These worms can vary in size, depending on the subfamily.
- They are all hermaphroditic and lack a larval stage.



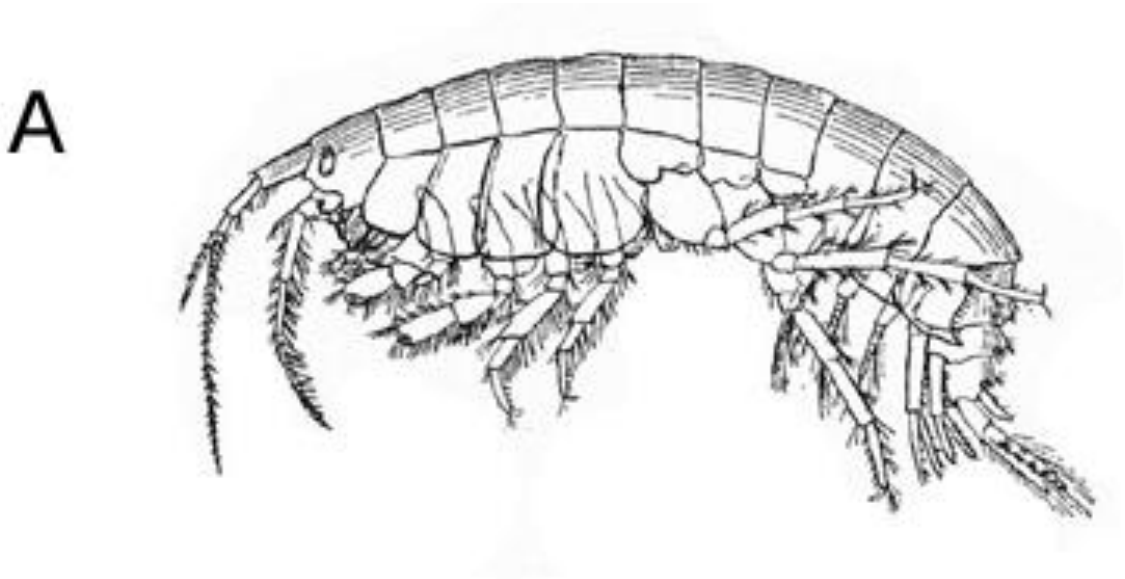
Classification

- Kingdom: Animalia
- Phylum: Annelida
- Class: Clitellata
- Subclass: Oligochaeta
- Order: Hapotaxida
- Family: Naididae

Gammaridae

General Information

- It's a large family of swimming amphipod crustaceans of both marine and freshwater forms.
- It belongs to the Gammaridea sub-class and to the Amphipoda class. They play an important role in the food chains and networks.
- They serve as a food source for the benthic fishes and other macrozoobentic invertebrates.

