

# Prehrana morskih organizama



# Prehrana morskih organizama

- Filtratori (filter-feeders; suspension-feeders)
- Deposit-feeders
- Herbivori (biljojedi)
- Predatori
- Strvinari



# Prehrana morskih organizama

## 1. Suspension-feeders/Filter-feeders

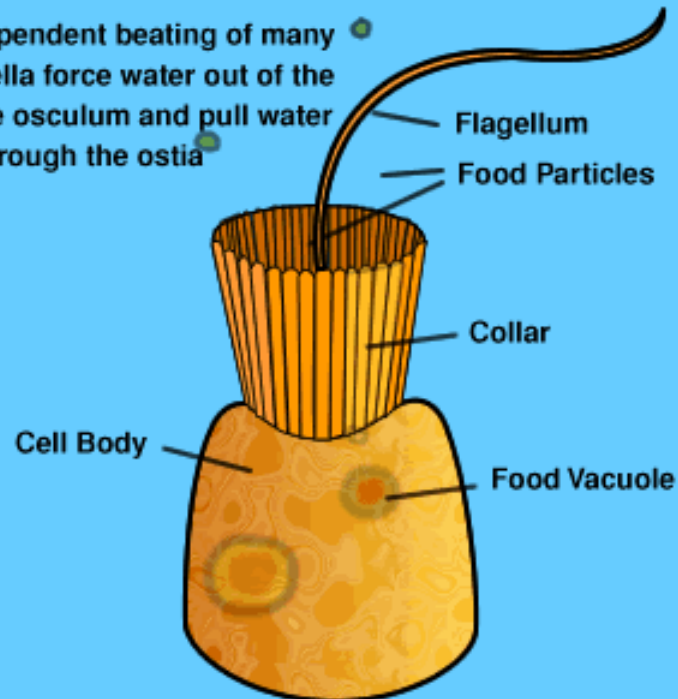
Organizmi koji se hrane česticama i organizmima u suspenziji na način da ih filtriraju (**filtratori**) ili hvataju (sakupljaju):

- **Bakterije** – spužve, mahovnjaci
  - **Fitoplankton** – većina školjkaša, mnogi poliheti, planktonski rakovi
  - **Zooplankton** – koralji, stapčari, plaštenjaci
  - **Detritus** – lovkaši, neki trpovi i zmijače, neki puževi (npr. *Crepidula*), neki dekapodni raci (npr. *Porcellana longicornis* hvata čestice pomoću trećeg para *maksilipeda*)
1. **Pasivni suspension-feeders** – Izlažu organe za prehranu struji i pasivno čekaju (stapčari)
  2. **Aktivni suspension-feeders** – Sami stvaraju struju koja dovodi čestice do usta (lovkaši, školjkaši sa sifonom, vitičari)

## Filter-feeders

### Enlargement of Collar Cell

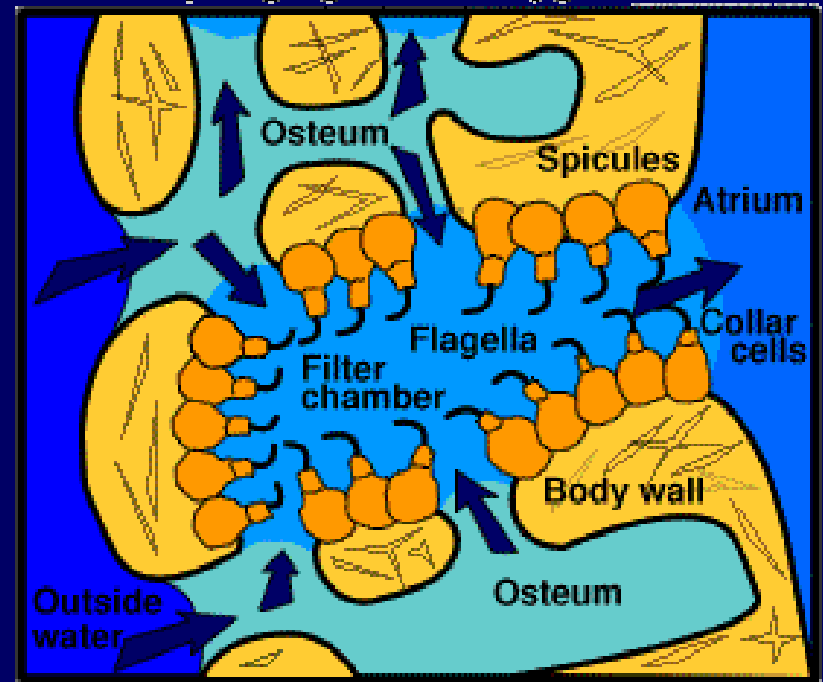
Independent beating of many flagella force water out of the large osculum and pull water in through the ostia



Particles of food are drawn into the collar to become trapped and then engulfed by the cell body and digested in the food vacuoles

## Spužve

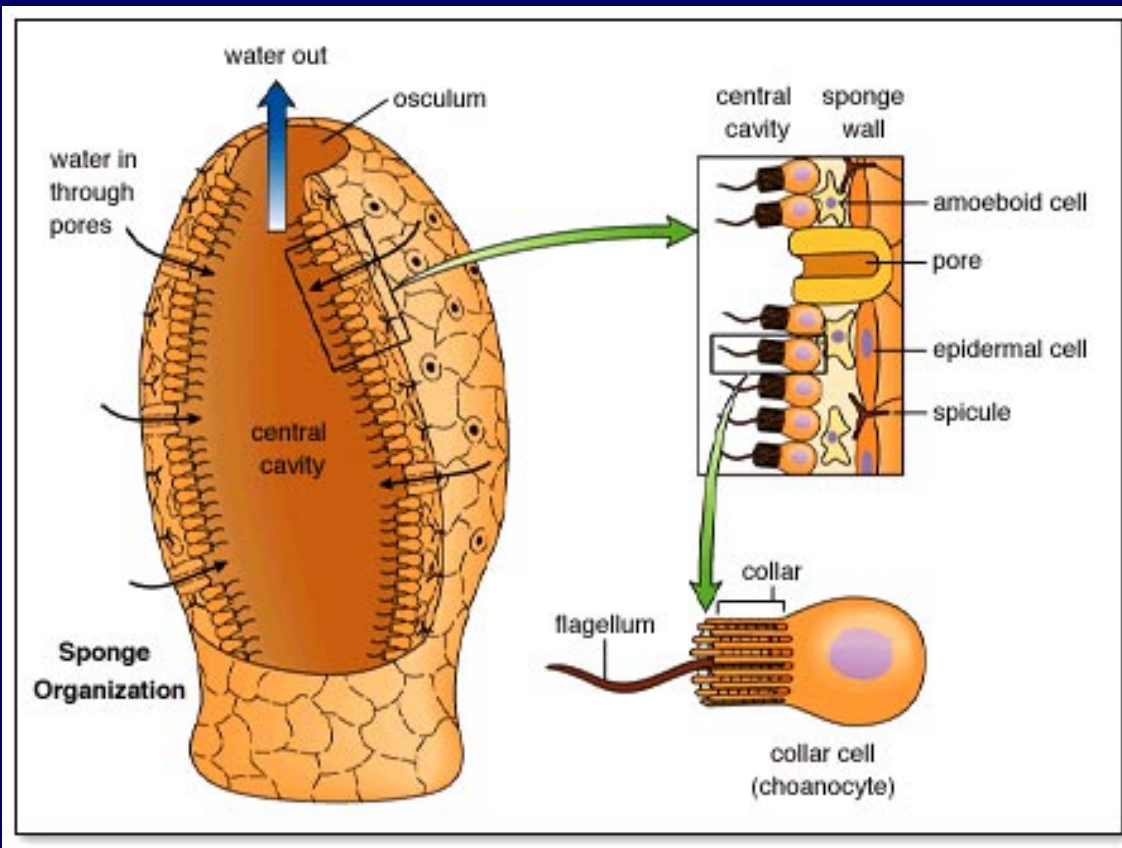
How a Sponge gets its oxygen and food



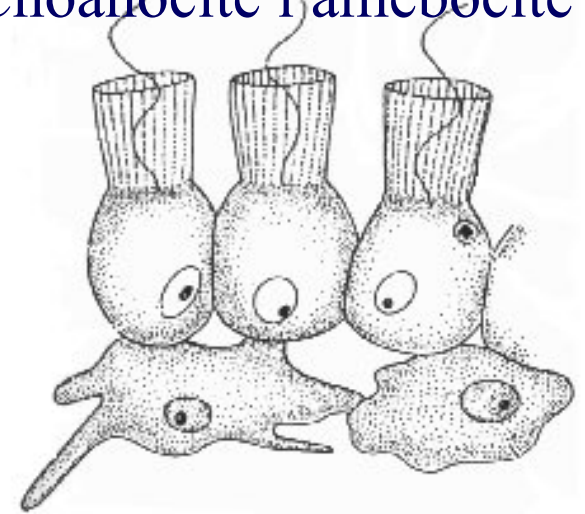
## Spužve

-Choanocyte – stanice koje filtriraju more

-Amebocyte – stanice koje raznose hranjive tvari



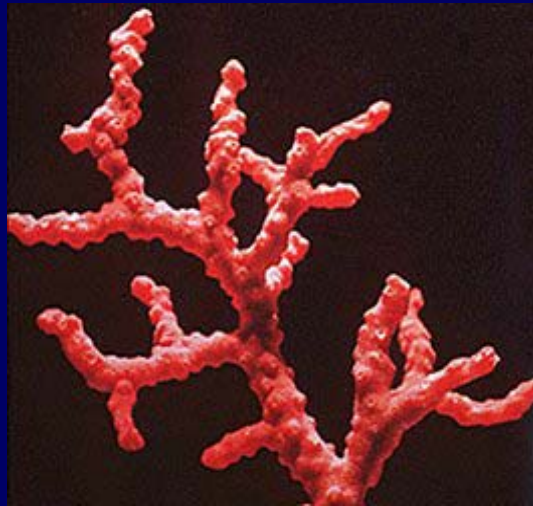
## Choanocyte i amebocyte



choanocyte



# Filter-feeders Koralji





## Filter-feeders Školjkaši



# Filter-feeders

## Školjkaši

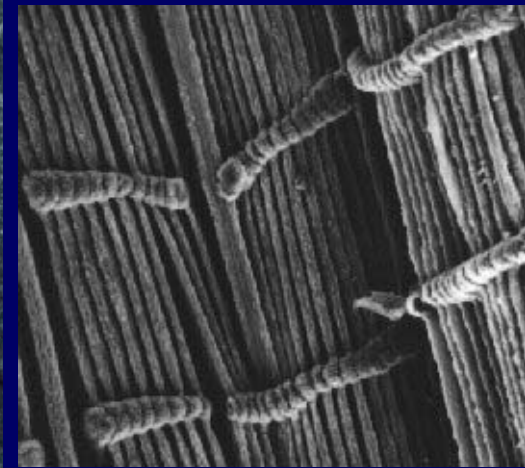
Mutualističke alge *zooxantelle*

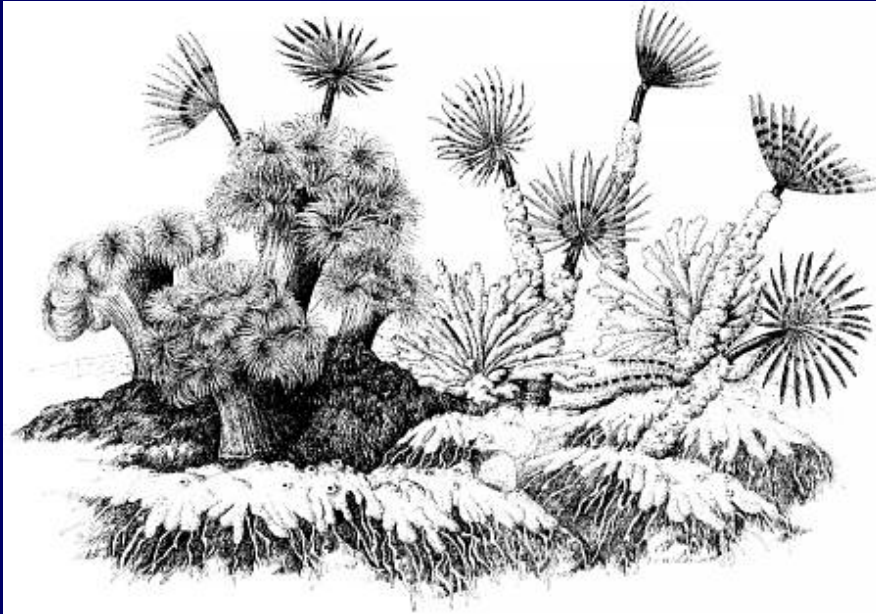


Školjkaš zakopan u  
sedimentu filtrira  
morsku vodu  
pomoću *sifona*  
(*tulajica*)



