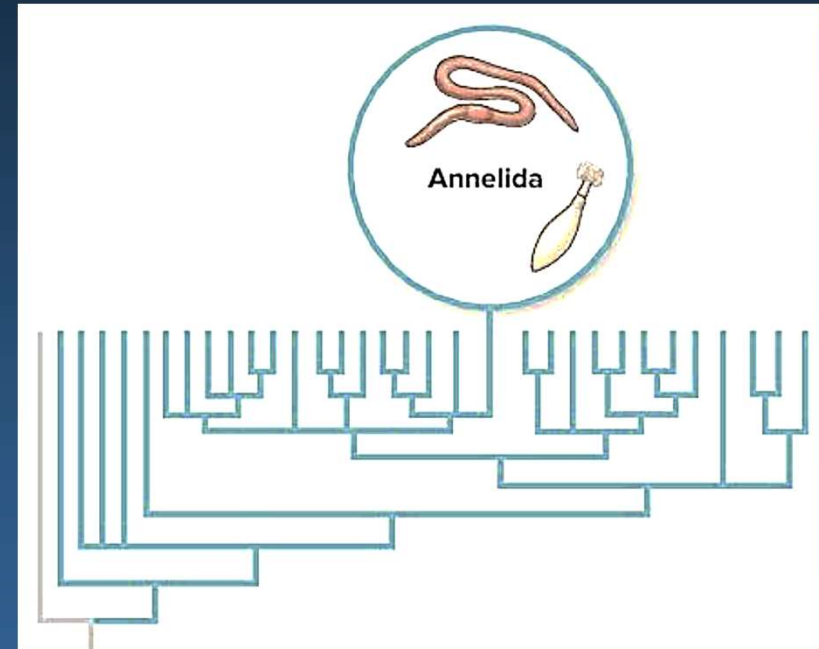
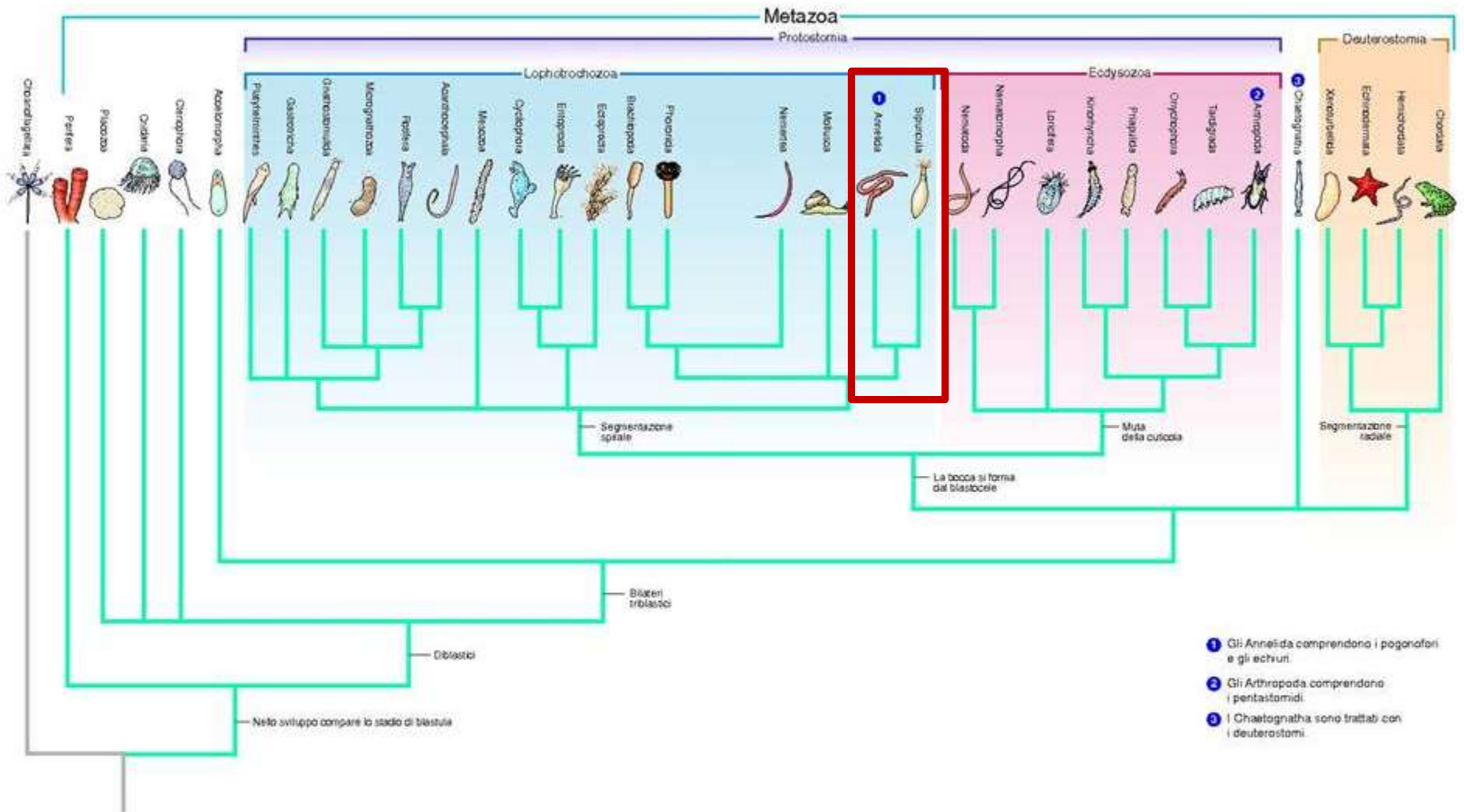