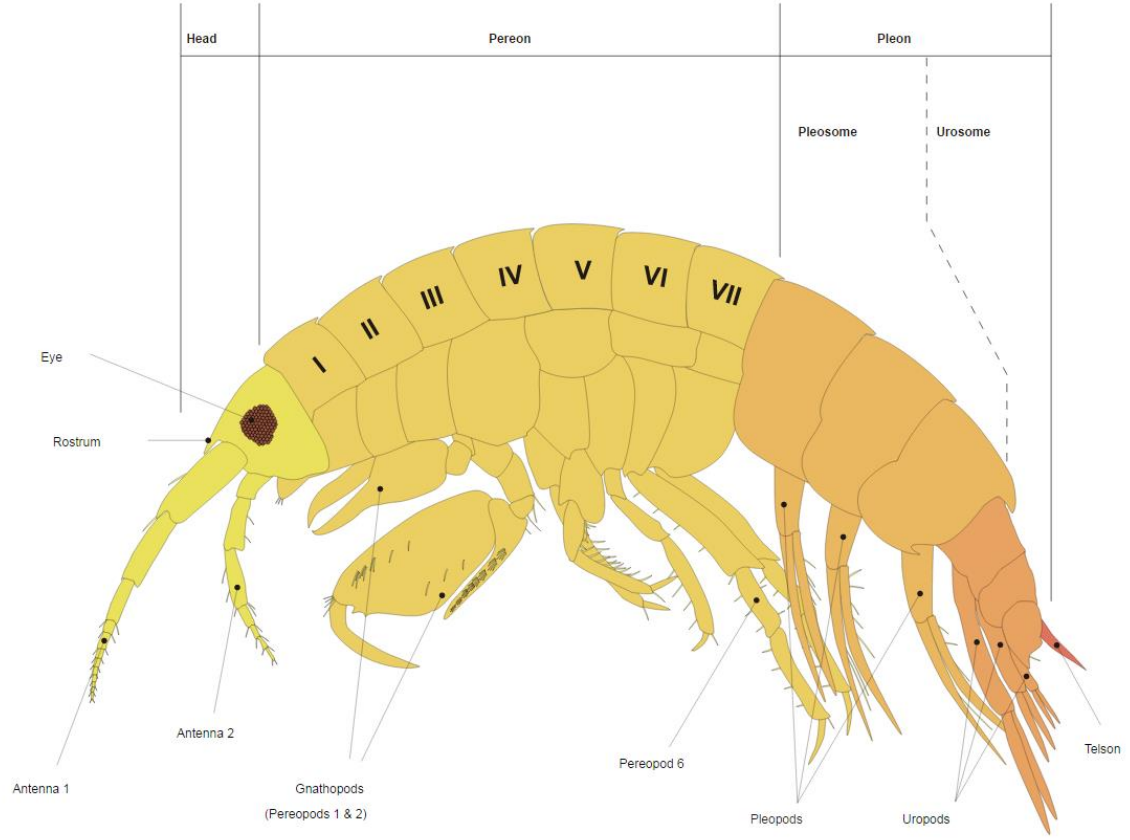


General Information

- The gammarid has seven pairs of walking legs.
- Gammarids grow to about 5 to 30 mm (0.2 to 1.2 inches) long. About 5,000 species are known worldwide.
- Gammarids may be locally abundant among aquatic plant growth.
- Habitat: Fresh water

Classification

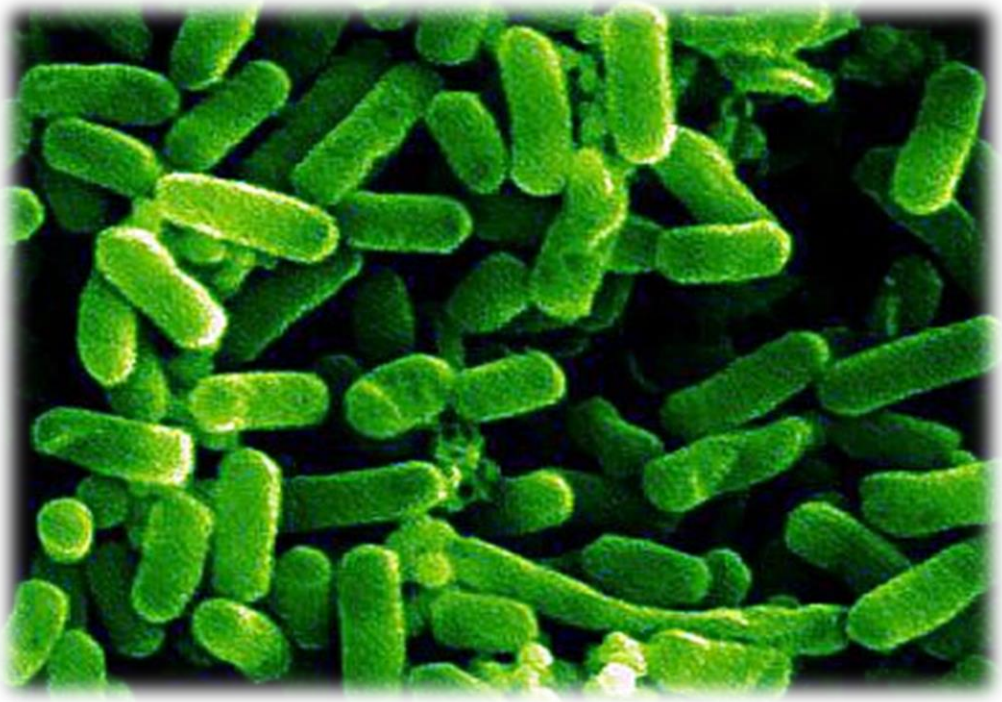
- Kingdom: Animalia
- Phylum: Arthropoda
- Subphylum: Crustacea
- Class: Malacostraca
- Order: Amphipoda
- Suborder: Senticaudata
- Family: Gammaridae