Škrge  
(*ktenidije*) kod  
školjkaša





## Filter-feeders

### Poliheti



# Suspension feeders

*Porodica Serpulidae*

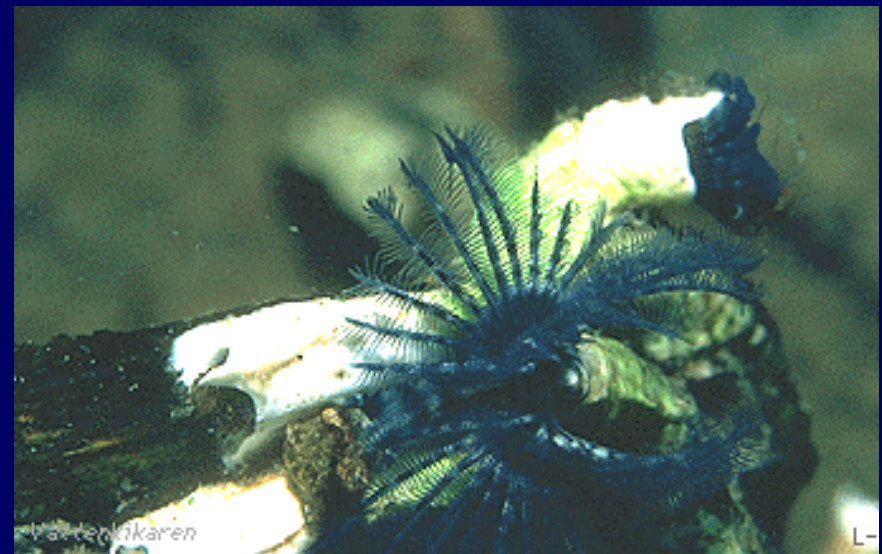


## *Porodica Serpulidae*



# Suspension feeders

## *Porodica Serpulidae*



# Suspension feeders

## *Porodica Serpulidae*

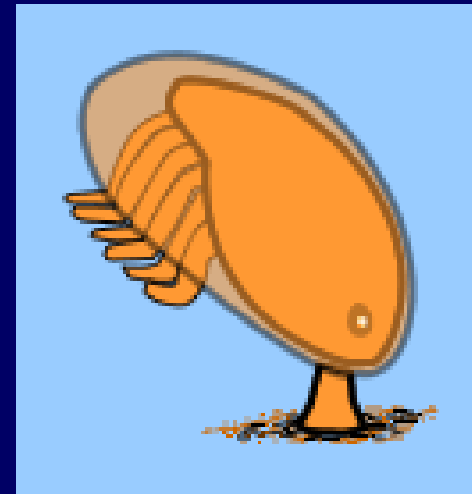




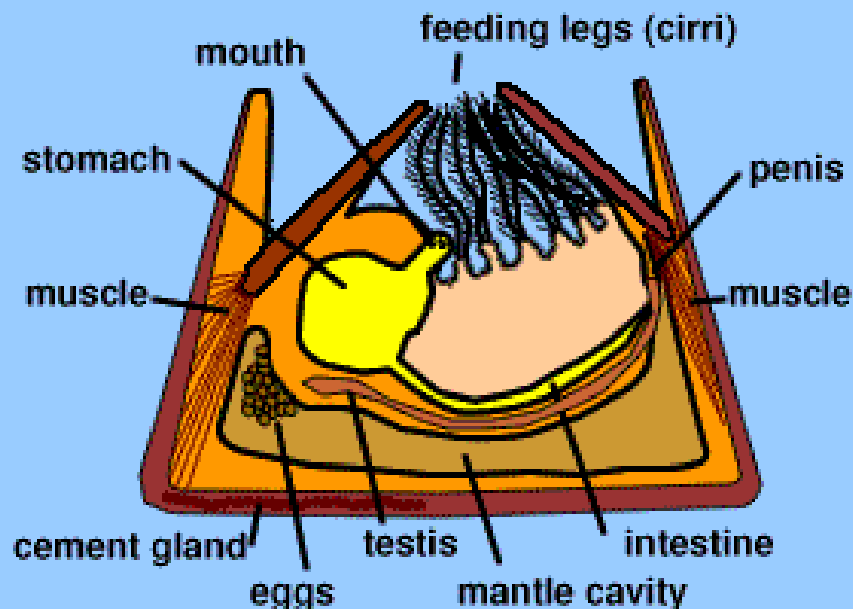
# Filter-feeders



## Rakovi vitičari



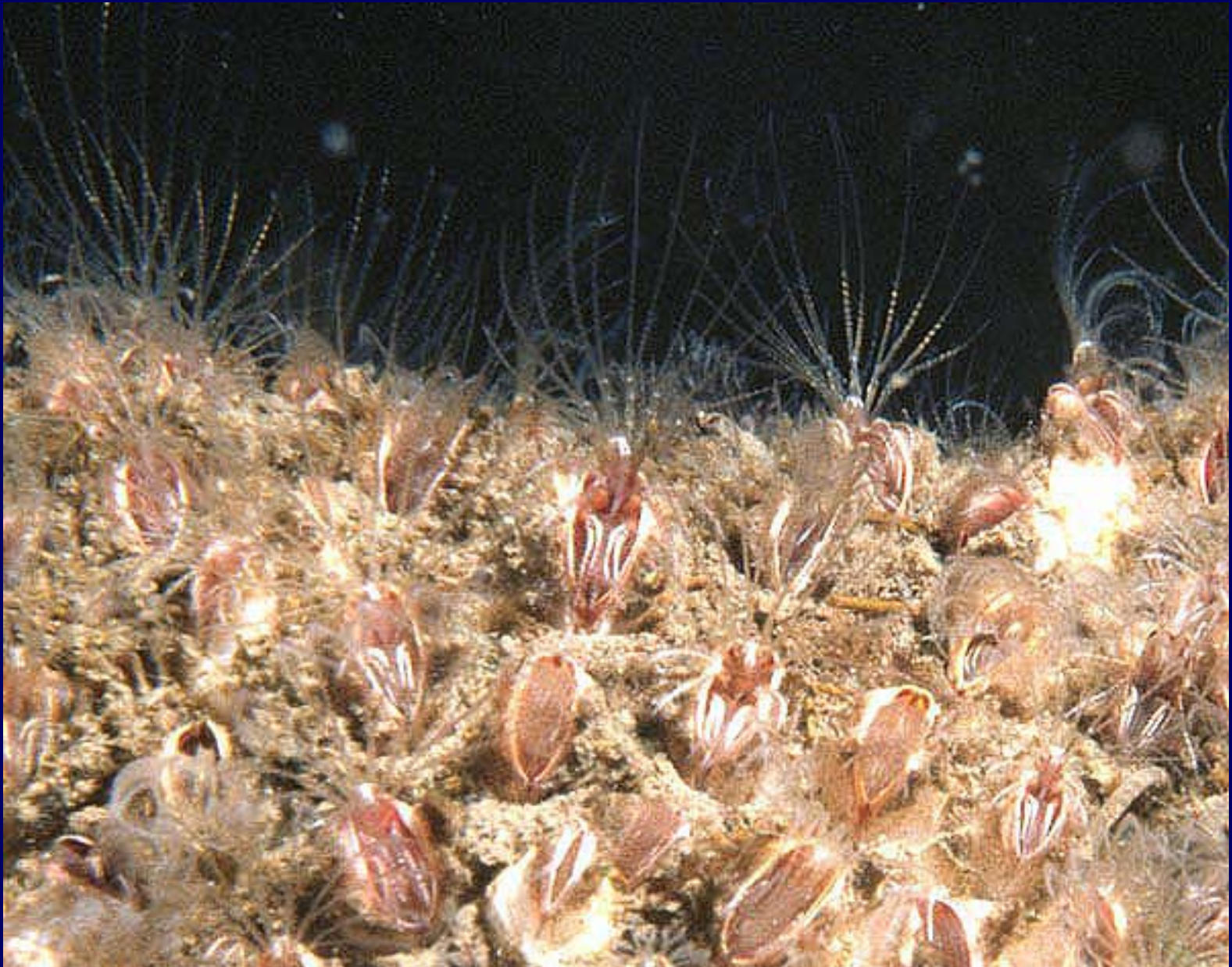
### Anatomy of a Barnacle



*Balanus sp.*



*Lepas  
fascicularis*



## *Dekapodni raci*

### *Porcellana platycheles*

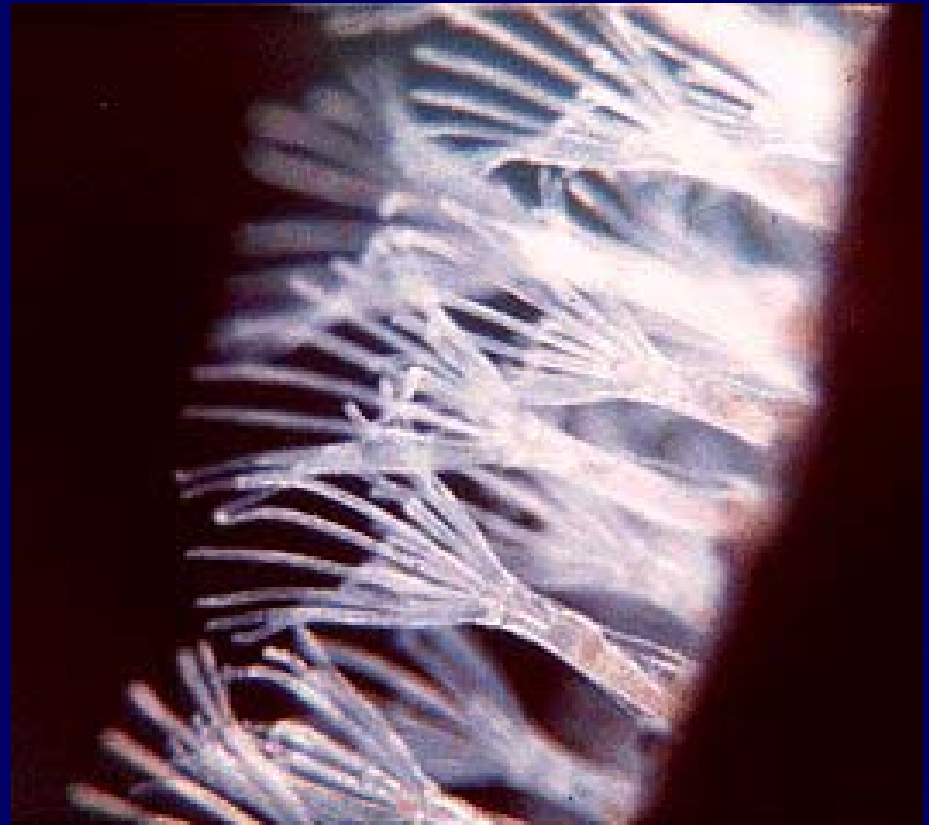
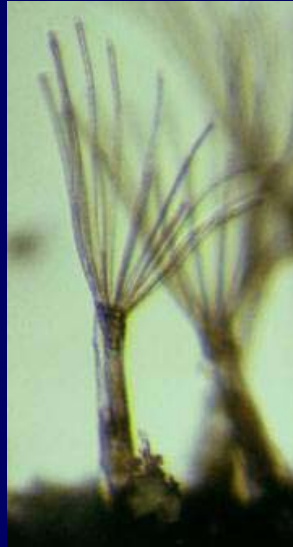