# Anellidi e taxa affini

Cap. 23





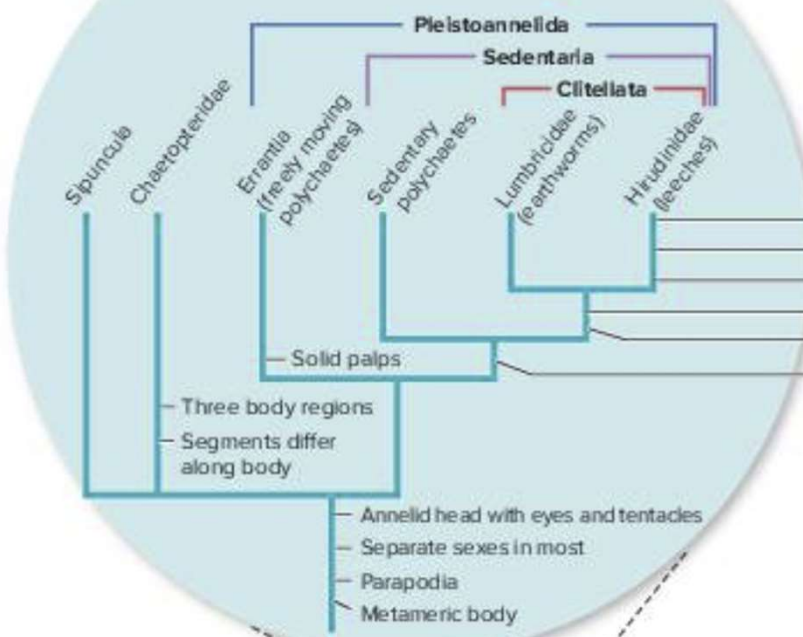
**Slide 2**

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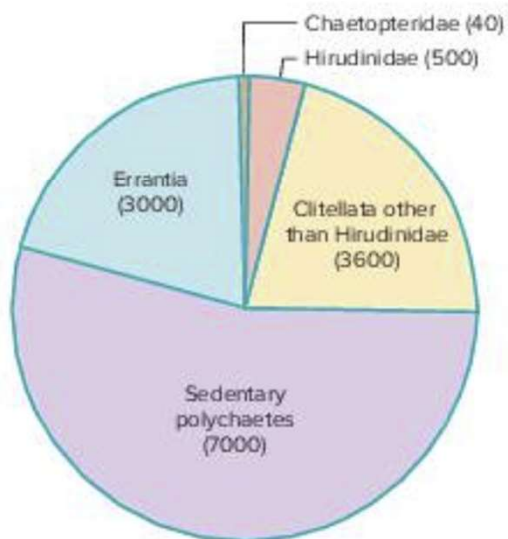
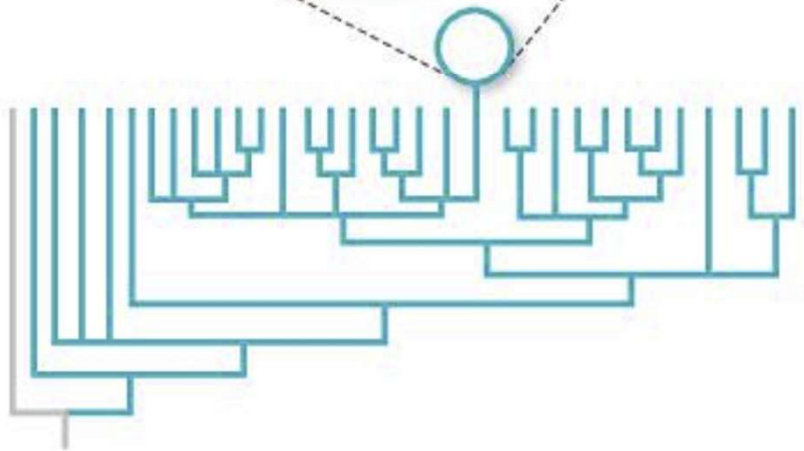
**PC1**

Paolo Ciucci, 09-Dec-20

# Phylum Annelida



- Body with fixed number of segments
- Setae reduced or absent
- Oral and posterior suckers in most
- Hermaphroditism
- Clitellum
- Parapodia reduced or absent
- Solid palps
- Three body regions
- Segments differ along body
- Annelid head with eyes and tentacles
- Separate sexes in most
- Parapodia
- Metameric body

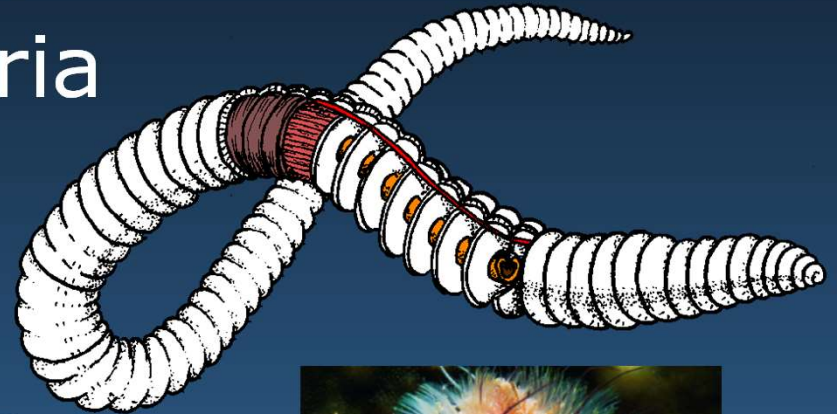






## Metameria

- *metameria*, come novità evolutiva
  - ✓ efficienza di movimento/scavo
  - ✓ indipendenza tra parti del corpo
  - ✓ minore vulnerabilità dovuta a ridondanza delle parti del corpo
  - ✓ *omonoma* vs *eteronoma*



*Chloeia sp.*



## Metameria

- Anellidi, Artropodi, Cordati: veri animali metamerici
- la metameria in questi taxa non è omologa, ma si è originata più volte indipendentemente:
  - ✓ Protostomi Lofotrocozoi
  - ✓ Protostomi Ecdisozoi
  - ✓ Deuterostomi







## Anellidi

- Protostomi Lofotrocozoi
- bilateri triblastici
- celomati (schizocelici)
- larva trocofora (stato ancestrale)
- Echiuridi e Sipunculidi non segmentati per perdita secondaria







# ANNELIDA

(*'annulus'*, piccolo anello)

- ~15.000 specie, cosmopoliti
- marine, acque interne, terreni umidi
- bentonici, pelagici, ematofagi
- filtratori, sospensivori, predatori
- rilevante ruolo ecologico







# ANNELIDA

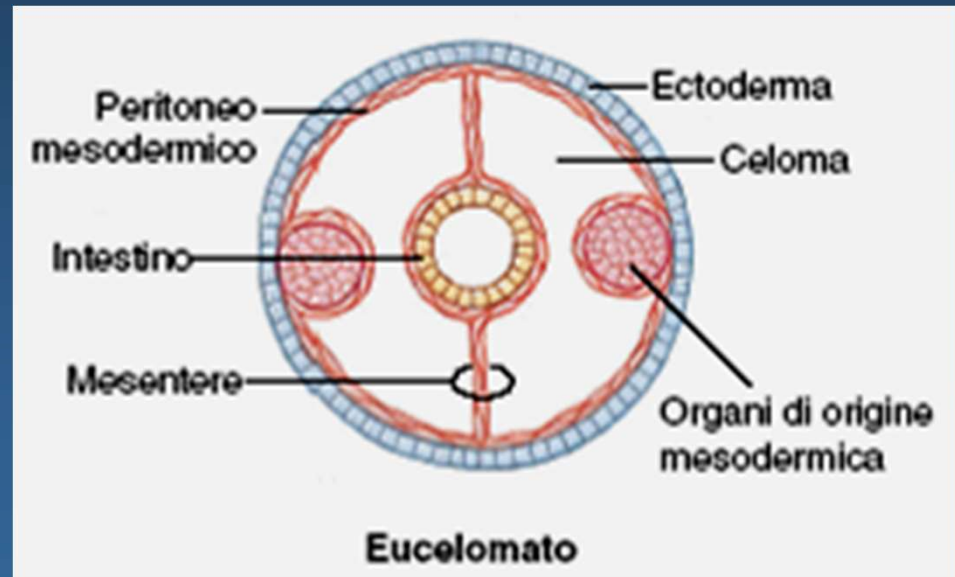
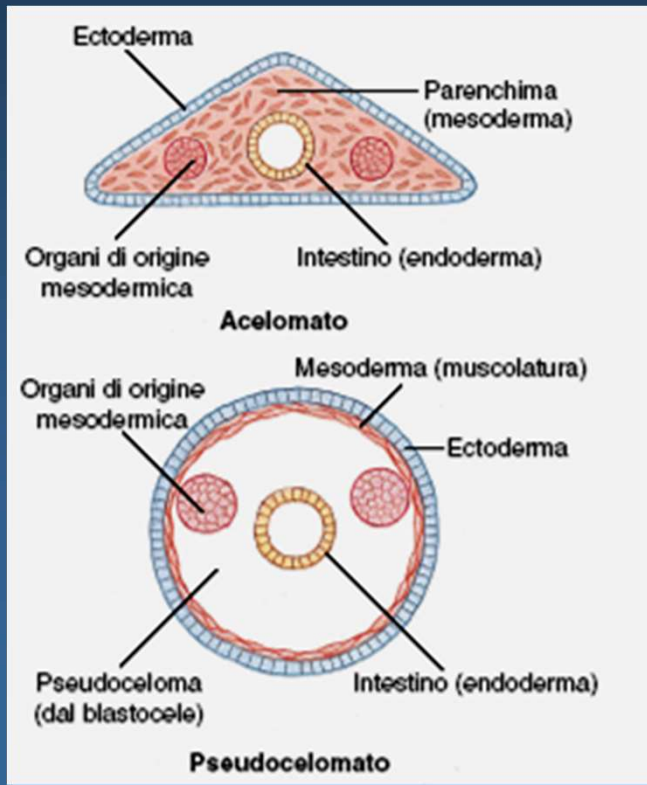
Importanti acquisizioni  
(oltre alla metameria):