BACTERIA IN RIVER GÖKSU

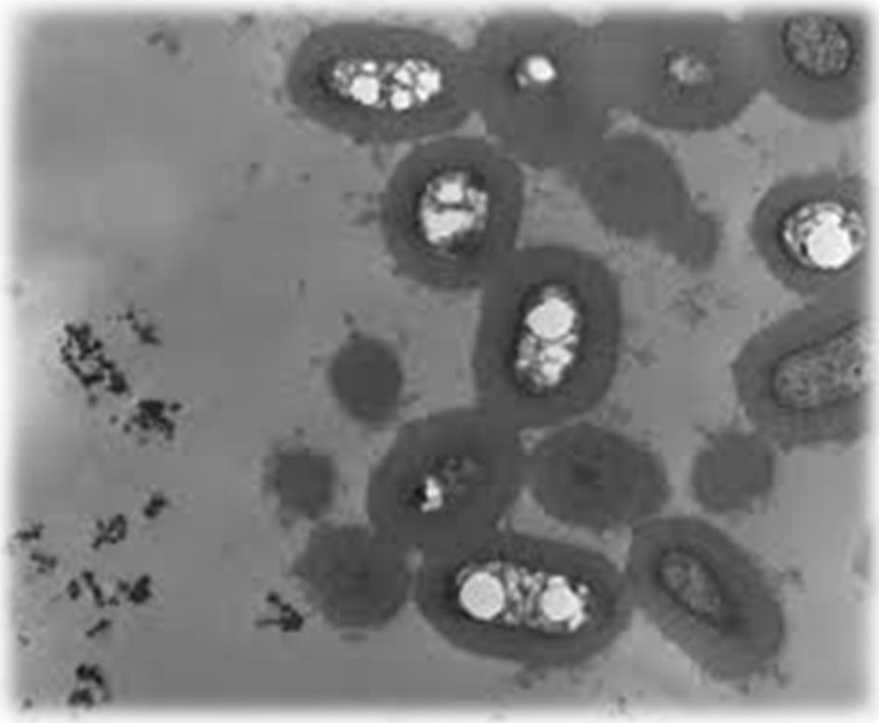
E. Coli

- Escherichia coli (E. coli) is a bacterium that is commonly found in the gut of humans and warm-blooded animals.
- It can grow in temperatures ranging from 7°C to 50°C.
- E. coli comes from human and animal wastes.
- E. coli may be washed into rivers, streams, lakes, or ground water. When these waters are used as sources of drinking water and the water is not treated E. coli may end up in drinking water.



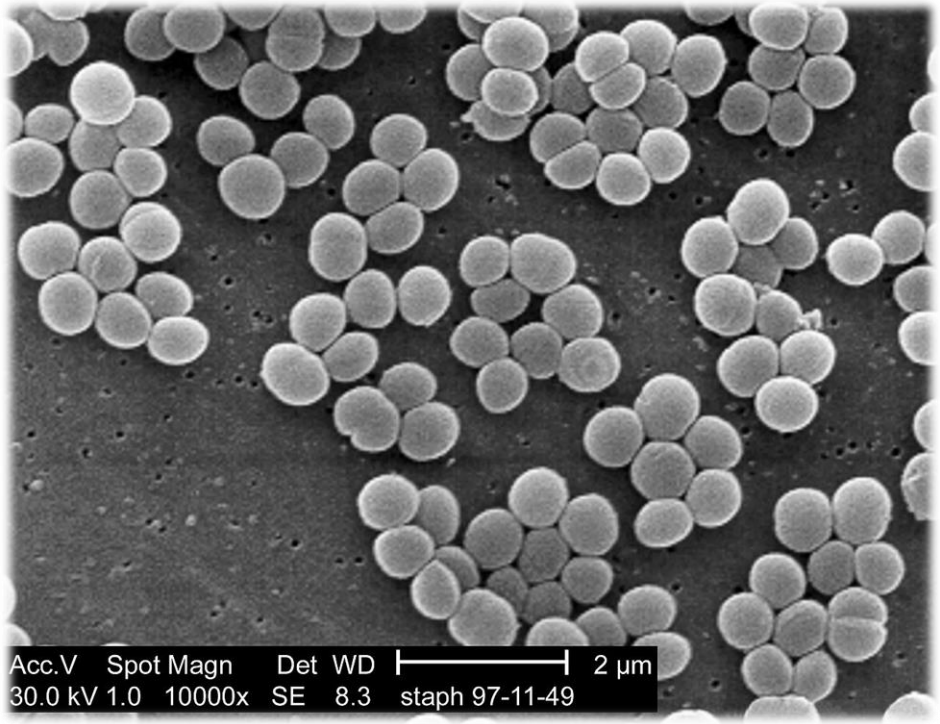
Klebsiella sp.