*Porcellana*  
filtrira vodu  
čekinjcama na  
prvom paru  
maksilipeda



# Filter-feeders

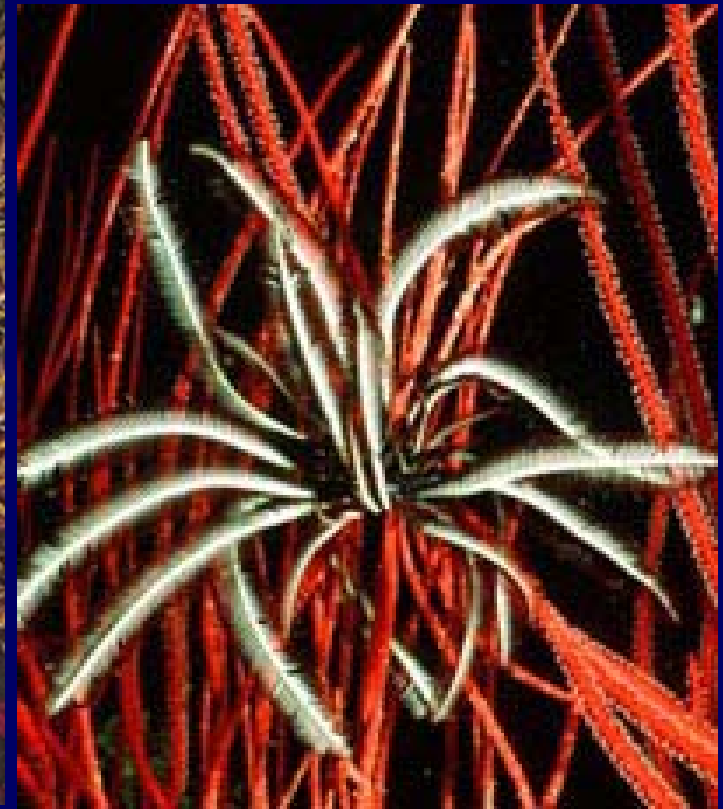
## Mahovnjaci



**Bodljikaši (Echinodermata)**  
*Crinoidea (Stapčari)*



**Filter-feeders**



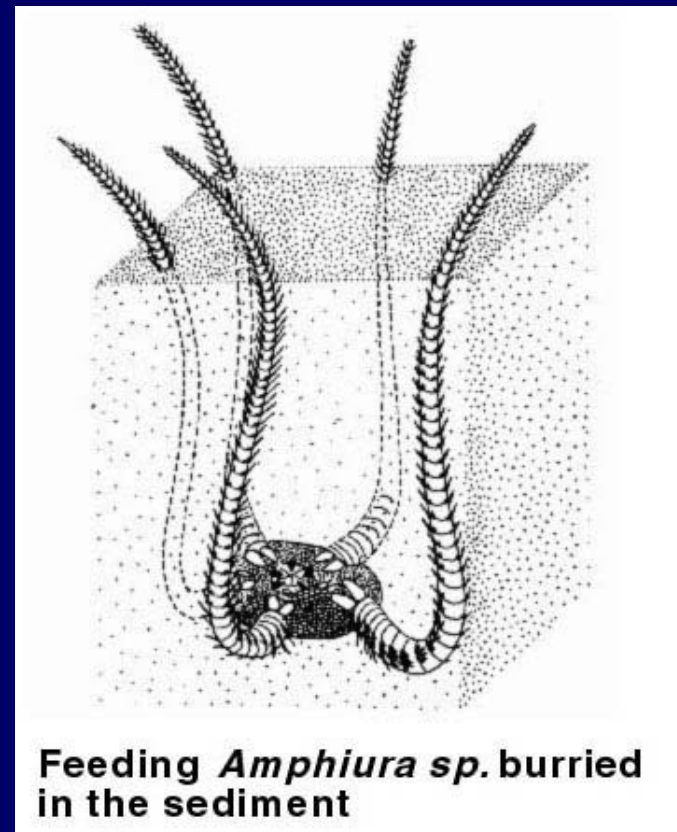
## *Stapčari*



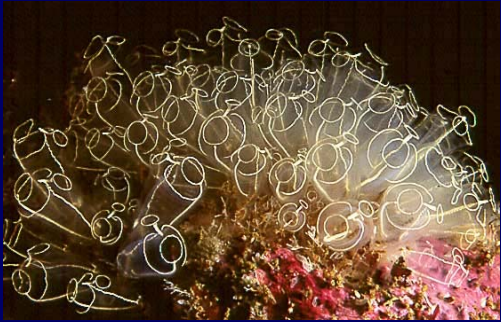
## Filter-feeders

## Bodljikaši

## *Zmijača*

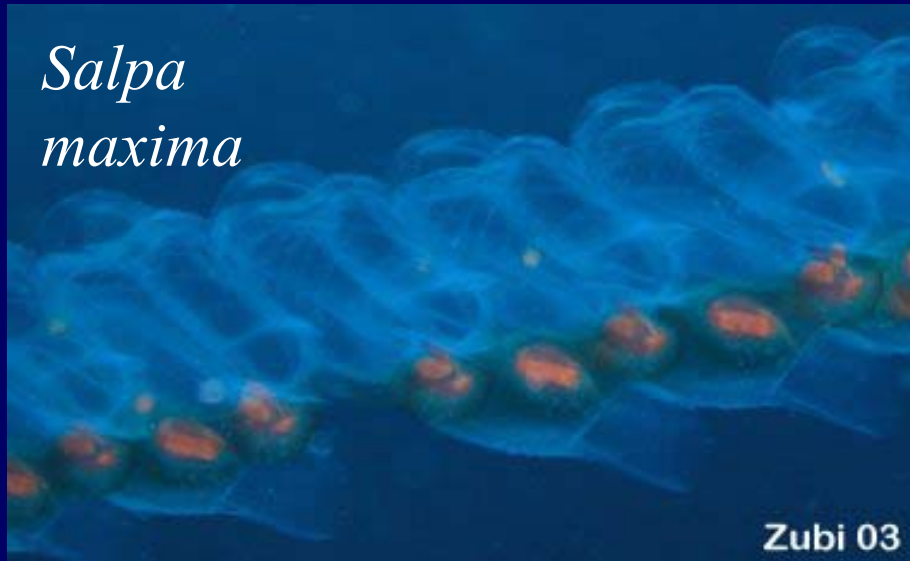


## Mješčičnice

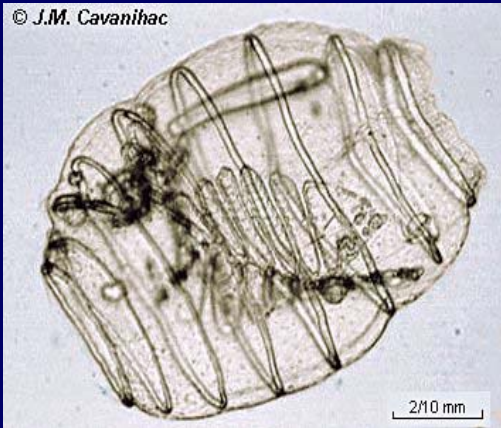


## *Dvootvorke (Thaliacea)*

*Salpa  
maxima*

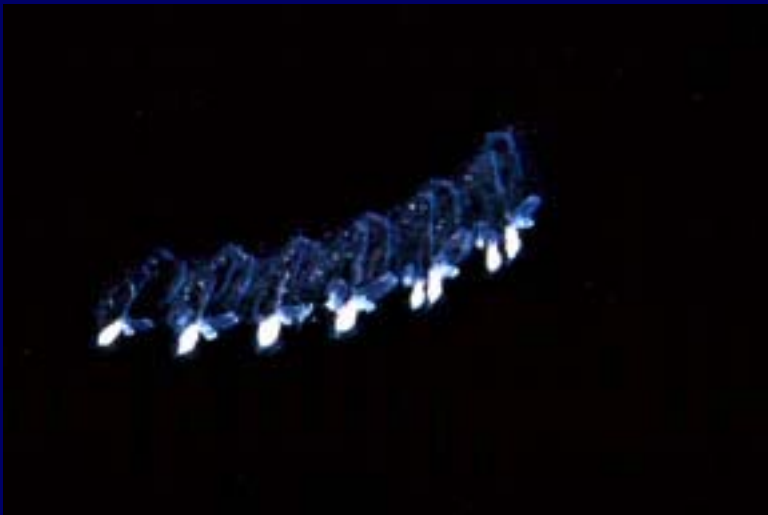
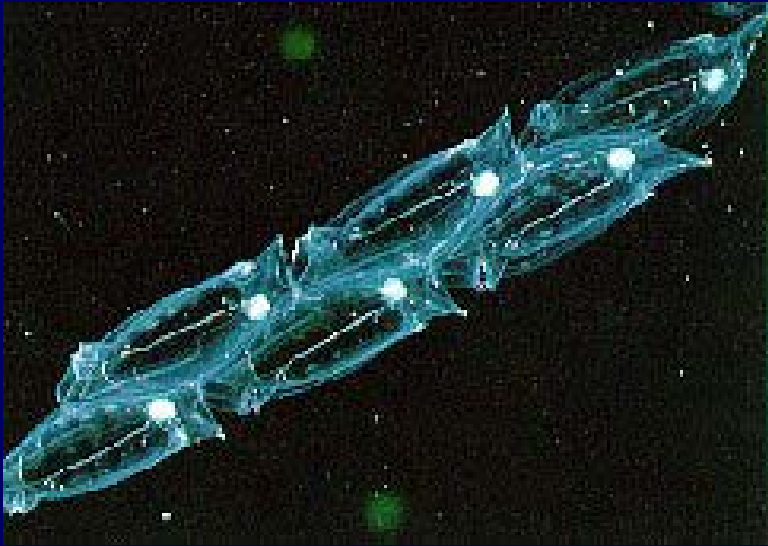


## *Dvootvorke (Thaliacea)*



# Tunicata (plaštenjaci)

*Thaliacea (Dvootvorke)*



Ličinka s hrskavičnim prutićem

# Prehrana morskih organizama

## 2. Deposit-feeders

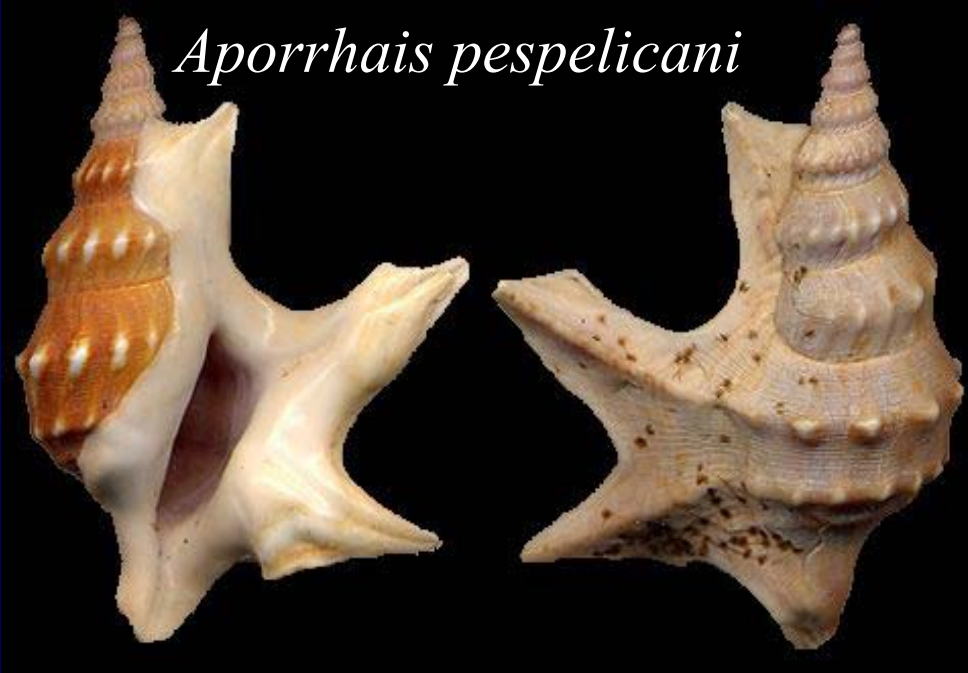
Organizmi koji gutaju sediment i koriste organsku tvar i mikroorganizme za prehranu:

- U ovu kategoriju spadaju mnogi trpovi i poliheti, štrcaljci, žiroglavci, neki puževi i rakovi, iregularni ježinci – ovi organizmi ruju po sedimentu
- Neki su organizmi specijalizirani za gutanje površinskog filma: puževi (npr. *Turitella*, *Aporrhais*; amfipodi, poliheti, zvjezdani)
- Neki organizmi jedu detritus nataložen na površini sedimenta: zmijače, mnogi rakovi (izopodi, amfipodi, kozice), trpovi nerovači, neki iregularni ježinci, dekapodi “šetači” (npr. *Galathea*)

## Deposit-feeders

### *Puževi*

*Aporrhais pespelicani*



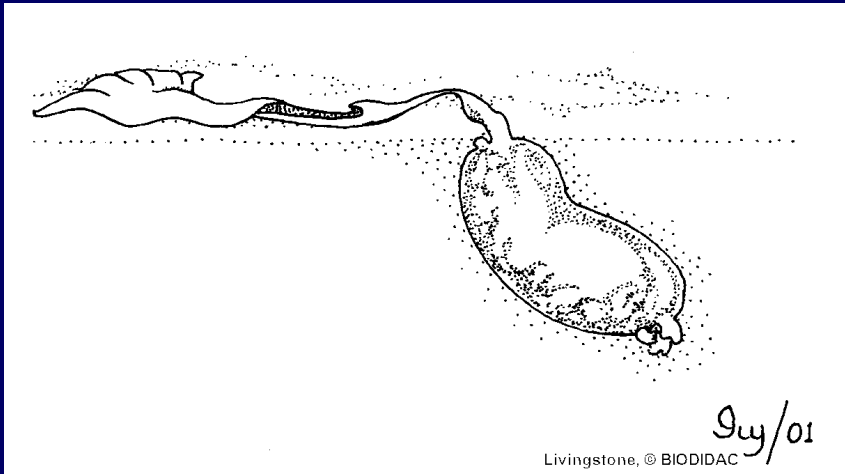
*Turitella* sp.



*Turitella communis*



## *Zvezdani*



# Deposit-feeders

## *Štrcaljci*

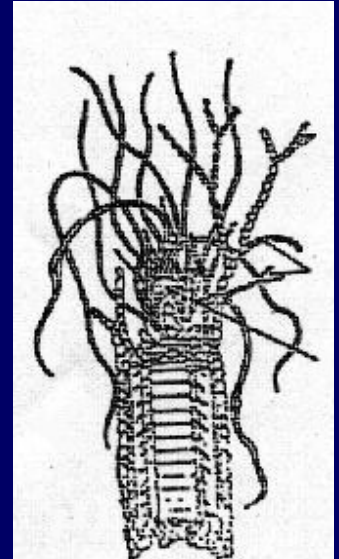


# Deposit-feeders

*Poliheti*



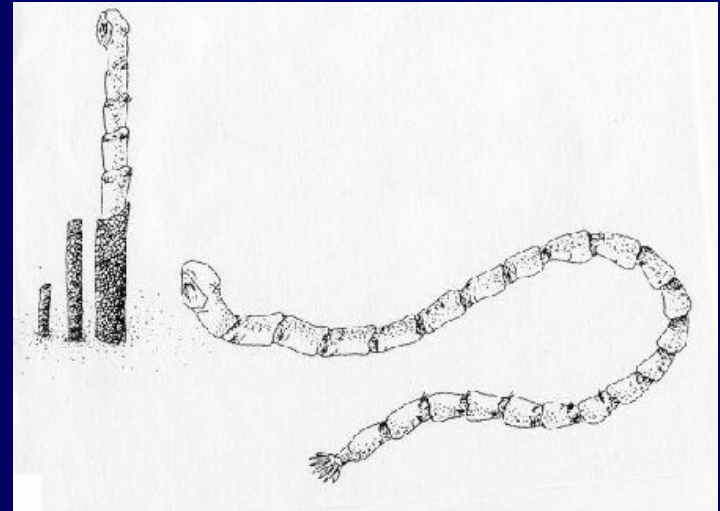
Porodica Terebelidae



*Abarenicola* sp.



## Polihet (cjevaš) *Clymenella torquata* – Head-down deposit feeders

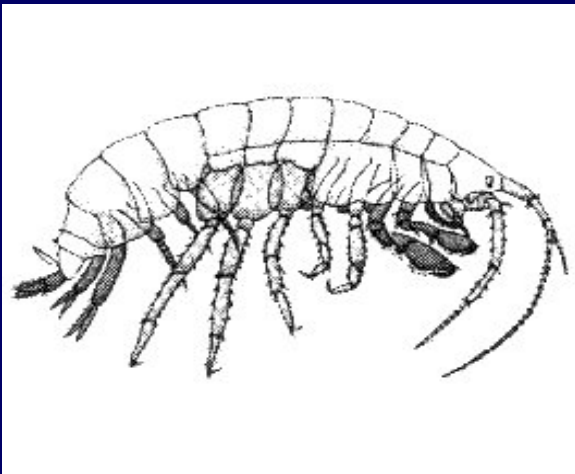


Polihet cjevaš *Clymenella torquata* je u cijevi okrenut glavom prema dolje. Hrani se tako što guta finije čestice sedimenta koje nakon što je probavio hranjive tvari izbacuje kroz analni otvor na površini sedimenta. Na taj način mijenja vertikalni raspored veličinskih kategorija čestica sediment