- **setae**: ancoraggio, nuoto
- sistema circolatorio completo
- sistema nervoso e organi di senso specializzati
- sistema escretore con nefridi





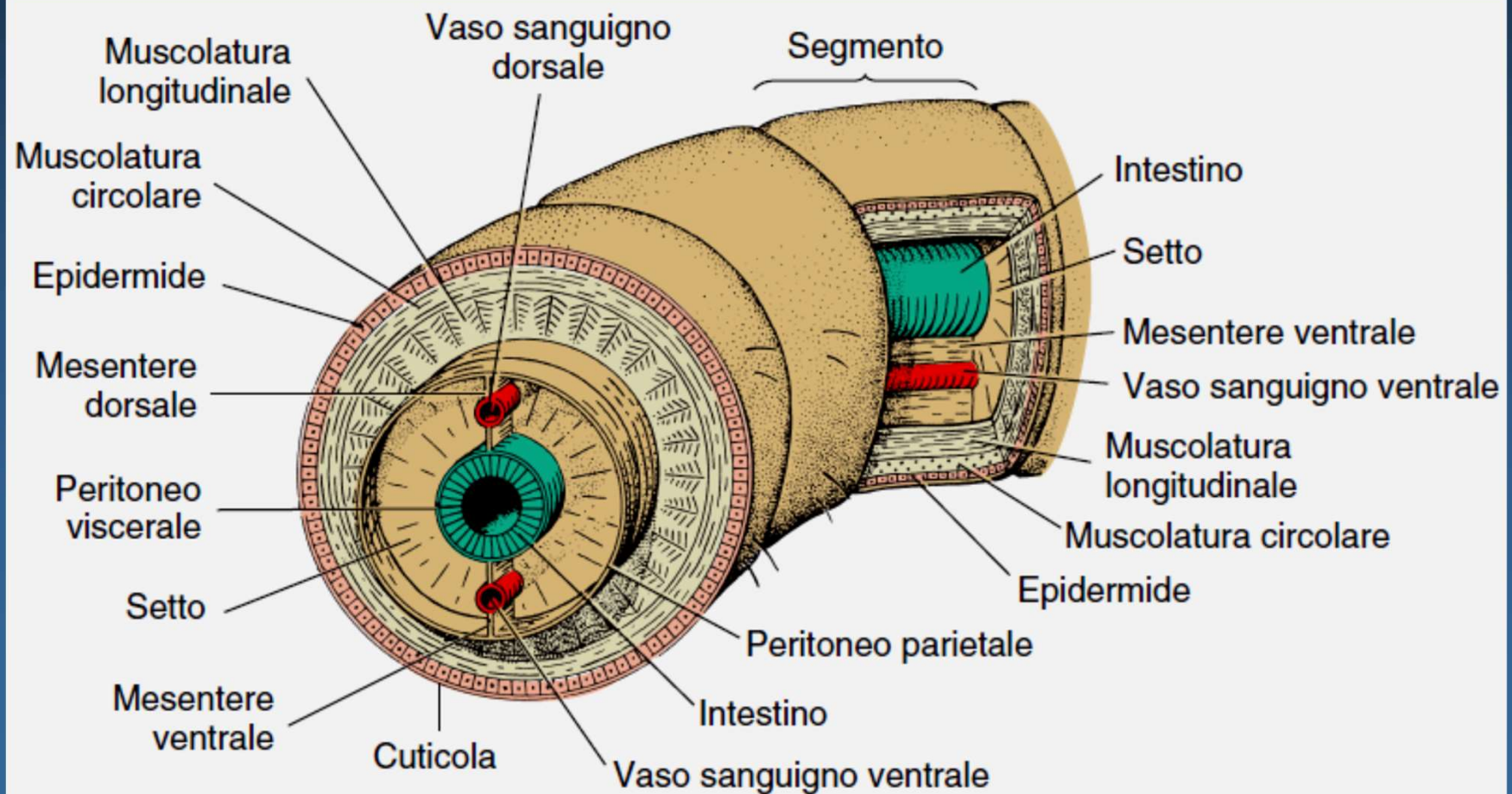
# Anellidi: eucelomati per eccellenza



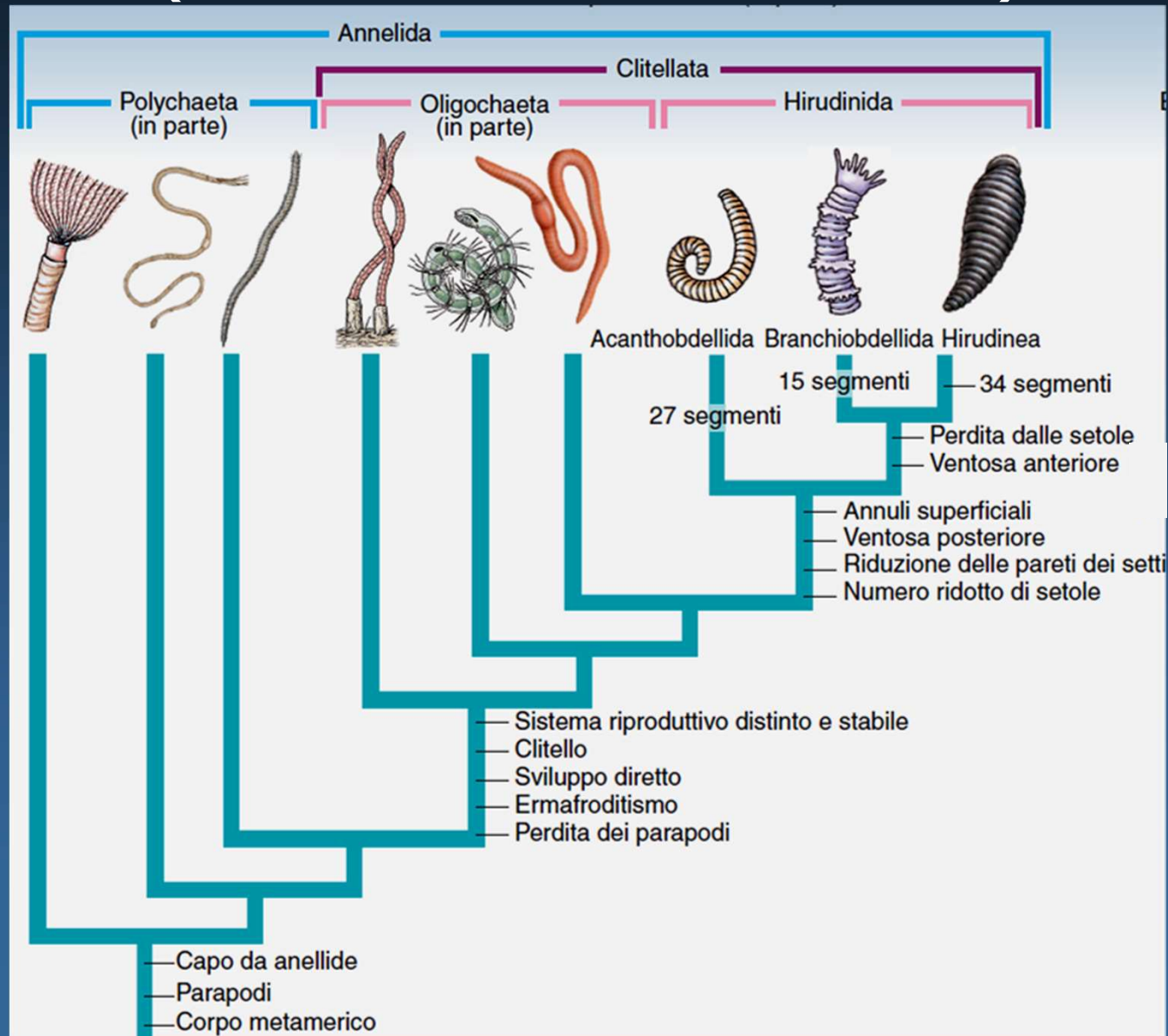