- A total of 208 samples of natural surface waters was examined.
- If the Klebsiella sp.is detected in drinking water, it doesn't represent a health risk. However, the ones which is in the surface water are nonclinical.
- Habitats: South Africa, North West Province

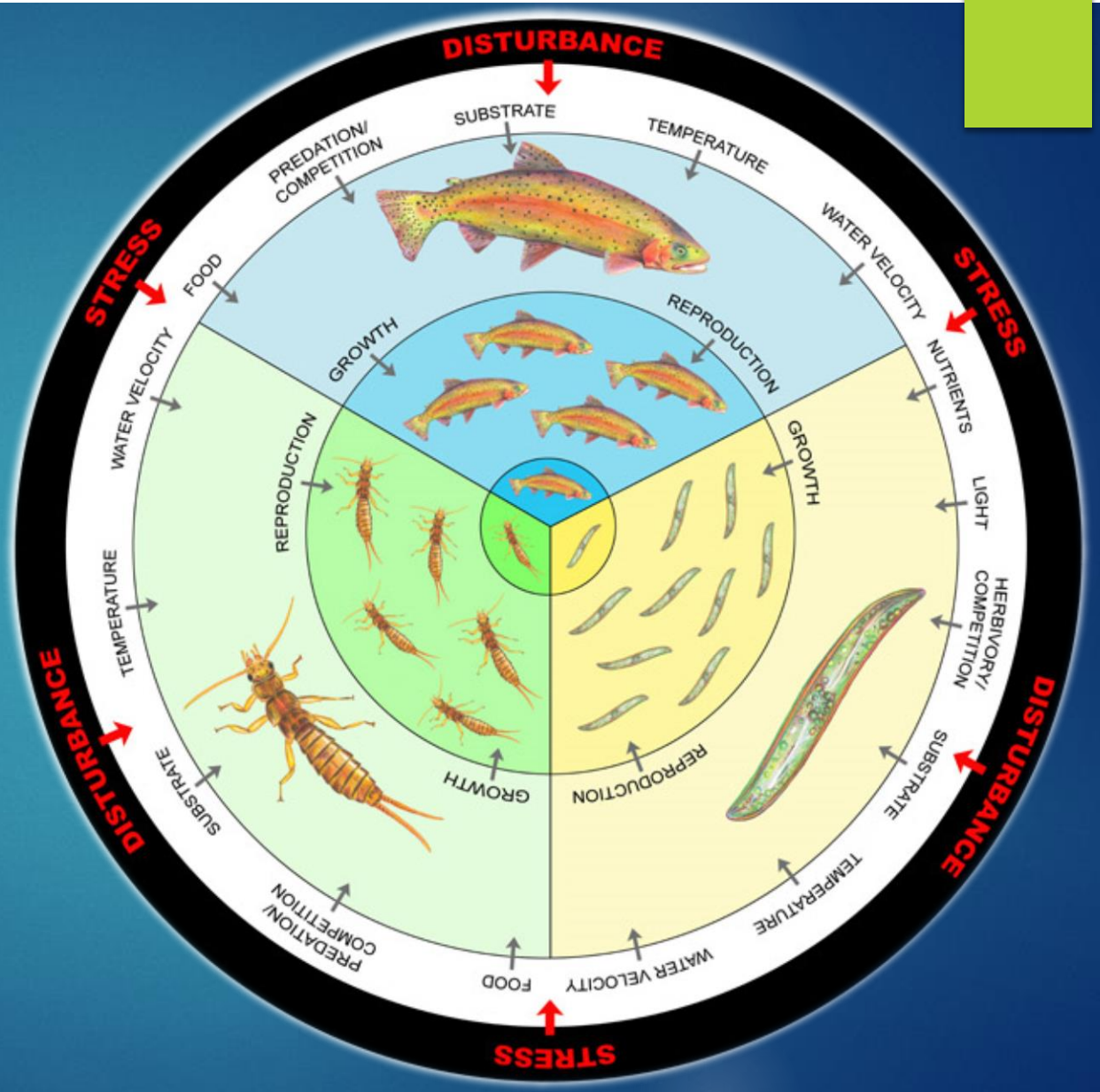


Staphylococcus spp.