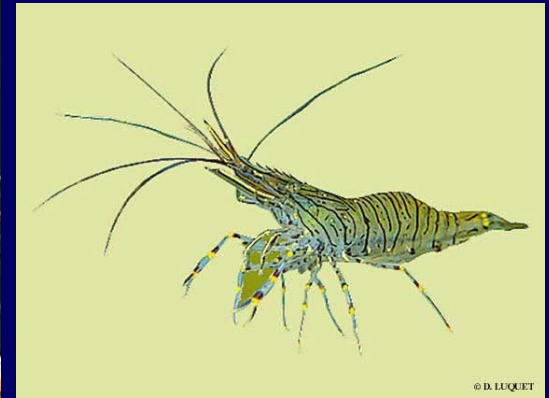
# Deposit-feeders

## *Rakovi*

### *Amphipoda - rakušci*



### *Kozice*



# Deposit feeders

## *Dekapodni raci*

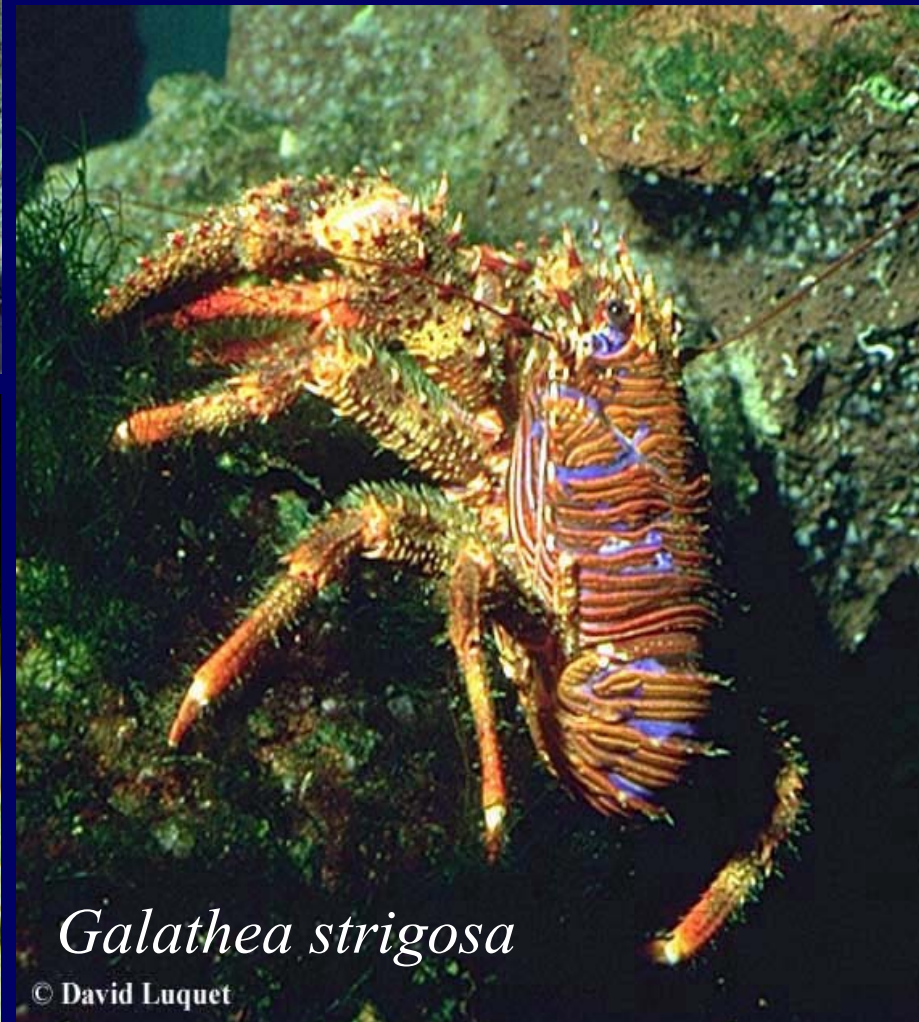


Rod *Galathea*



## Deposit-feeders

*Rakovi*



*Galathea strigosa*

© David Luquet



## Deposit-feeders

*Rakovi*

*Nephrops norvegicus* -  
škamp



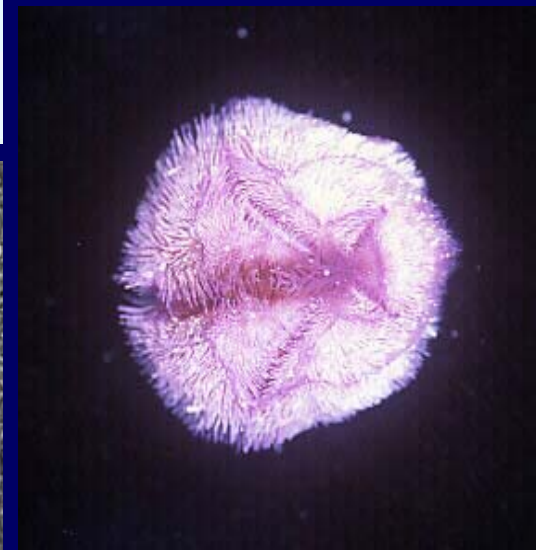
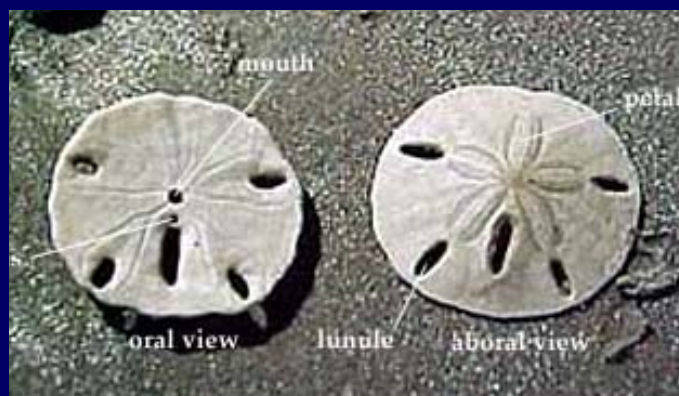
# Deposit-feeders

## *Trpovi*



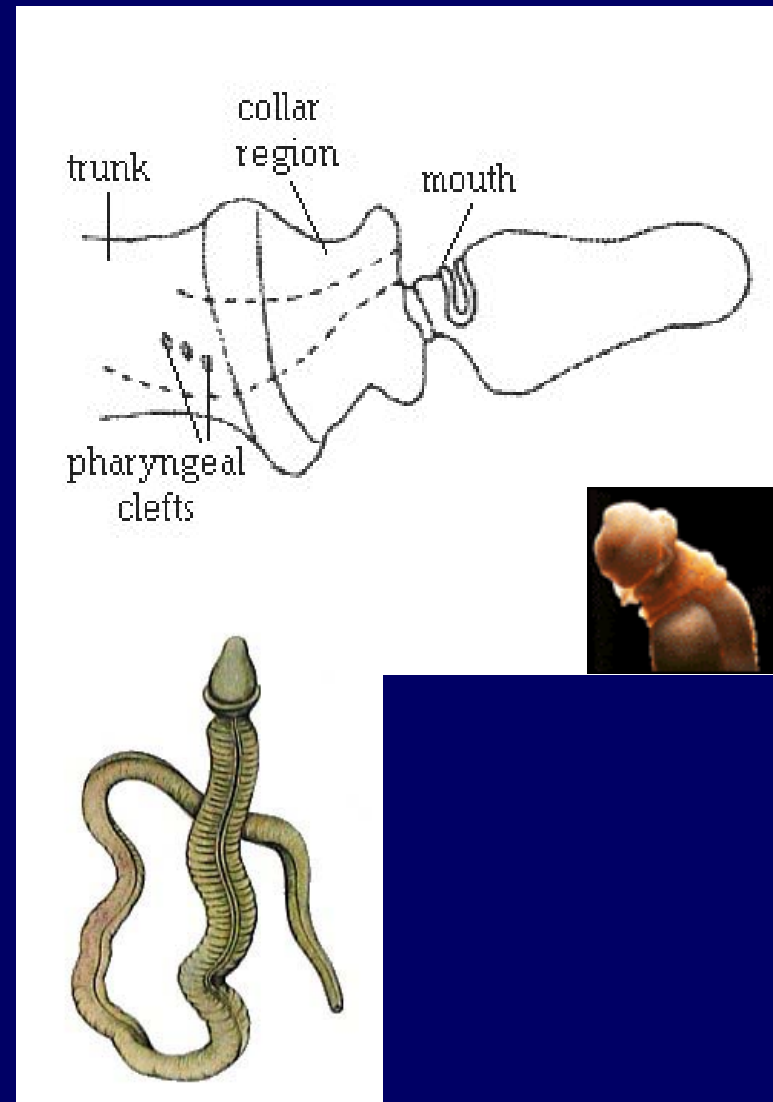
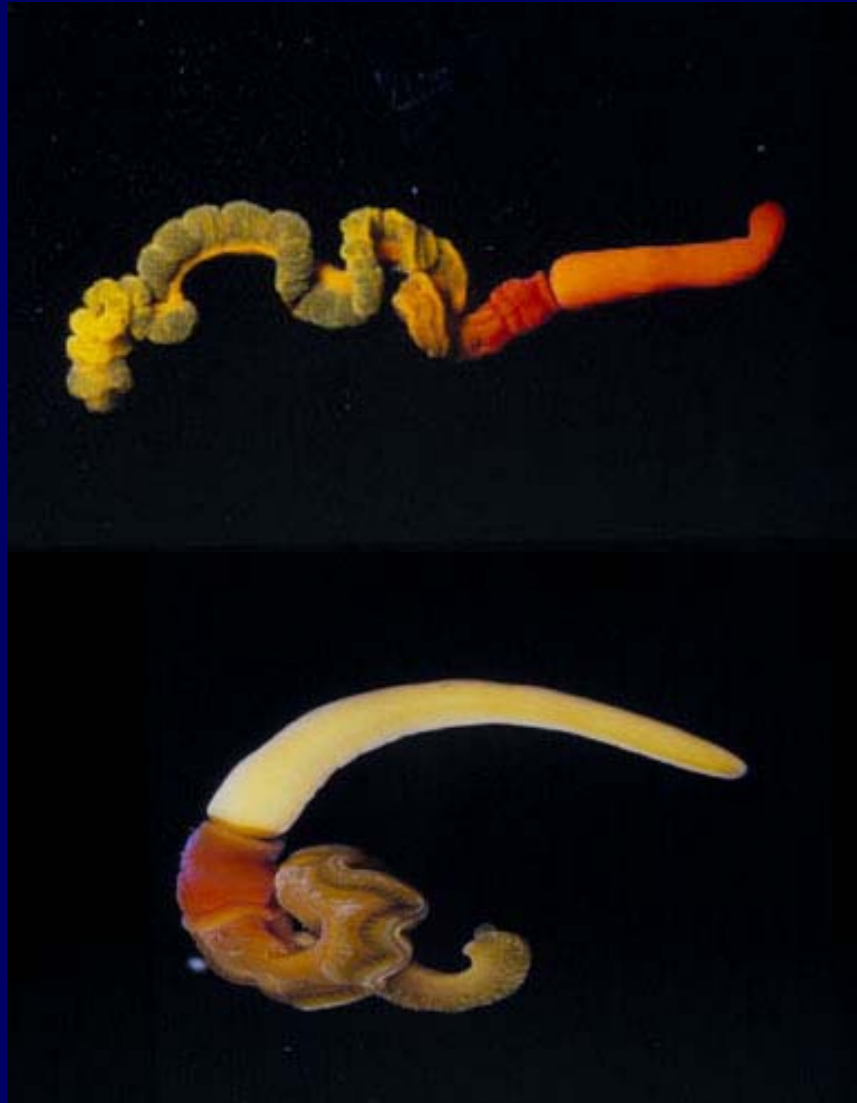
# Deposit-feeders

## *Iregularni ježinci*



# Deposit-feeders

## *Žiroglavci*



# Prehrana morskih organizama

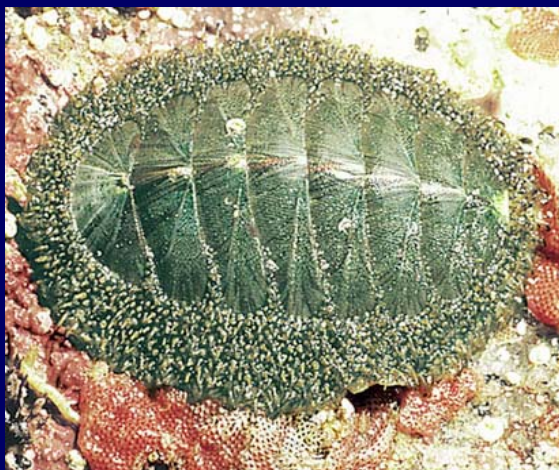
## 3. Herbivori (Biljojedi)

Organizmi koji se hrane biljkama (mikroskopskim i makroskopskim algama, te morskim cvjetnicama)

- Brojni se organizmi hrane makrovegetacijom (makroskopskim algama i morskim cvjetnicama) (**makrofitofagi**): mnogi puževi (gološkržnjaci, stražnjoškržnjaci); ježinci (*Arbacia*, *Paracentrotus*); neke bentoske ribe, neki poliheti
- Neki organizmi stružu filmove mikroalgi na različitim podlogama (stijena, makroskopske alge) (**mikrofitofagi**): mnogi puževi (npr. *Bittium*, *Risoo*, *Gibbula*) – specijalizirani organ: **trenica** ili **radula**; mnogoljušturaši (npr. *Chiton*)

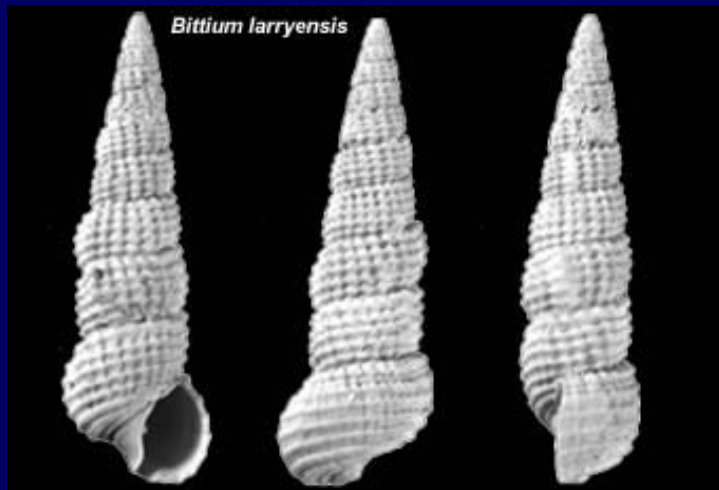
# Herbivori

## *Mnogoljušturaši*



# Herbivori

## *Puževi*



# Herbivori

## *Puževi*



*Haliotis  
lamellosa* –  
Petrovo uho

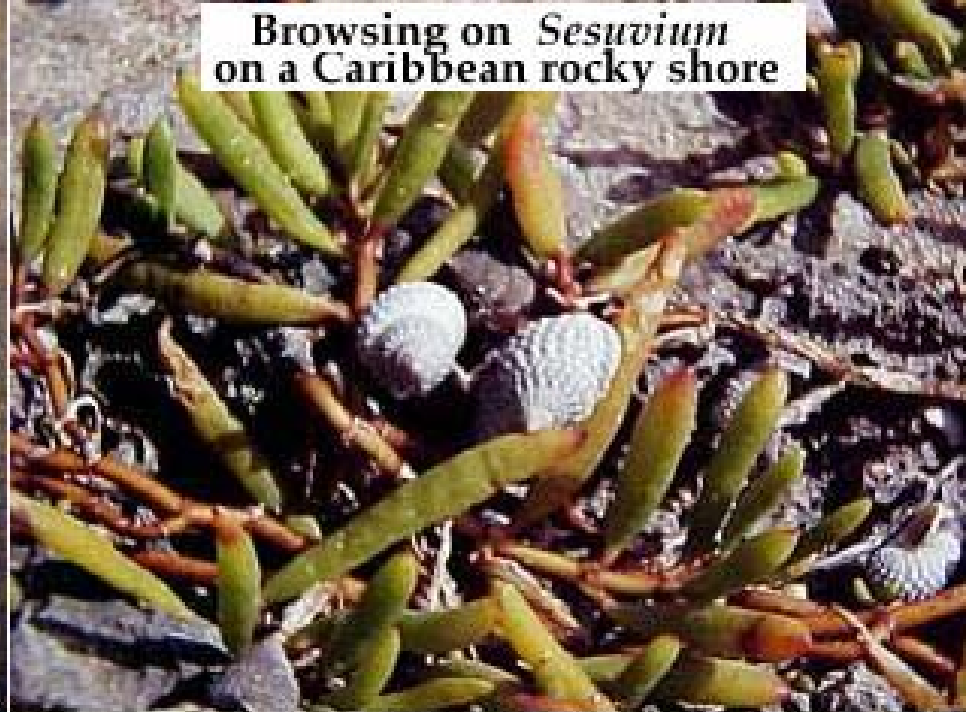


# Herbivori *Puževi*



*Tectarius muricatus* "beaded periwinkle"

Browsing on *Sesuvium*  
on a Caribbean rocky shore



*Littorina irroata* "marsh periwinkle"