# ANNELIDA – piano organizzativo

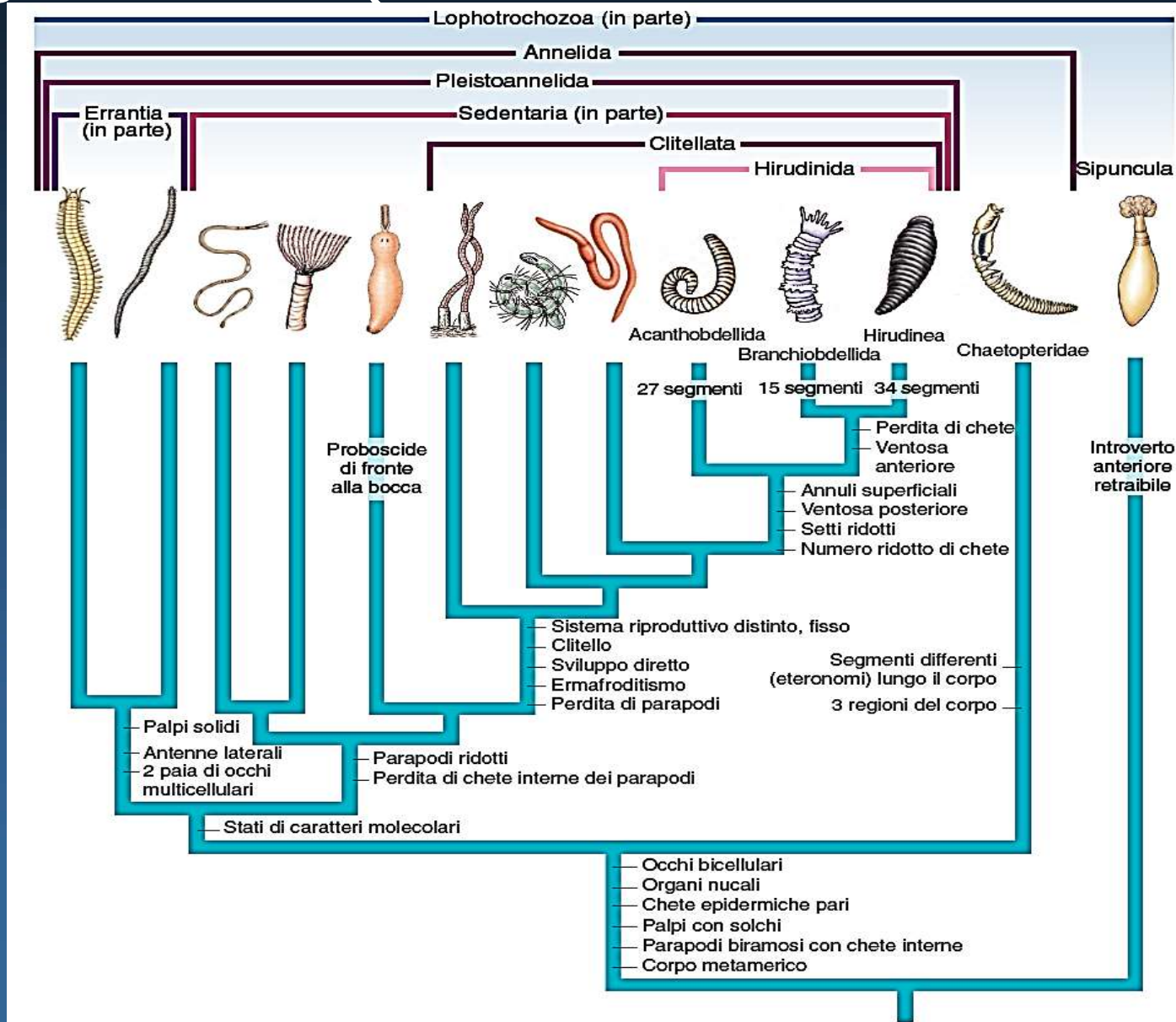


# Classificazione degli Anellidi: 3 classi (Hickman et al. XV ed.)





# Classificazione degli Anellidi: cladi gerarchici (Hickman et al. XVI ed.)



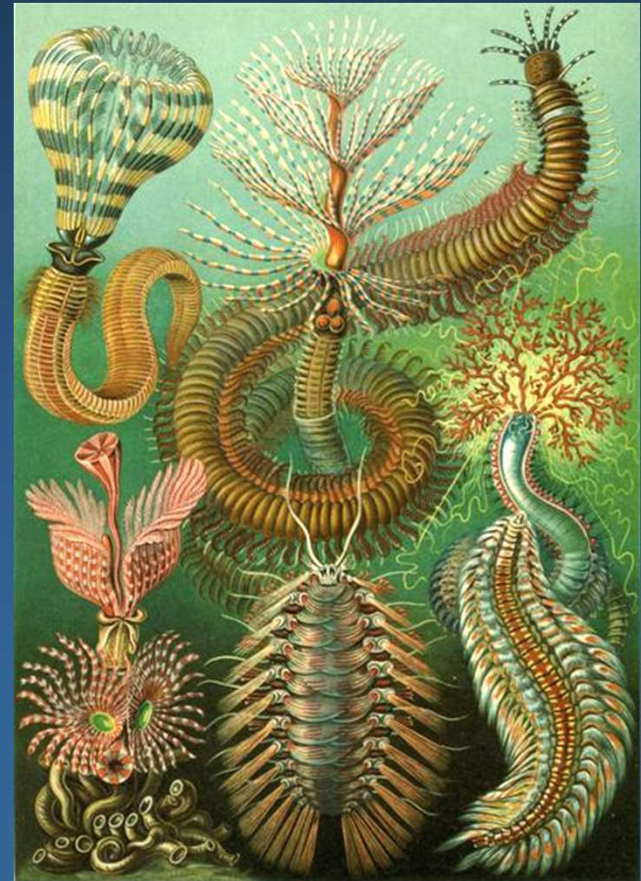




## 'Polychaeta'

(*gr. polys* 'molti' + *chaite* 'lungo capello')