- ***Staphylococcus*** is a genus of Gram-positive bacteria. Under the microscope, they appear round (cocci), and form in grape-like clusters.
- The *Staphylococcus* genus includes at least 40 species. Most are harmless and reside normally on the skin and mucous membranes of humans and other organisms



Bioindicators

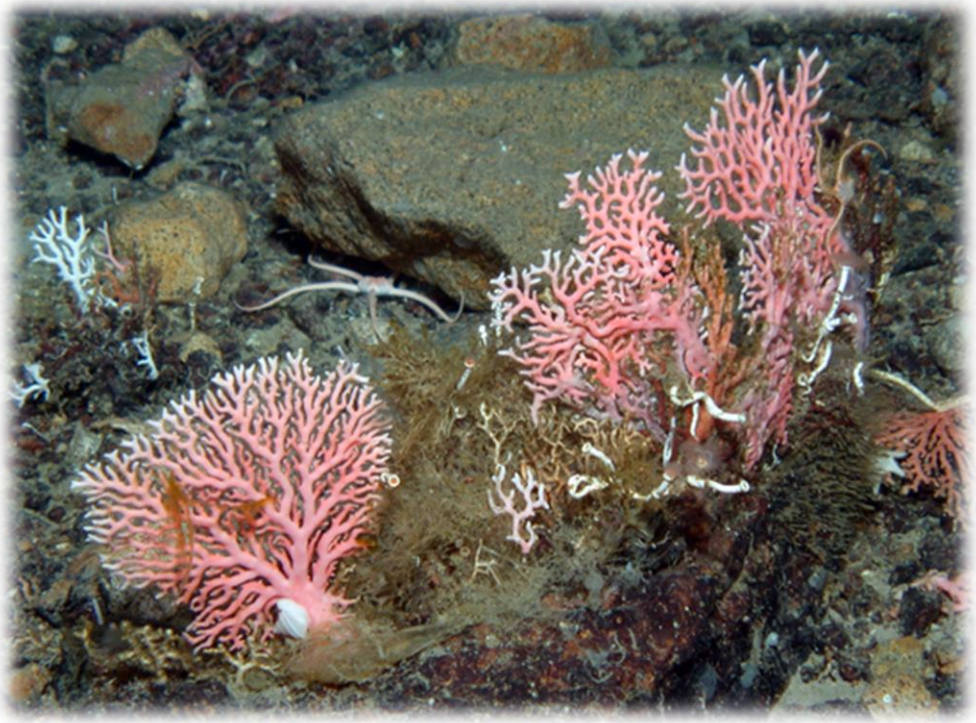


What is a Bioindicator?

- A bioindicator is a living organism that gives us an idea of the health of an ecosystem.
- Bioindicators can be plants, animals, or microorganisms. For example E.coli
- Another type of bioindicators that are used often to see if water is clean or polluted are invertebrates. Aquatic invertebrates, or invertebrates that live in water, are also known as benthic macroinvertebrates, or benthos.

Benthos

- Benthos make excellent bioindicators because;
- They live in water for the majority of their lives.
- They stay in areas where the water is good for them to live in.
- They're easy to collect.
- They are different in their ways to react to pollution.
- They're easy to identify.
- They usually live longer that a year.
- They have limited mobility.



Lichen

- Another kind of bioindicator is lichen, a kind of algae. Lichen is used as a bioindicator for pollutants, climate change and habitat management.

What Can They Show You?