Around the base of cord grass  
in a Texas tidal marsh



# Herbivori

## *Puževi*

*Monodonta turbinata*



*Diodora italica*



*Patella ferruginea*



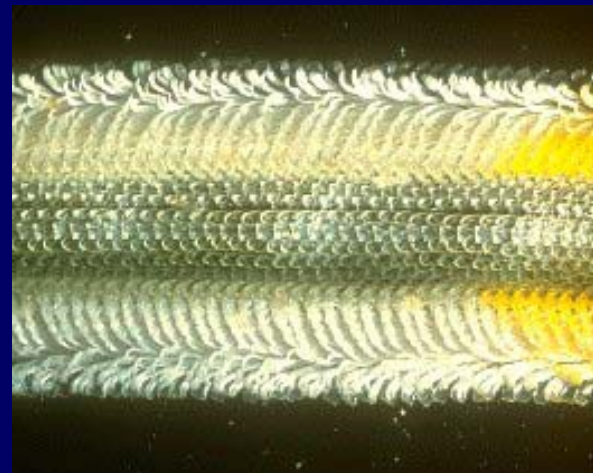
*Patella caerulea*



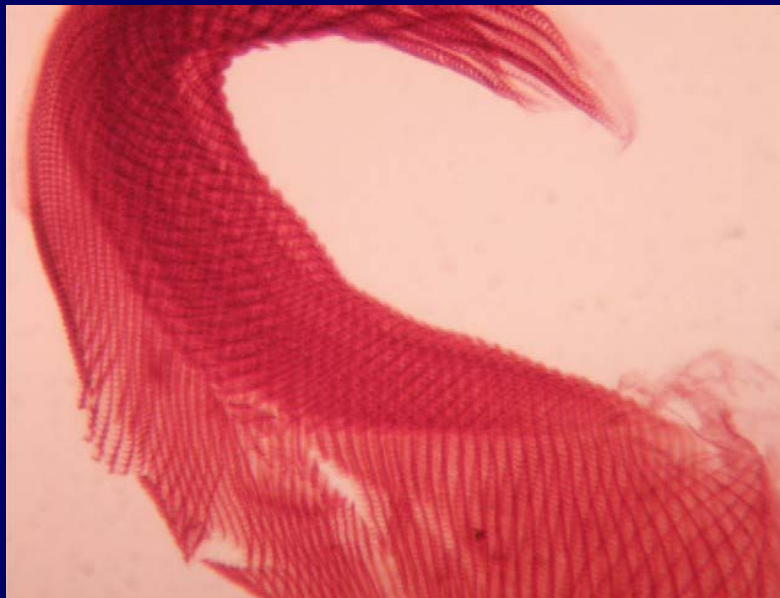
*Patella lusitanica*



**Herbivori**  
*Puževi*



**Radula  
ili  
trenica**





*Patela vulgata*

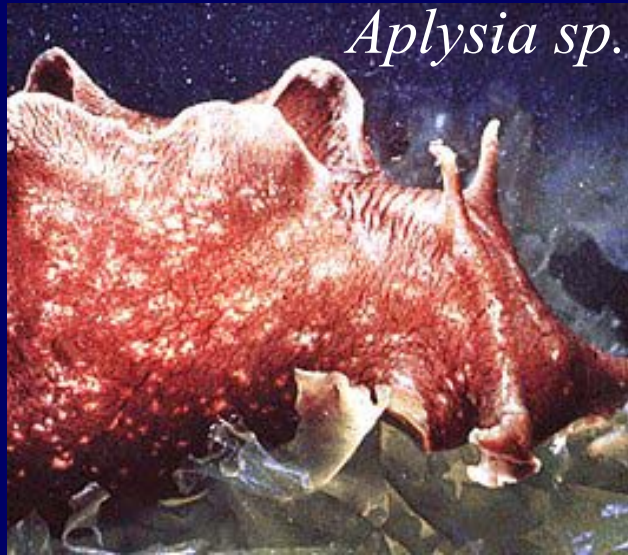


Dio hridine s kojeg je priljepak radulom  
sastrugao alge

# Herbivori

## *Puževi*

Mnogi su stražnjoškržnjaci biljojedi



# Herbivori

## *Rakovi jednakonošci* (Isopoda)



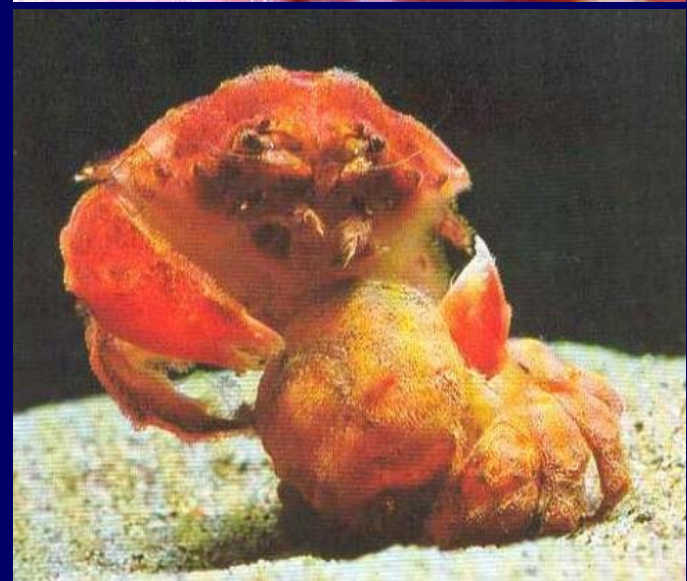
# Herbivori

## *Dekapodni rakovi*

### *Dromia vulgaris*

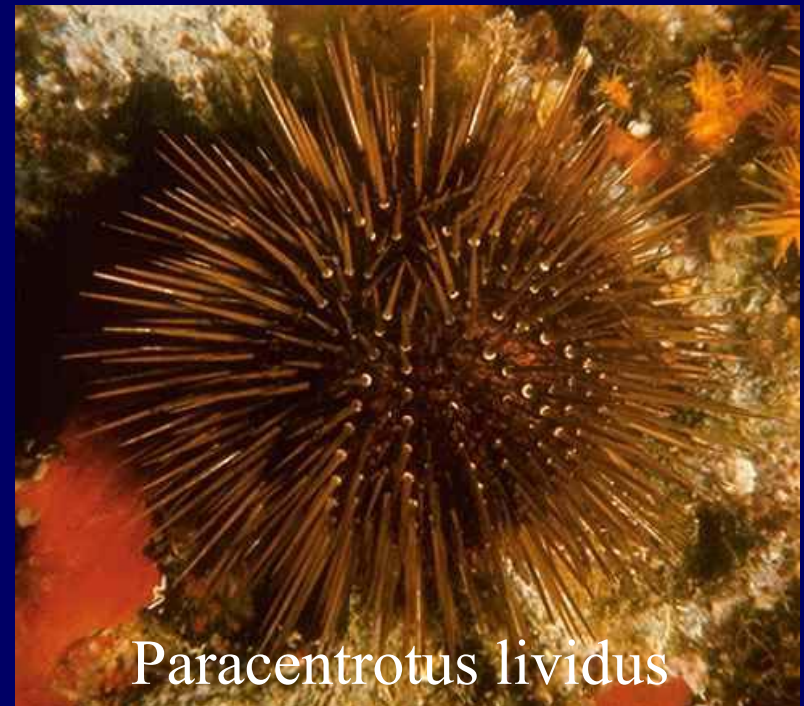
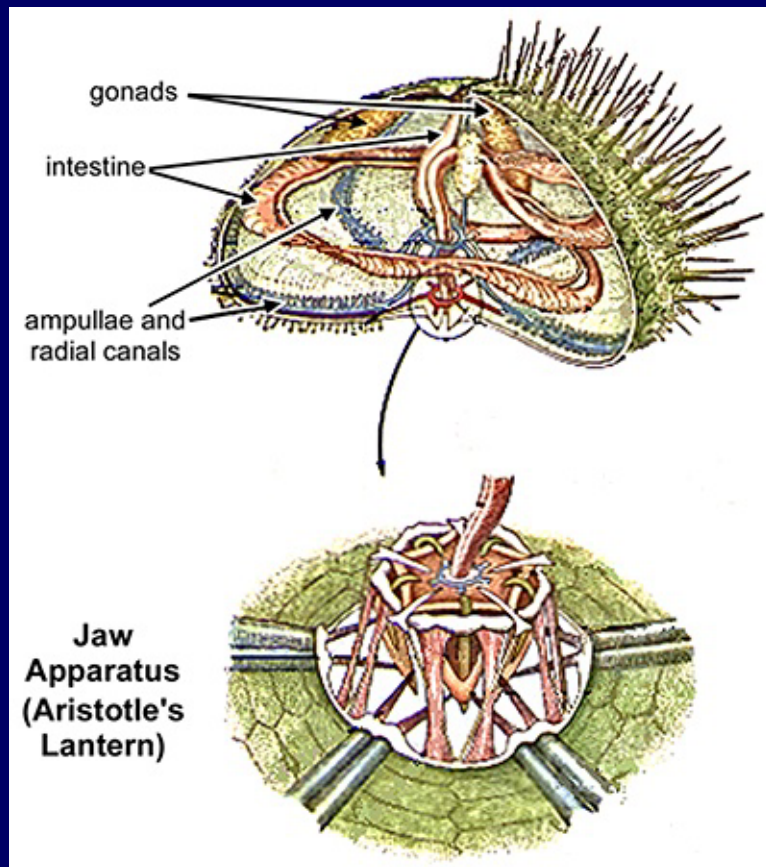


© 1998 by Dieter M. Hummel



# Herbivori

## *Ježinci*

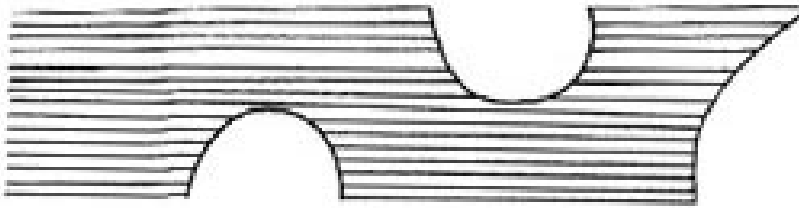


# Herbivori *Ježinci*

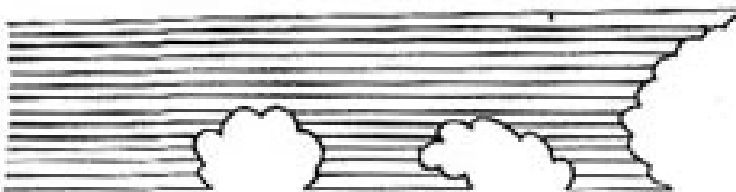


# Herbivori

## Karakteristični tragovi hranjenja herbivora s morskom cvjetnicom



*Boops salpa* -  
salpa



*Idotea hectica*  
(Isopoda)



*Paracentrotus lividus*  
- ježinac

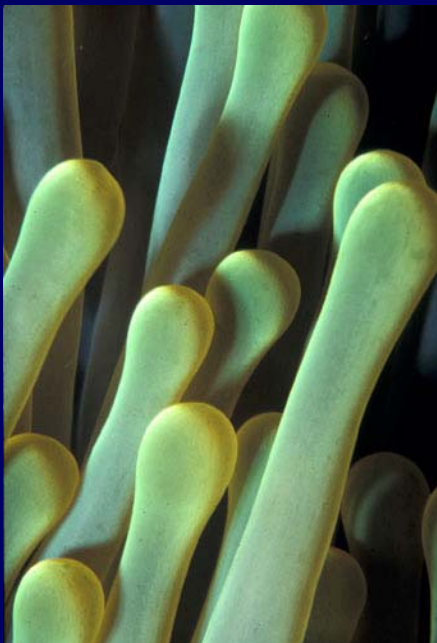
# Prehrana morskih organizama

## 3. Predatori (Karnivori)

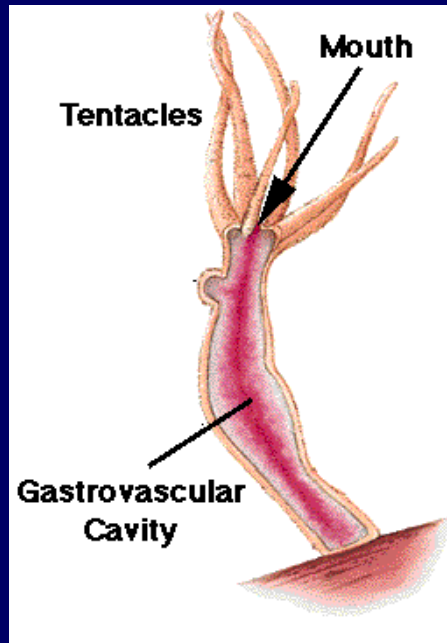
Organizmi koji se hrane drugim životinjama

- U ovu kategoriju spadaju brojni organizmi: vlasulje, meduze, rebraši, vrpčari, valjčari, puževi (npr. *Conus*, *Fasciolaria*), koponošci, glavonošci, poliheti, rakovi, zvjezdače, zmijače, čeljustousti, neki ježinci, kralježnjaci
- Predatori su razvili brojne organe i prilagodbe za hvatanje i savladavanje plijena: vanjska probava, izbacivanje želuca, lučenje toksina (zvjezdače); rila (vrpčari, puževi); lovke (rebraši); žarnice (meduze i vlasulje); snžne čeljusti (čeljustousti, glavonošci, kralježnjaci); električni organi (neke ribe)