- ~ 10.000 specie, per lo più marine
- lunghi 5-10 cm (1-3 m)
- bentonici (*sedentari, erranti*) o pelagici
- includono i 'vermi a ventaglio'







## Pleistoanellidi - Errantia

- 3000 specie
- bentonici (tubicoli, striscianti), pelagici
- predatori, necrofagi



Foto di Rocco Mussat Sartor  
© Università degli Studi di Torino





## Pleistoanellidi - Sedentaria

- includono 'policheti' sedentari (7000 spp), 'oligocheti' (3600 spp) e Irudinei (500 spp)
- fossori, tubicoli, scavatori



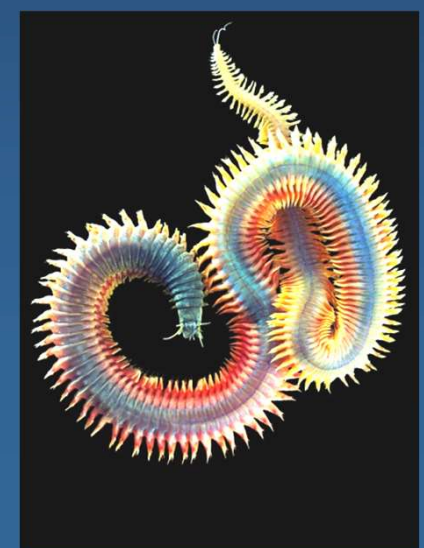
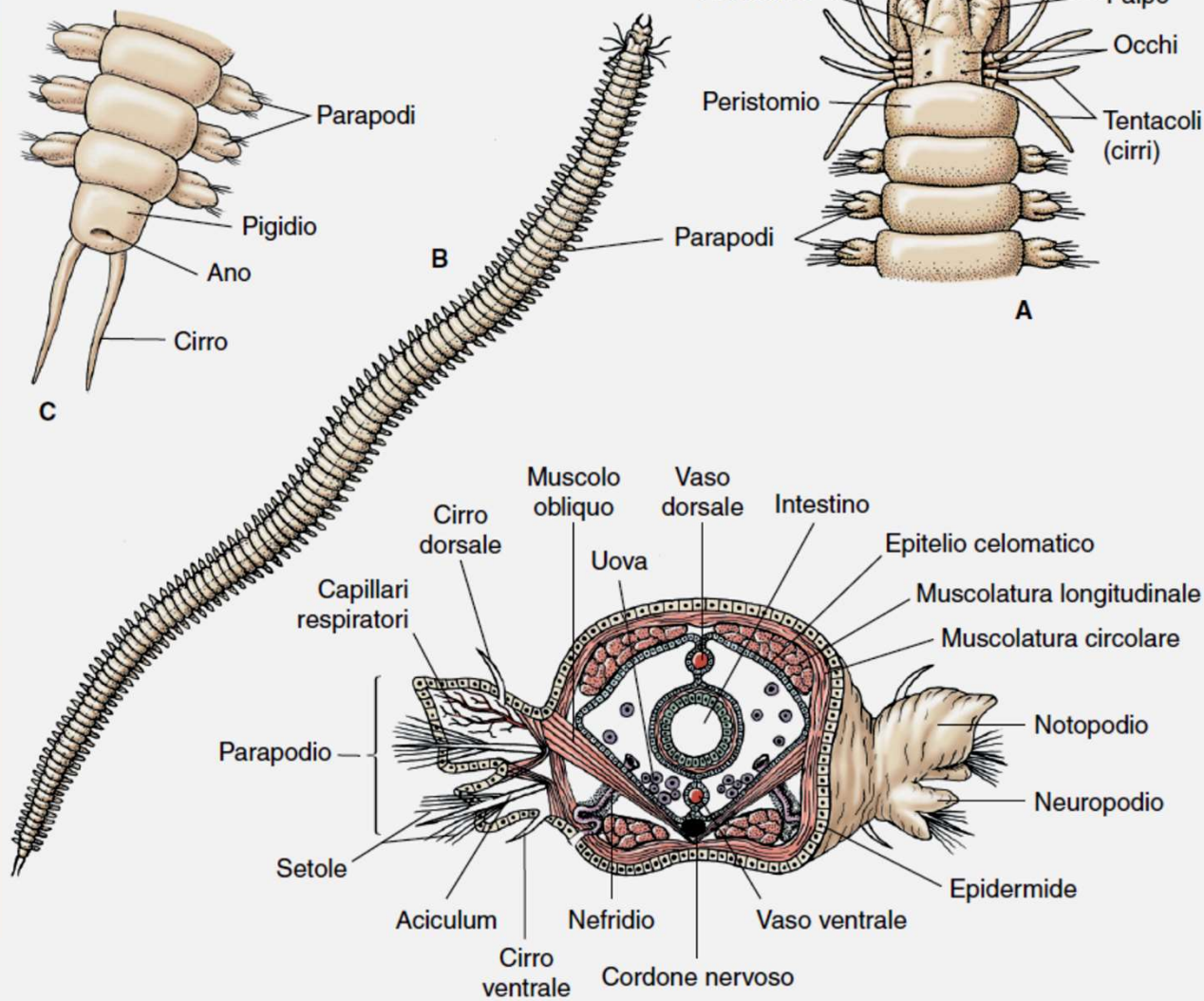
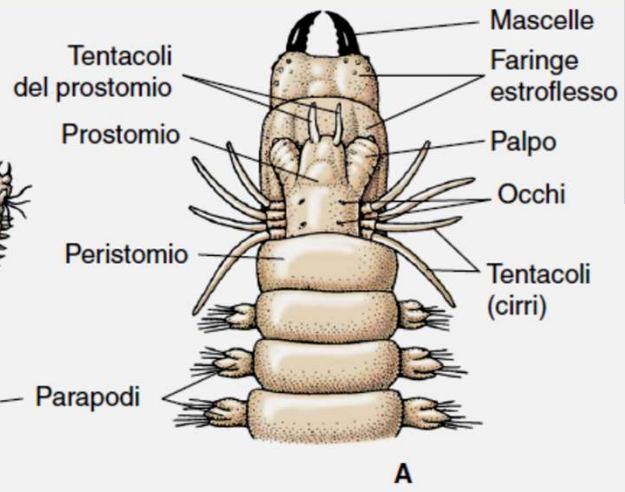
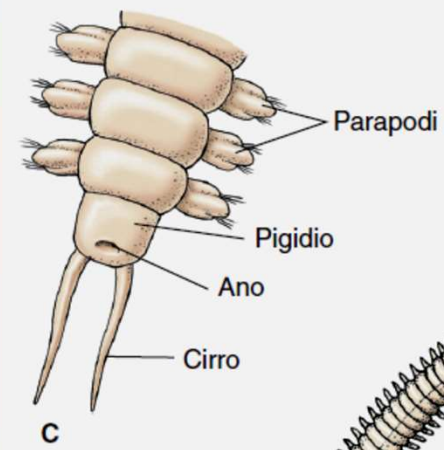