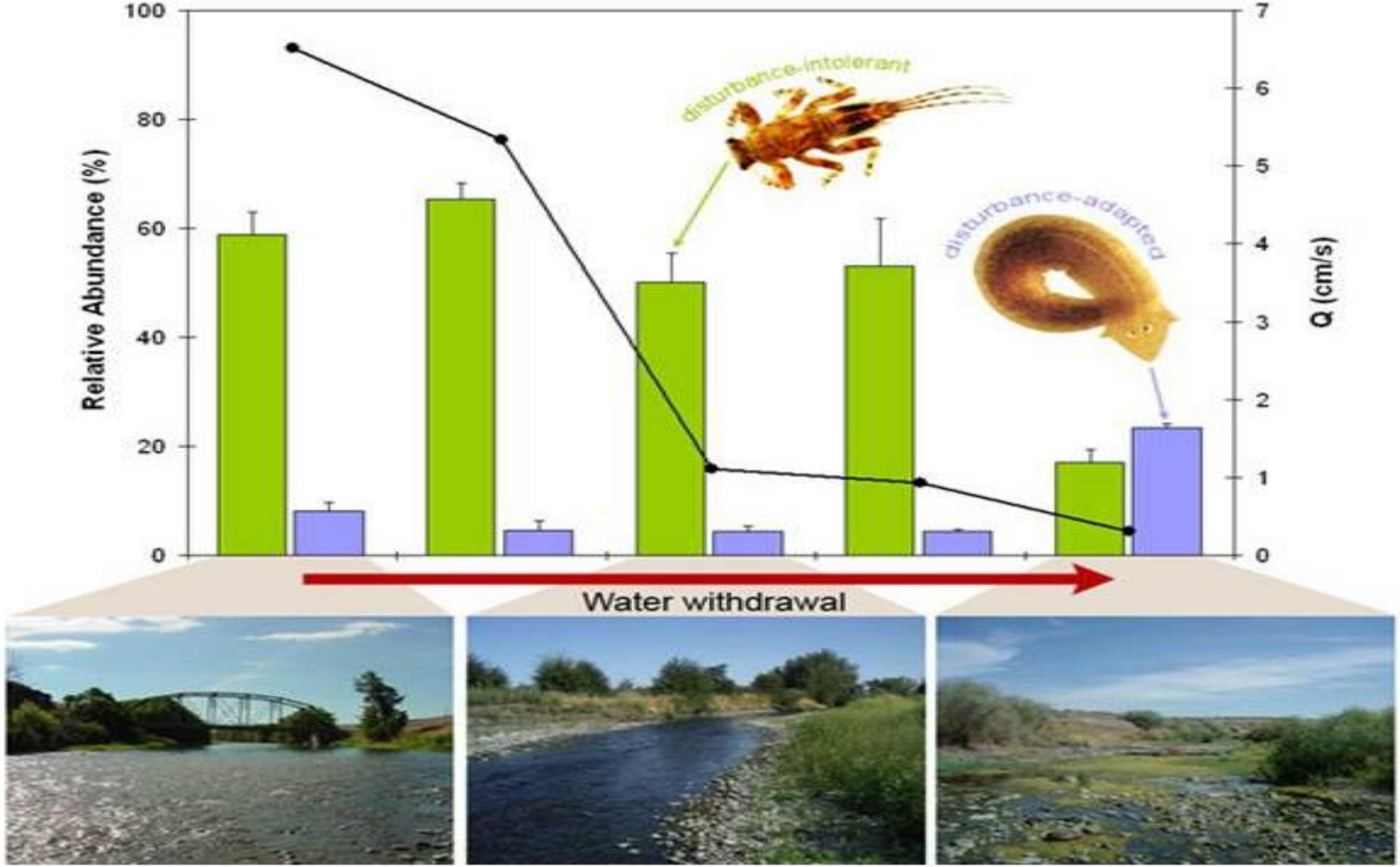
- They can show that there is chlorine in the water.
- They can show that there are pollutants in the water.
- They can indicate that there is human waste in the water.

How Can They Show You?

- There will be fewer of that species in the area
- Less eggs will hatch in the area.

Diptera

- Diptera is a bioindicator.
- They take part in many important biological processes in soil such as the decomposition of plant litter and nutrient cycling.
- Soil dwelling Diptera include groups and species that vary in size as well as in food and ecological demands.


Relative Abundance (%)
100
80
60
40
20
0
Q (cm/s)
7
6
5
4
3
2
1
0
disturbance-intolerant
disturbance-adapted
Water withdrawal