Vlasulje, moruzgve



Meduze



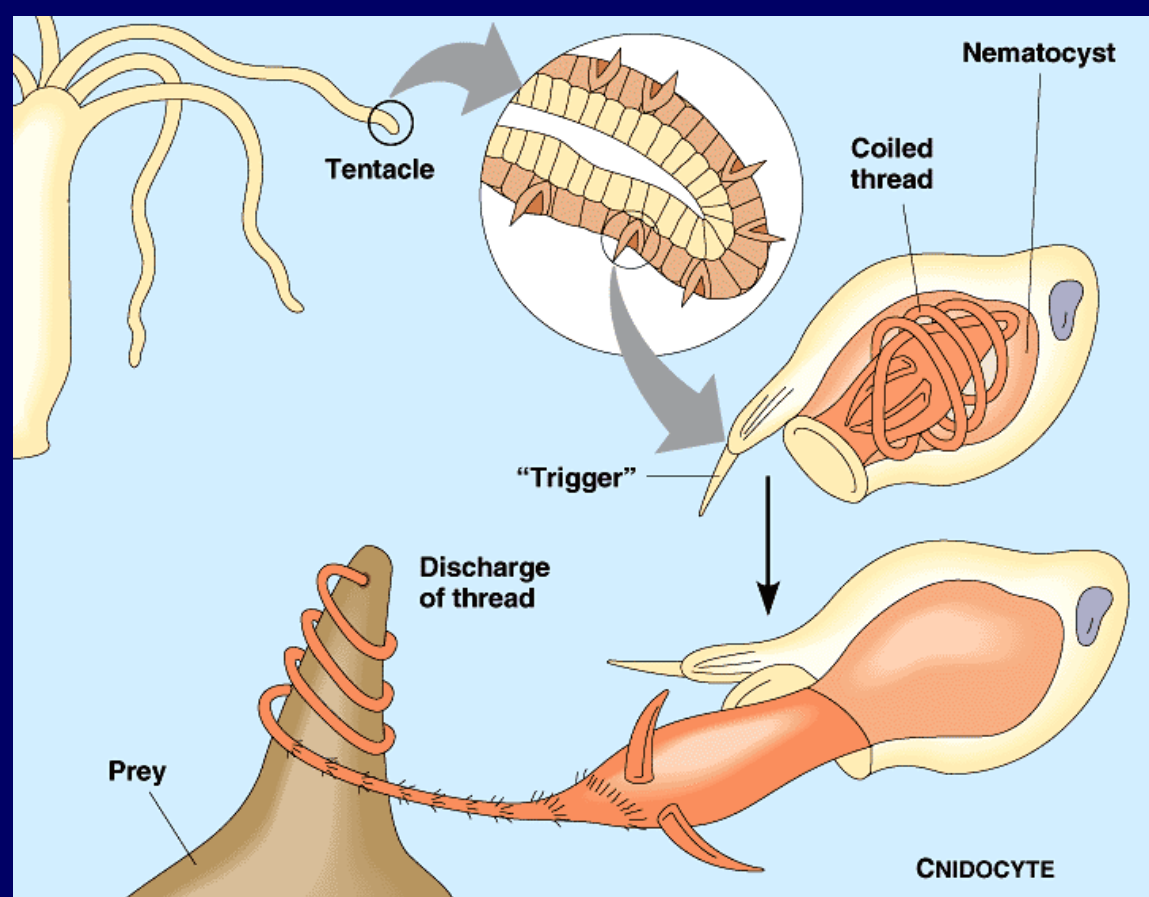
## Predatori *Žarnjaci*



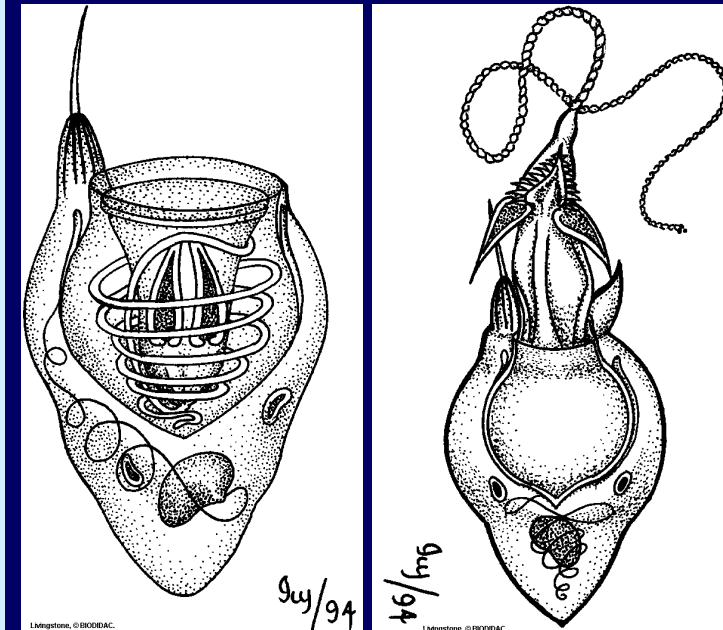
Gastrozoid-polip za  
prehranu kod žarnjaka

# Predatori *Žarnjaci*

Žarnjaci love plijen pomoću lovki koje su opremljene posebnim stanicama – žarnicama kojw se zabadaju u žrtvu i uštrcavaju otrov



**Knidocita prije i  
poslije izbacivanja**

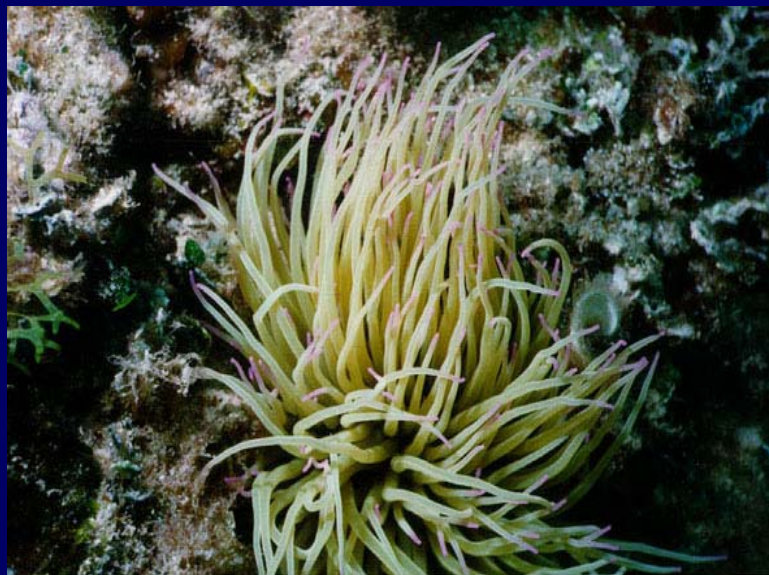


# Vlasulje, moruzgve

*Urticina eques*





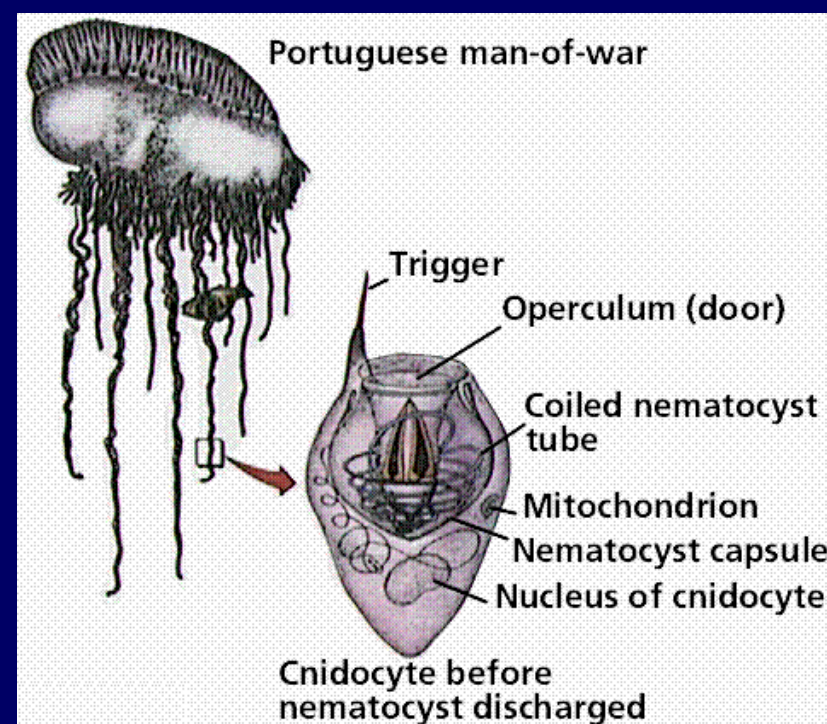
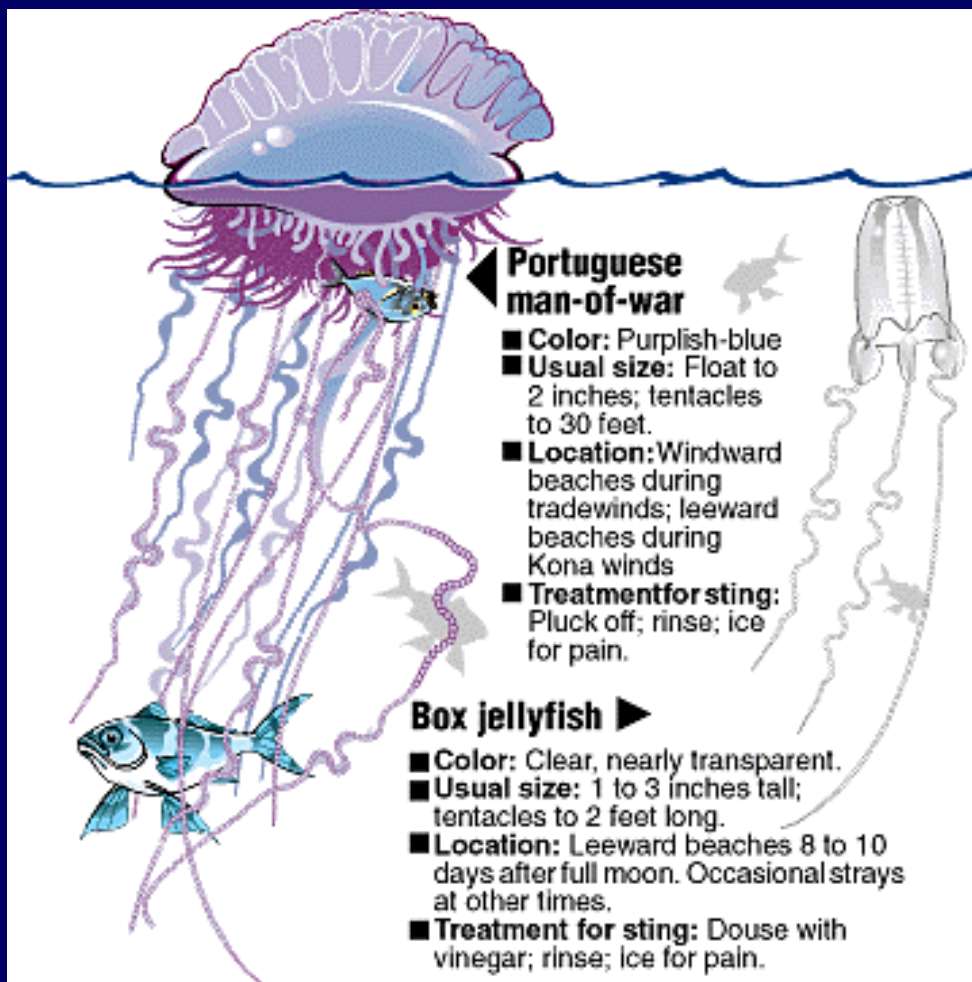




# Meduze



## *Physalia physalis* – portugalski ratni brod



# M. Šolić: Ekologija mora



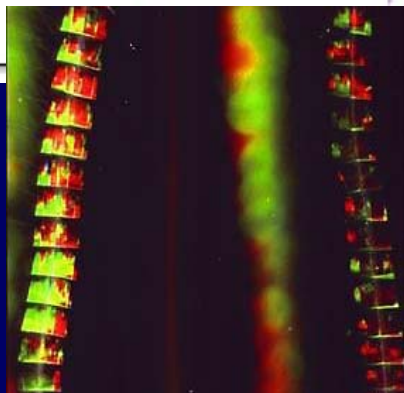
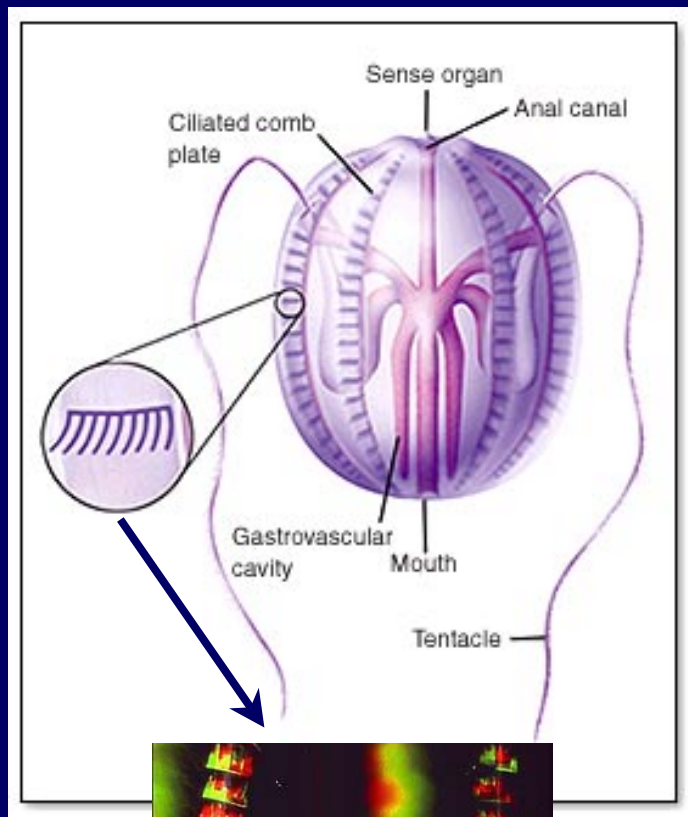
**Ličinka vlasulje jede ličinku raka**



**Ličinka meduze jede ličinku hobotnice**

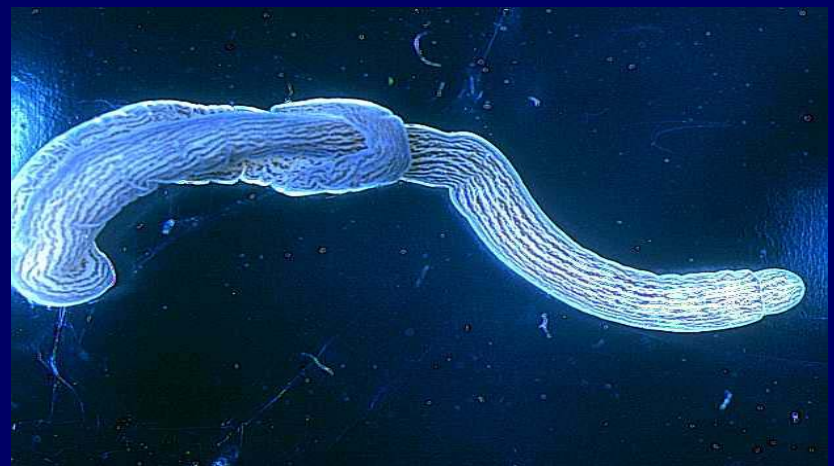
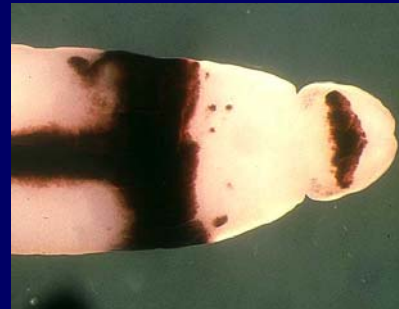
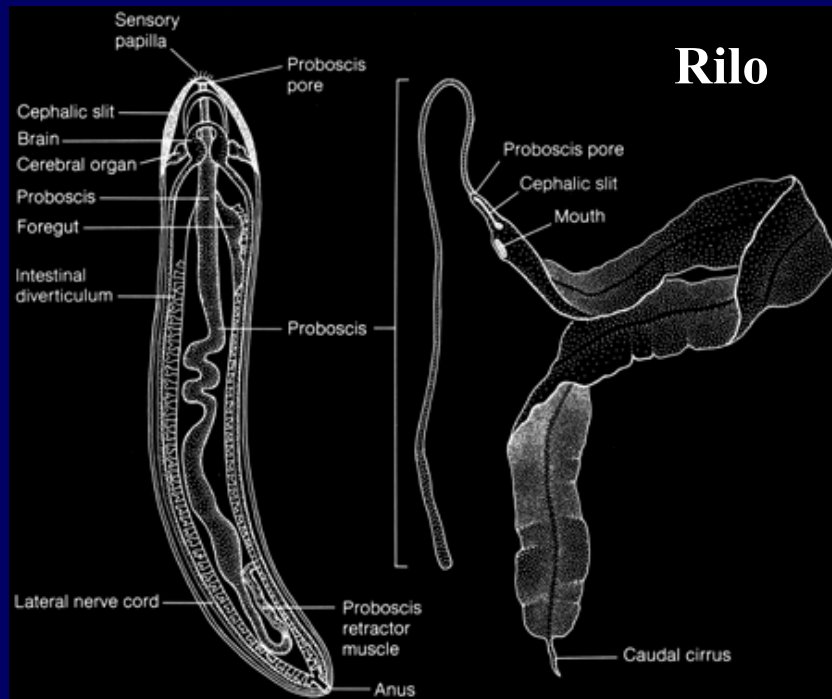