# Errantia

*Nereis sp.*



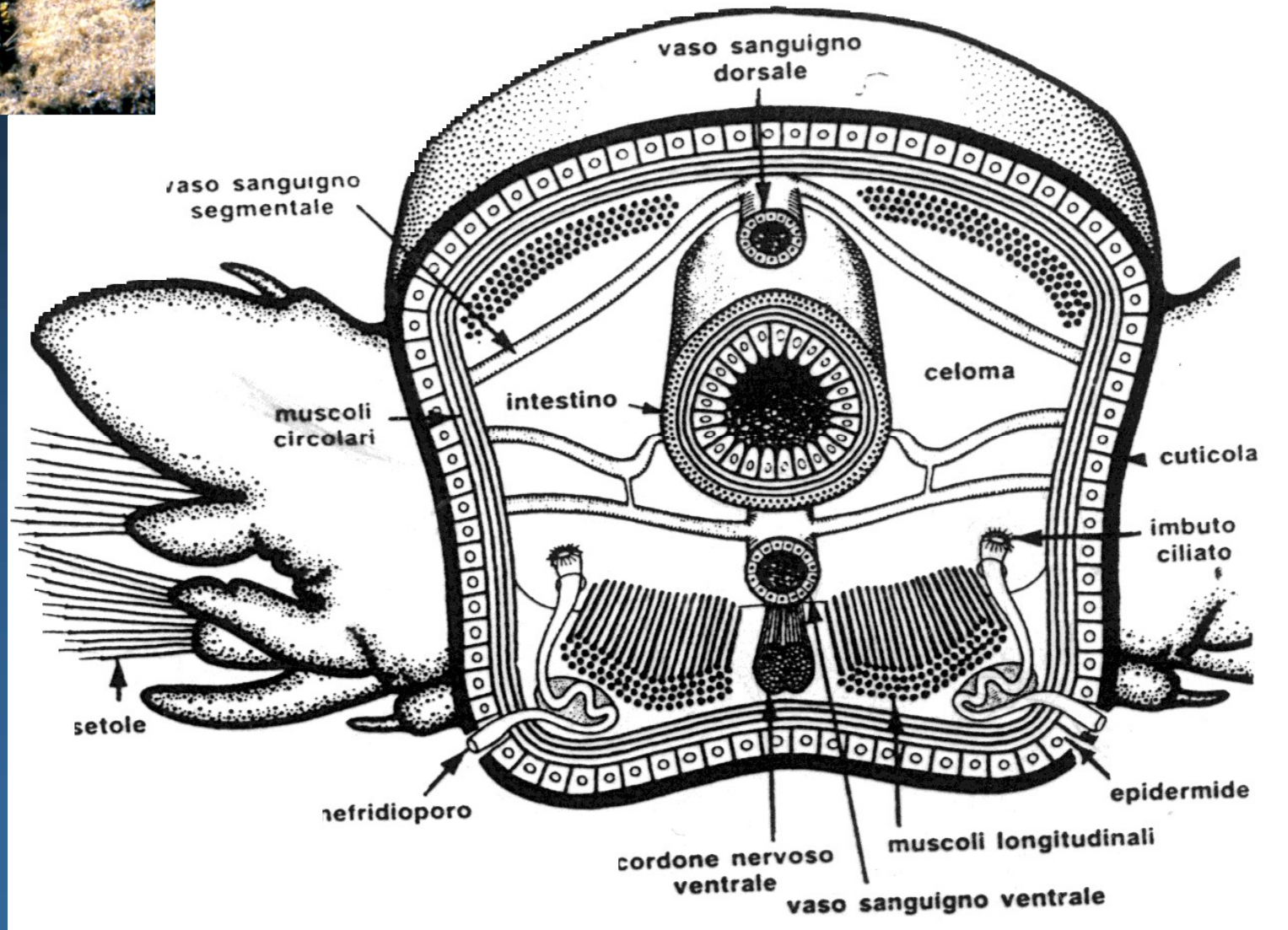
F Mouthparts of *Nereis sandersi*



# Errantia



*Nereis  
diversicolor*

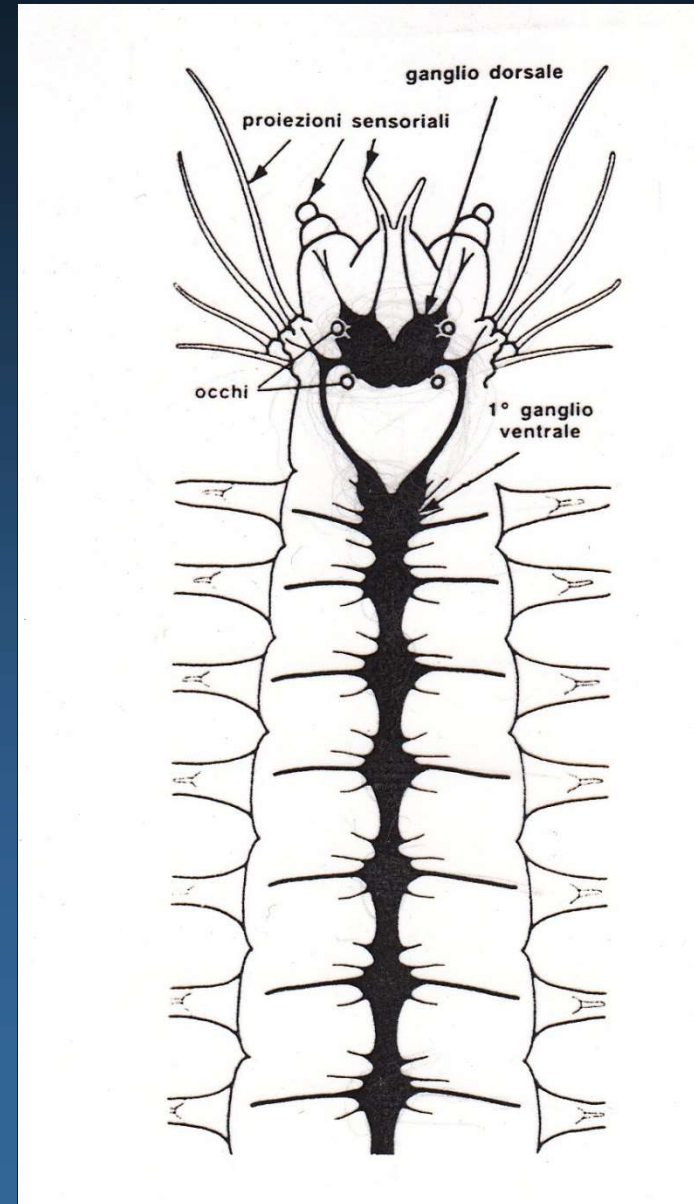
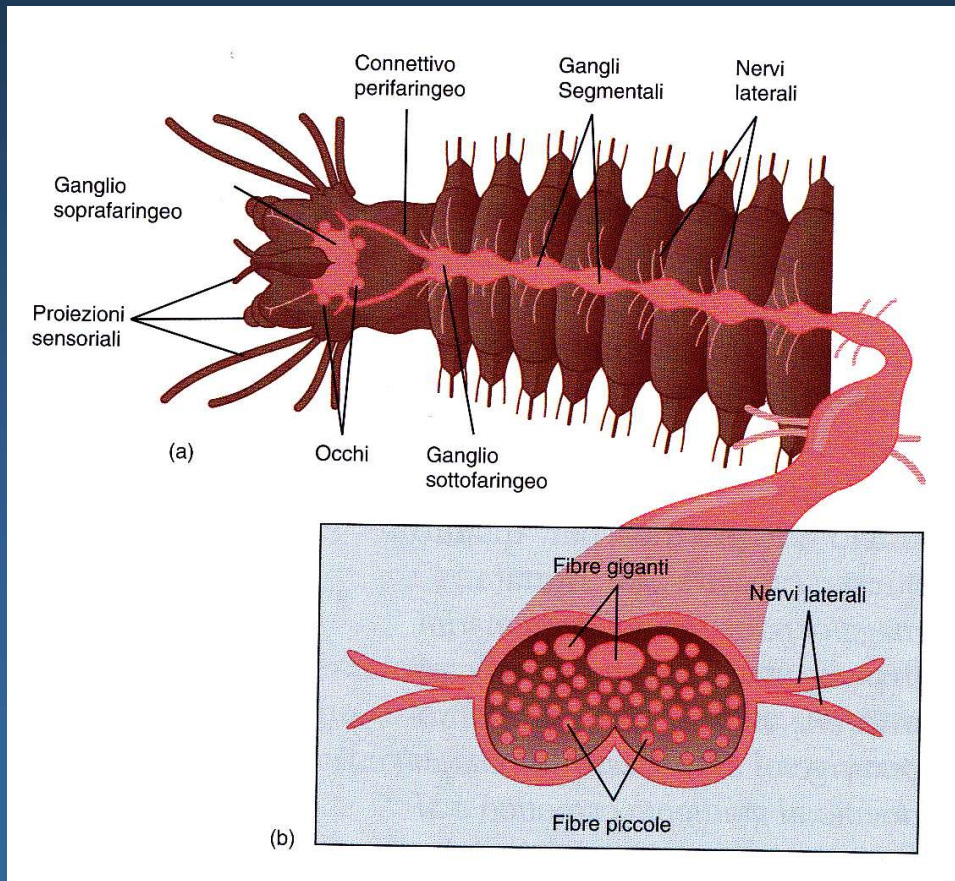