CLEAN WATER *

SLIGHTLY POLLUTED WATER **

POLLUTED WATER ***

VERY DIRTY WATER ***

Gradation of the presented species

Single species

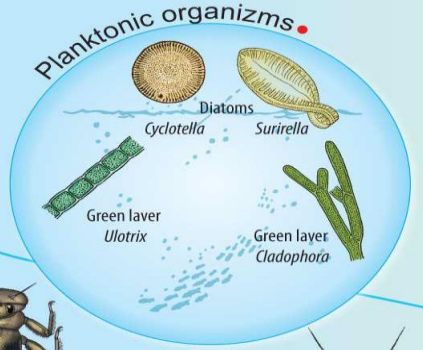
Lakes, ponds


Larva of damselfly *Zygoptera*

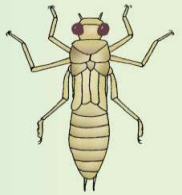

Mollusk limnaea *Limnaea*


Hydra *Hydra*

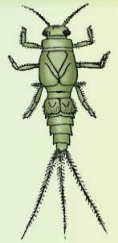

Freshwater shrimp *Gammarus*

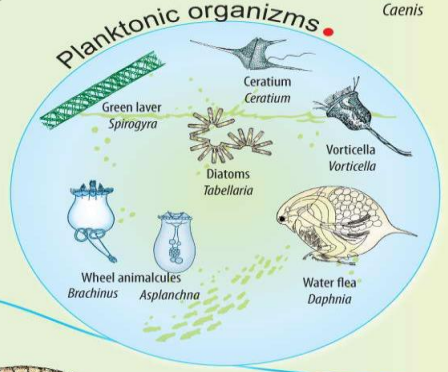


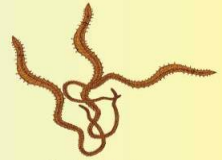

Larva of muddy water beetle *Enochrus*

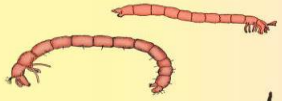

Larva of dragonfly *Anisoptera*


Water boatman bug *Corixa*

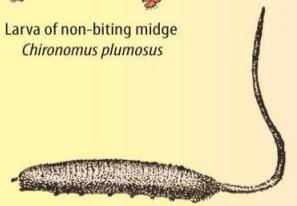

Larvae of mayfly *Caenis*

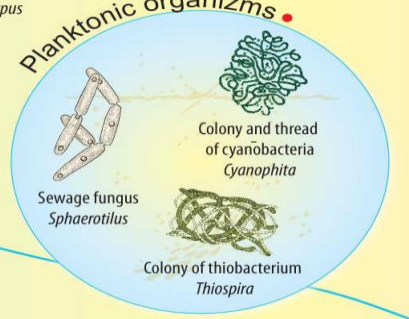



Sludge worm *Tubifex*


Larva of non-biting midge *Chironomus plumosus*


Mosquito larva *Tanypus*


Rat-tailed maggot *Eristalis*



Rivers


Rhitroqena

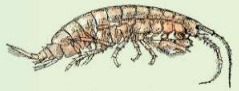

Larvae of mayflies

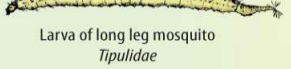
Iron


Case and larva of caddis fly *Trichoptera*

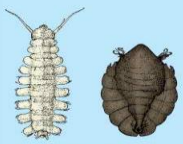

Larva of stonefly *Plecoptera*

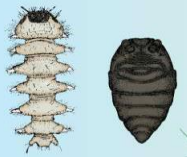

Larva of mayfly *Ephemerella*

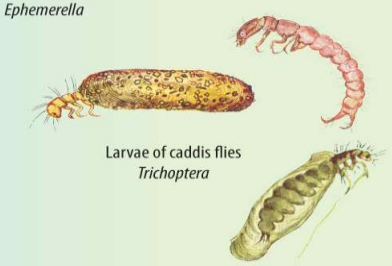

Freshwater shrimp *Gammarus*

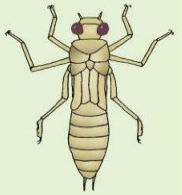

Larva of long leg mosquito *Tipulidae*


Larva and pupa of midge-simulida *Simuliidae*


Larva and pupa of Deuterophlebia *Deuterophlebia*


Larva and pupa of Blepharocera *Blepharocera*


Larvae of caddis flies *Trichoptera*


Larva of dragonfly *Anisoptera*

No life

Because of closeness to glacial drainage, quick oxygen-enriched stream and riverside vegetation, cleans the water which means that there are only a few strongly polluted rivers on the territory of Kyrgyzstan.

* **It is possible to drink this water after boiling**

** **This water is not recommended to drink**

*** **It is dangerous to drink this water**

LIVING INDICATORS OF THE RESERVOIRS OF KYRGYZSTAN

Visual aid for identification of water quality

Remember!
Even water of the good quality should be boiled (no less, then 10 minutes) before use for drinking!

● **Plankton – small organisms, lining in water column. For their identification it is necessary to use magnifying devices.**

GEA Global Environmental Action

БИОМ

Sources

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