## *Rebraši*

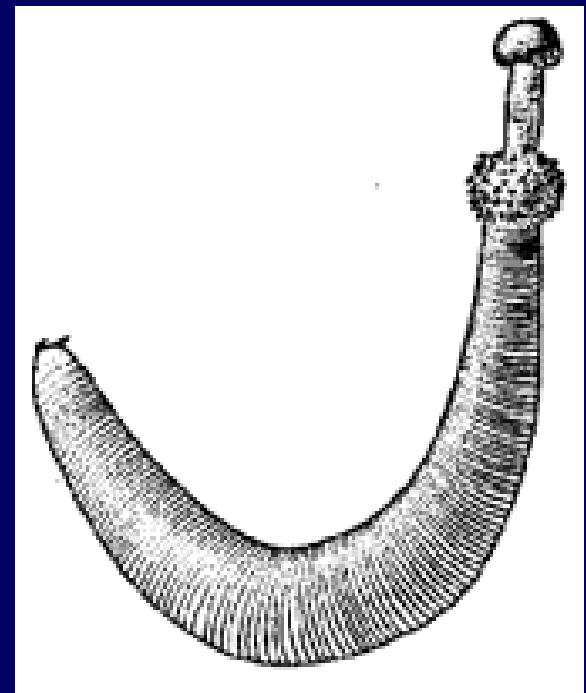
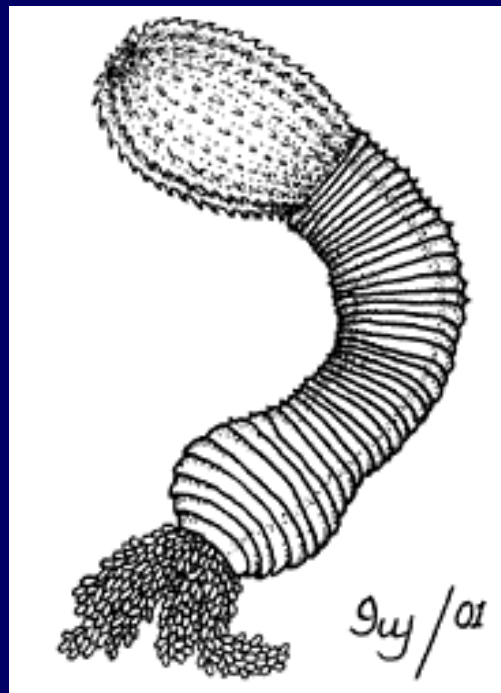
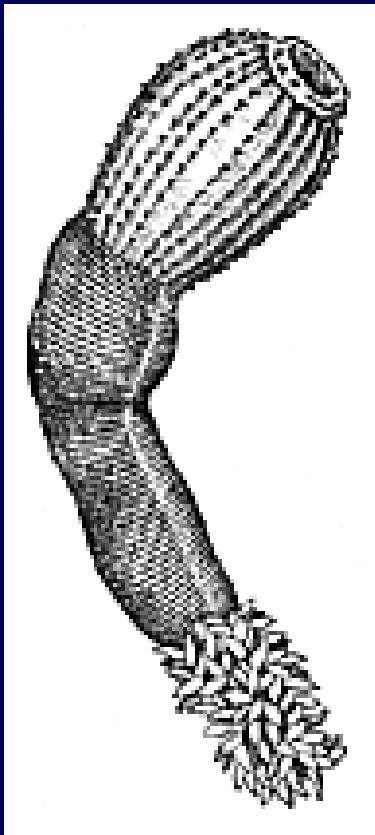
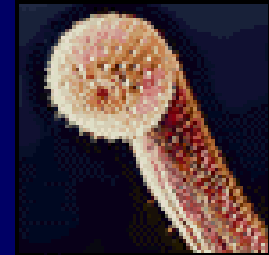


## *Vrpčari*

## Predatori



## *Valjčari*



## *Puževi*



## *Puževi*

Rod *Epitonium* – hrane se  
žarnjacima osobito moruzgvama

*Epitonium scalare*



Rod *Cyprea* – hrane se  
spužvama i koraljima



*Cyprea lurida*

## Predatori

### *Puževi*

**Muricidae** (volci) i  
**Nassidae** – predatori  
(uglavnom napadaju  
puževe) i strvinari



# Predatori

## *Puževi*

### *Cassidaria* sp.



Hrane se prvenstveno  
puževima i školjkašima

### *Tritonalia* sp.



Hrane se prvenstveno  
zvjezdačama koje gutaju  
čitave

### *Dolium* sp.



Hrane se školjkašima,  
ježincima i trpovima



## Predatori *Puževi*



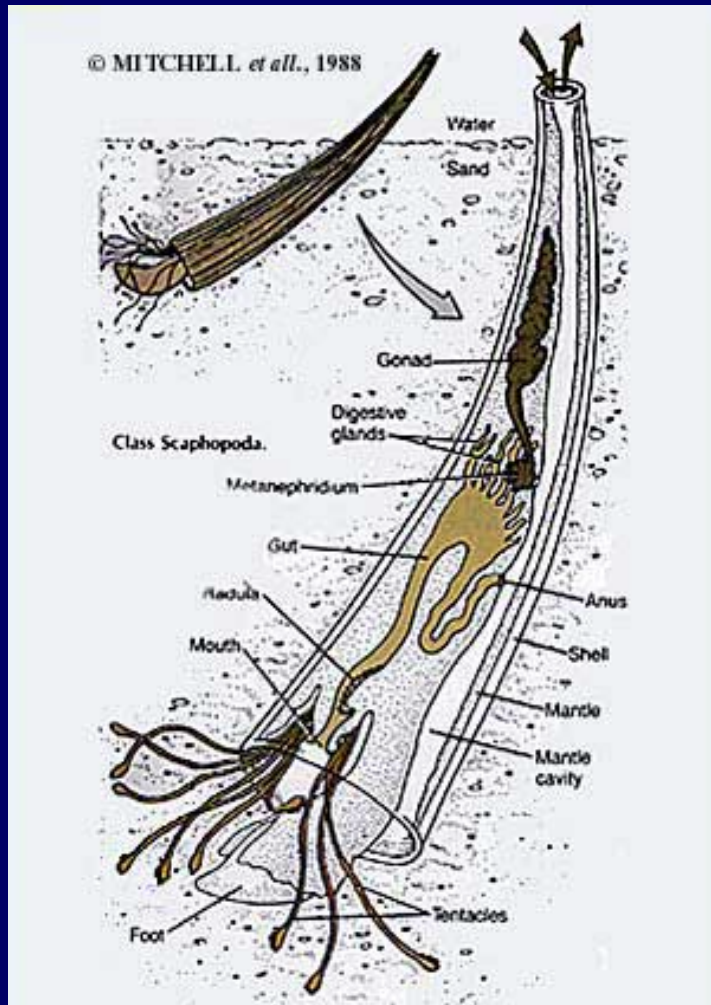
Rod *Natica* –  
napadaju  
školjkaše  
tako što  
probuše rupu  
u ljušturi i  
zatim isisaju  
meko tkivo



Gološkržnjak  
koji napada  
spužvu

# Predatori

## *Koponošci*



Ruju po  
pjeskovitom  
dnu i hrane se  
krednjacima



*Dentalium* sp.

## *Glavonošci*



**Hobotnica  
žrtvu  
najčešće  
ubija  
otrovom**



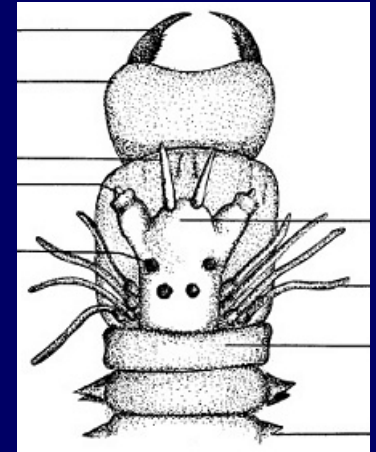
*Nereis* sp.



*Eunice norvegica*



*Poliheti*

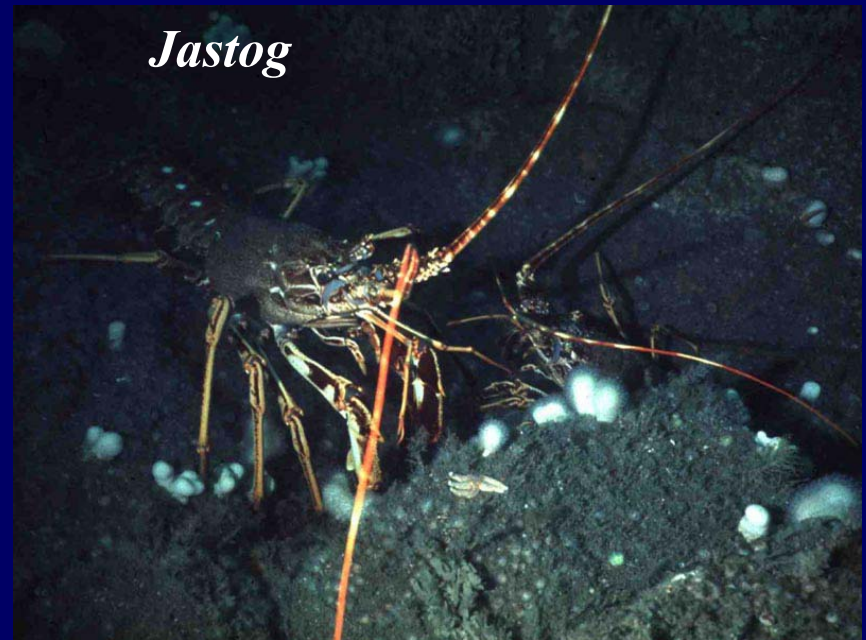


Čeljusti  
predatorskog  
poliheta iz  
roda *Nereis*

# Predatori

## *Rakovi*

Jastog i hlap su predatori koji se hrane puževima, školjkašima, rakovima i bodljikašima; a ponekad i strvinom



**M. Šolić:** Ekologija mora



## *Rakovi*



*Cancer paragus*



© D. LUQUET



*Carcinus maenas*

# Predatori

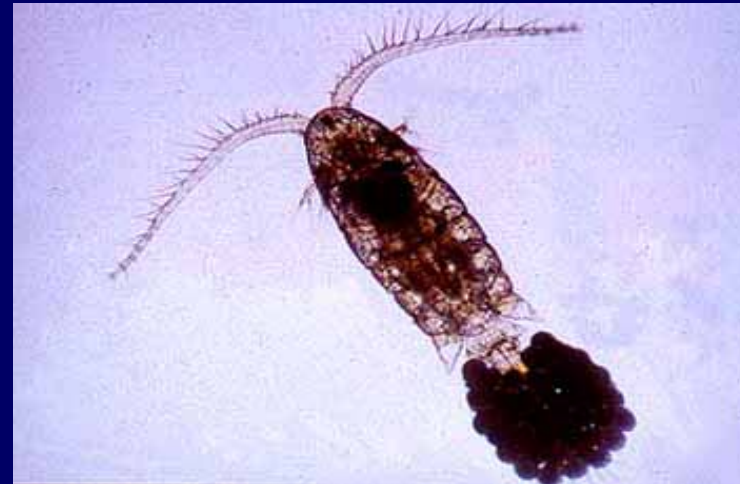
## *Rakovi*



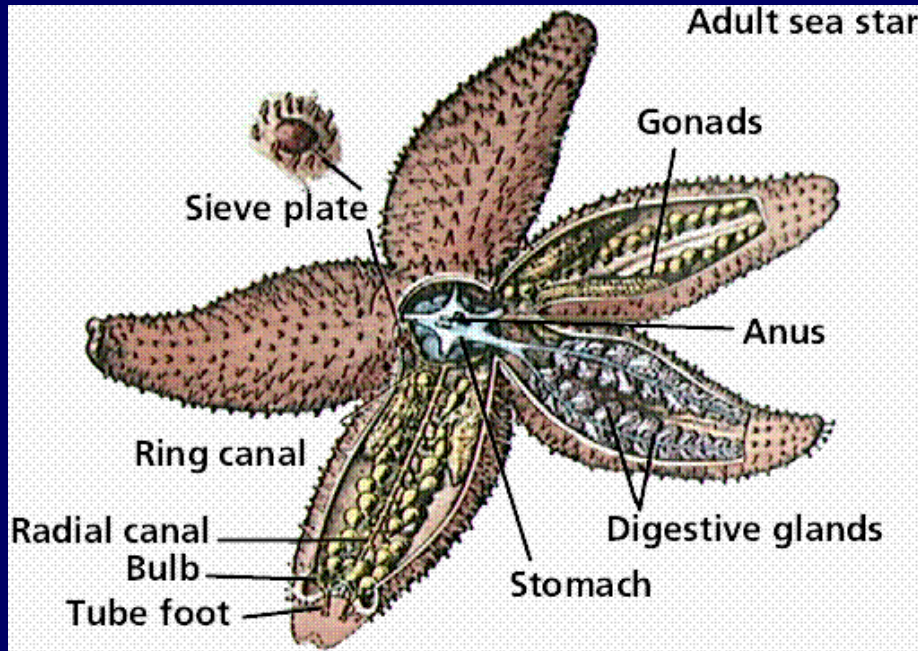
**Kopepodi su  
predatori koji se  
hrane  
fitoplanktonom**