# Errantia



*Nereis diversicolor*





# Errantia



*Hermodice carunculata* (Vermocane)

<https://www.youtube.com/watch?reload=9&v=Z4OGPzzuhHM>



CARD  
69

Monsters of the Deep

## BOBBIT WORM

**WORM HOLE:** This worm usually makes its home by digging a vertical burrow in the sand between rocks or corals in a tropical reef. The burrow is barely wider than the creature's body, but must be as deep as the worm is long.

**MR. SENSITIVE:** The bobbit worm finds prey with five long antennae on the top of its "head." These antennae wave in the current, picking up scents of possible prey in the water as they flow by and letting the worm know a meal might be near.

Staying completely still among the colorful surroundings of a coral reef, the bobbit worm disguises itself as a harmless plant when it's on the hunt. This predator extends partway out of its burrow, until a tasty morsel wanders in range. Like no worm on land, this one strikes at prey with sharpened jaws, trapping and killing them in its scissor-like grip.



Copyright © SeaPics.com

*Eunice aphroditois*

[https://www.youtube.com/watch?v=K\\_7ByiYbCYM](https://www.youtube.com/watch?v=K_7ByiYbCYM)



# Polychaeta



*Amphitrite* sp.



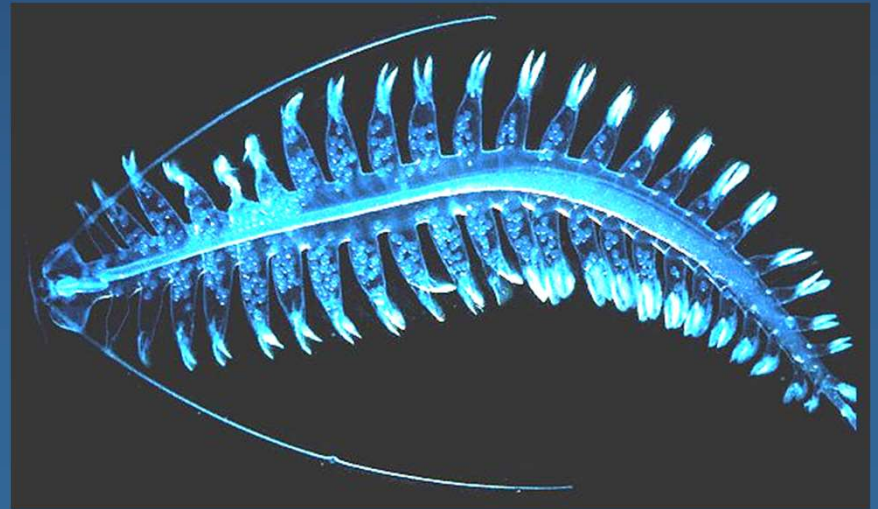
*Hermodice carunculata*



*Arenicola marina*



# Policheti *erranti*





# 'Policheti' Sedentaria





# Sedentaria filtratori





# Sedentaria filtratori



*Sabella pavonina*

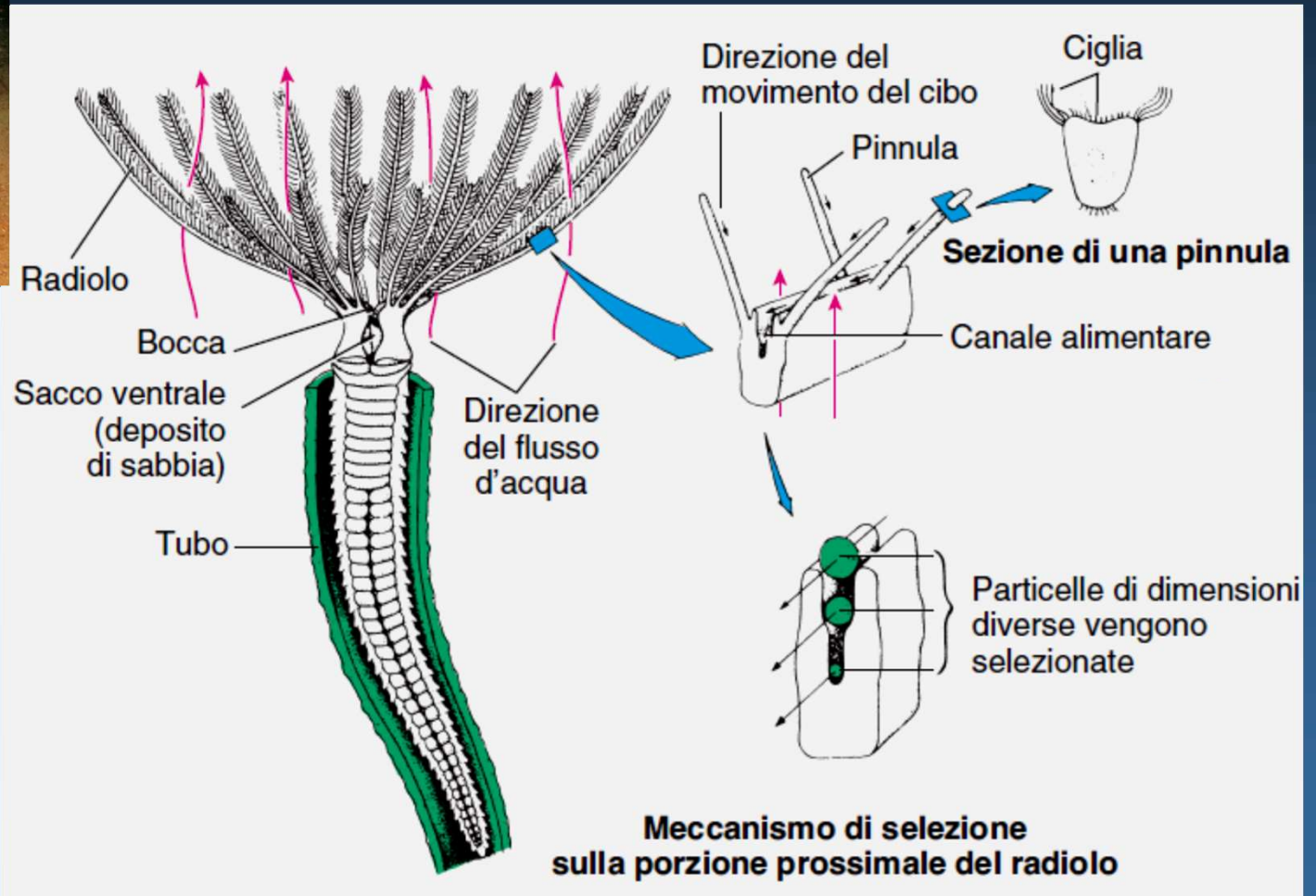
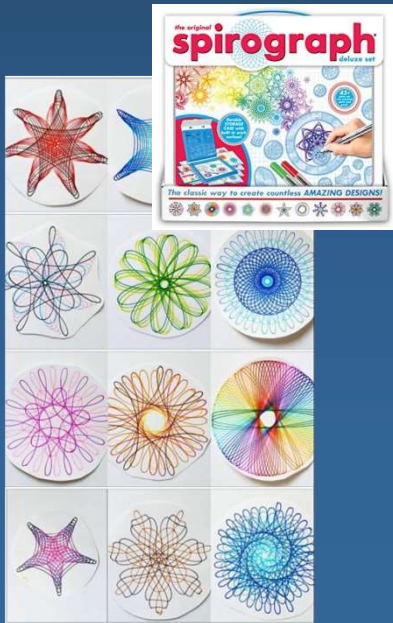
ARKive