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## *Zvezdače*



Sve zvjezdače su predatori, a omiljena hrana su im školjkaši. Prilagodbe su vanjska probava (želudac izbacuju izvan tijela) i ličenje toksina



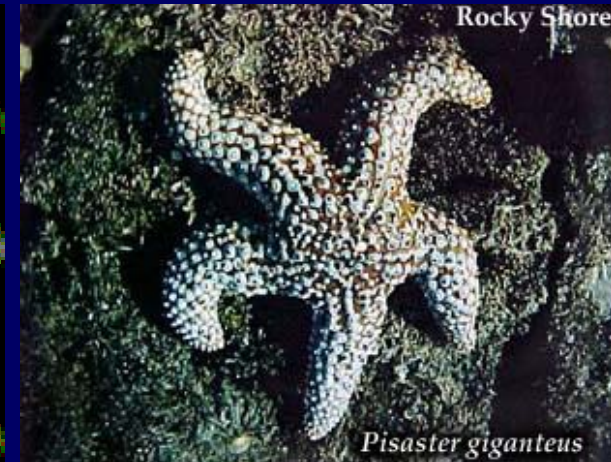
## *Zvezdače*



## *Zvezdače*



## *Zvezdače*



## *Zmijače*



## Ježinci



## *Ježinci*



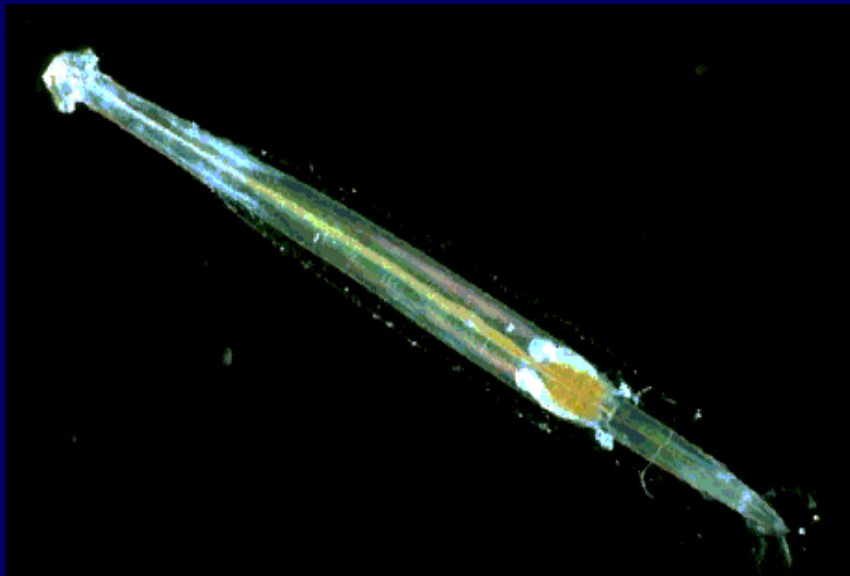
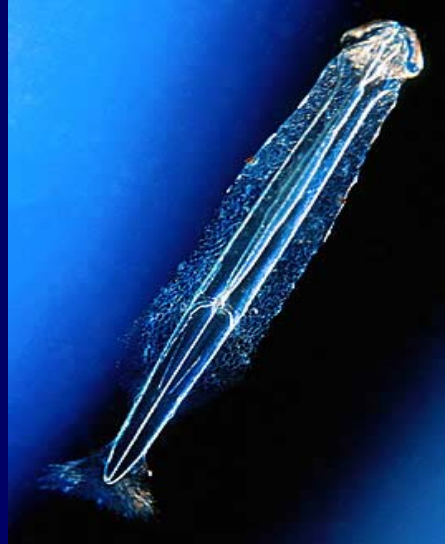
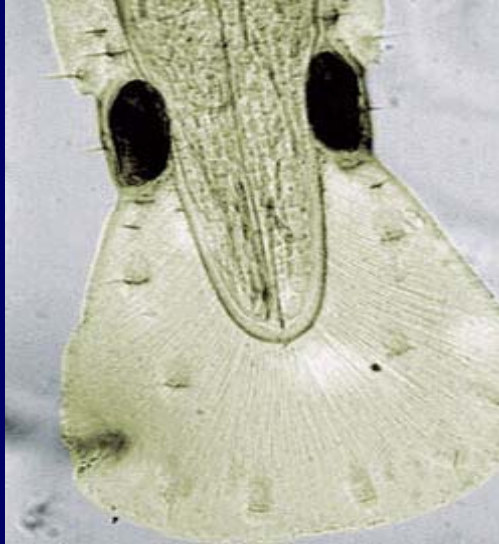
# Predatori

## *Ježinci*

Aristotelova svjetiljka – aparat za žvakanje kod ježinaca



## *Čeljustousti*



# Predatori

## *Kralježnjaci*

### *Kružnouste - Paklare*



## *Kralježnjaci*

## Predatori

Manta se hrani  
oblakom planktona



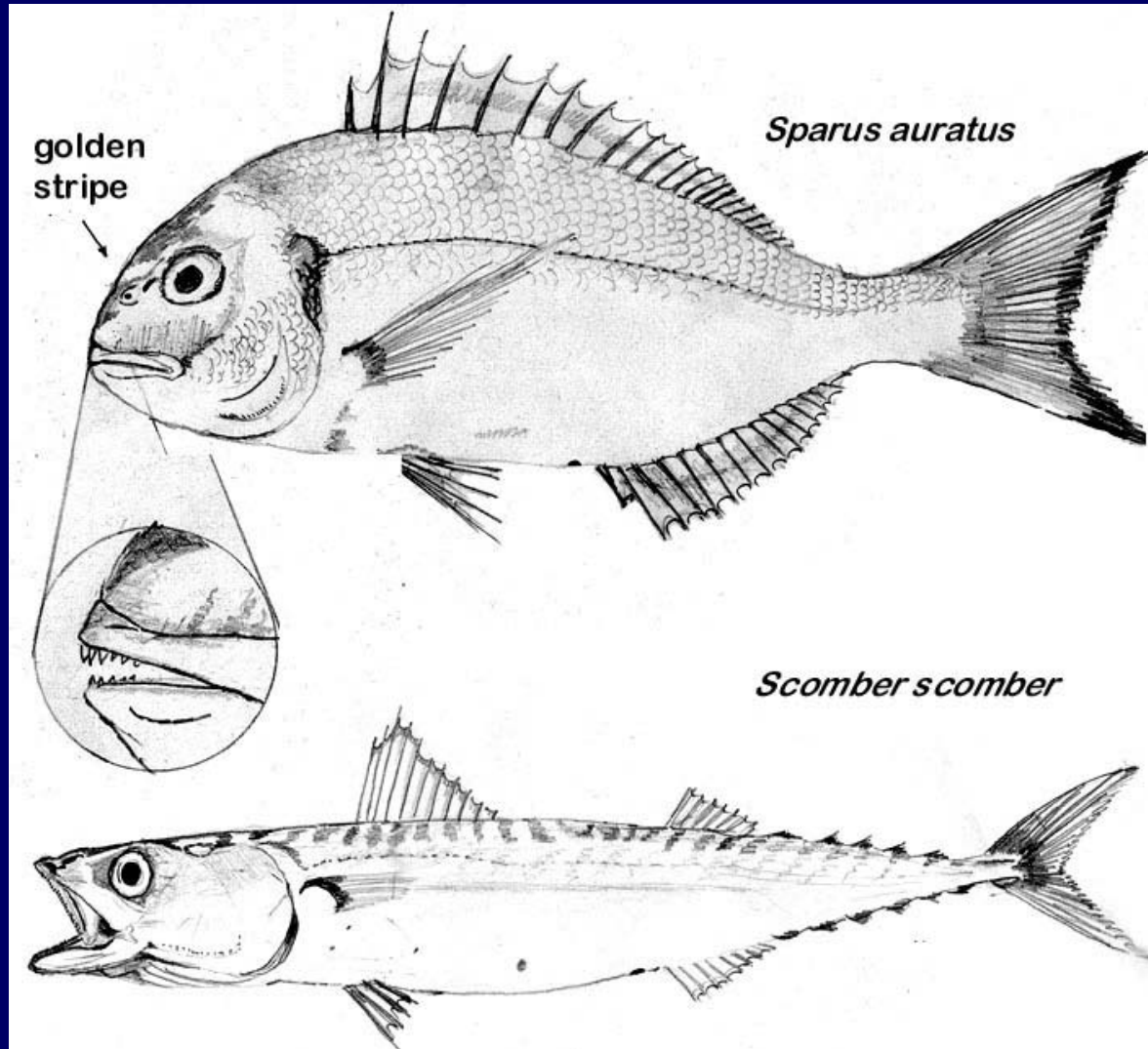
Morski pas se  
hrani krilom



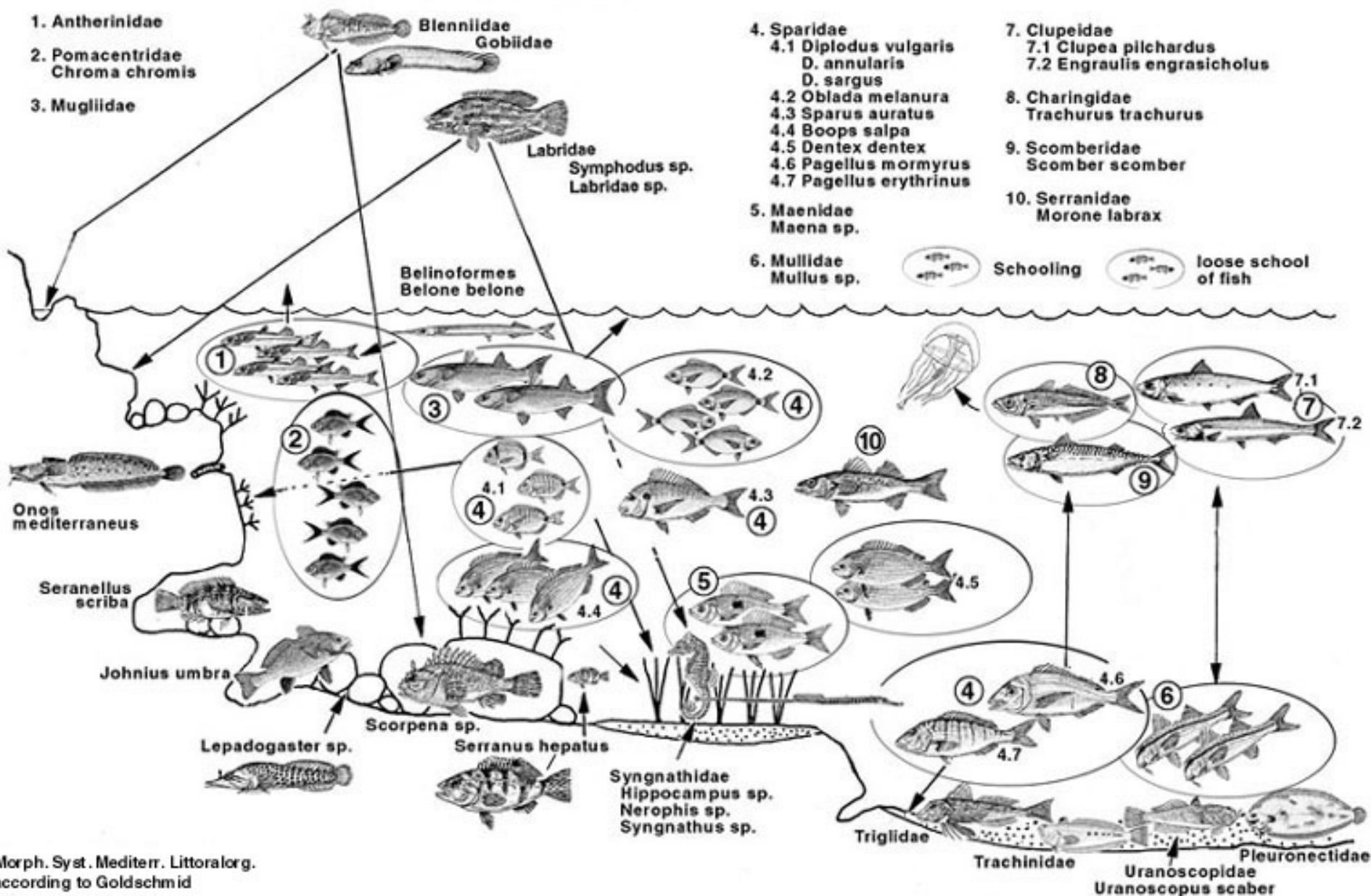
## *Kralježnjaci*



## *Kralježnjaci*



## Distribution of epipelagial fish communities



## *Kralježnjaci*



## Predatori



# Prehrana morskih organizama

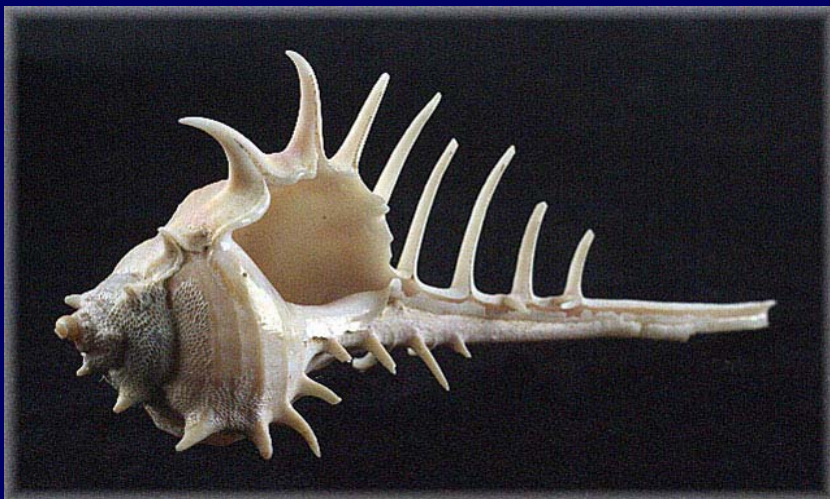
## 3. Strvinari (čistači)

Organizmi koji se hrane uginulim biljkama i životinjama ili njihovim ostacima

- U ovu kategoriju spadaju brojni organizmi: dekapodni raci (većina rakova samaca *Pagurida*); brojni puževi (osobito porodica *Nassidae* čiji predstavnici imaju vrlo dugačka rila za sisanje); neke zmijače itd.

## *Puževi*

**Porodica: Muricidae (volci)**



# Strvinari

## *Puževi*

**Porodica:**  
**Nassidae**

*Nassarius mutabilis*



# Strvinari

# *Rakovi samci*



# Strvinari



*Dekapodni rakovi*





## Strvinari *Zmijače*