www.arkive.org

# Sedentaria filtratori 'vermi a ventaglio'



*Sabella sp.*





# Sedentaria filtratori



*Sabella* sp.

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fact-files illustrating the world's species  
visit [www.arkive.org](http://www.arkive.org)

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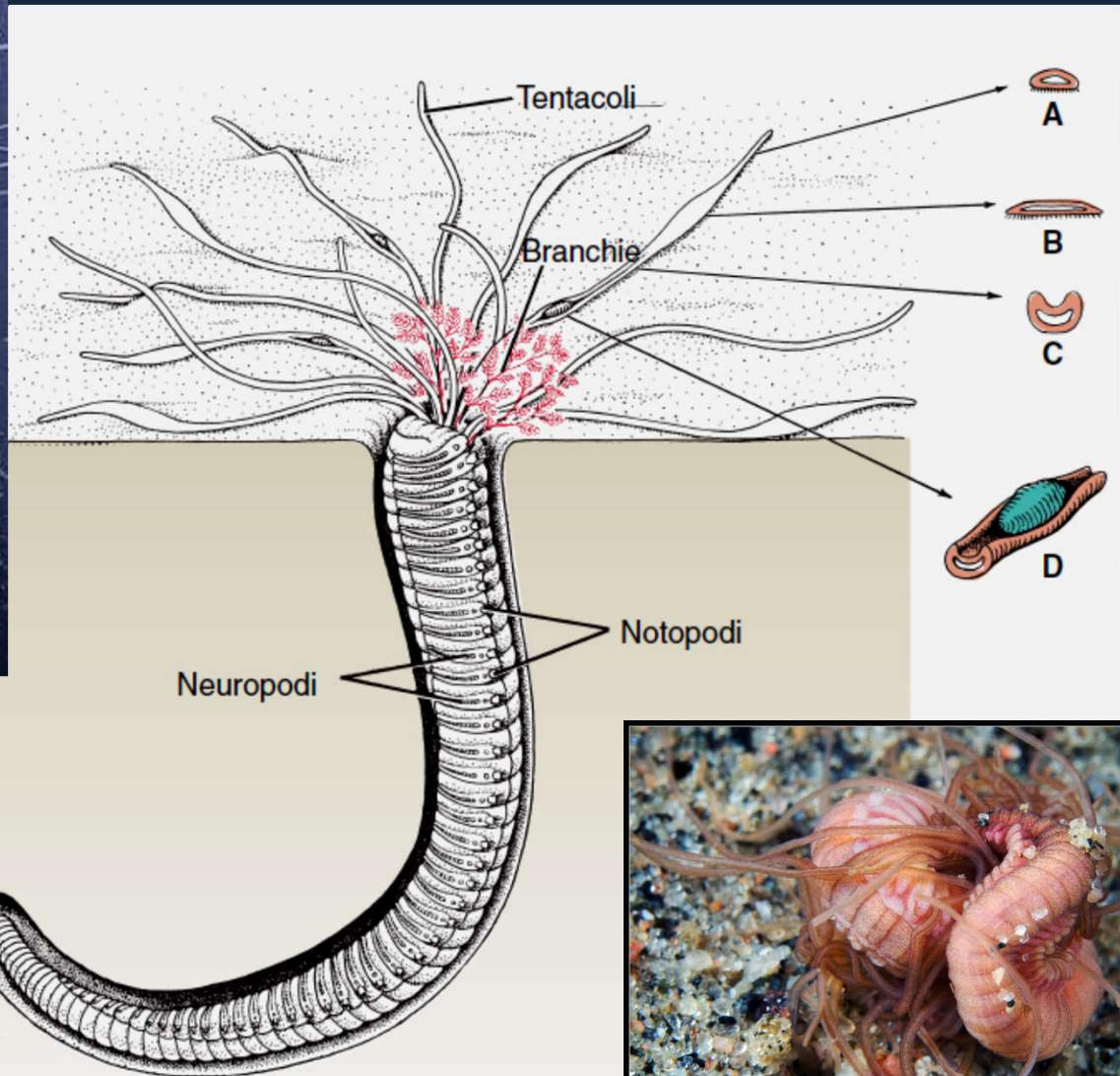
[www.arkive.org](http://www.arkive.org)

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Use of this media is restricted, please see [www.arkive.org/terms.html](http://www.arkive.org/terms.html).

# Sedentaria filtratori



*Amphitrite sp.*

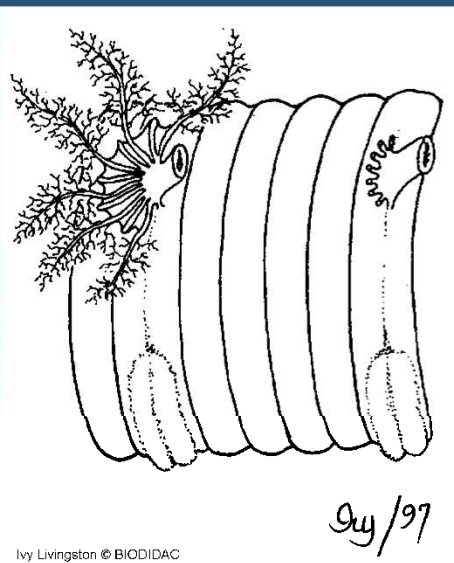




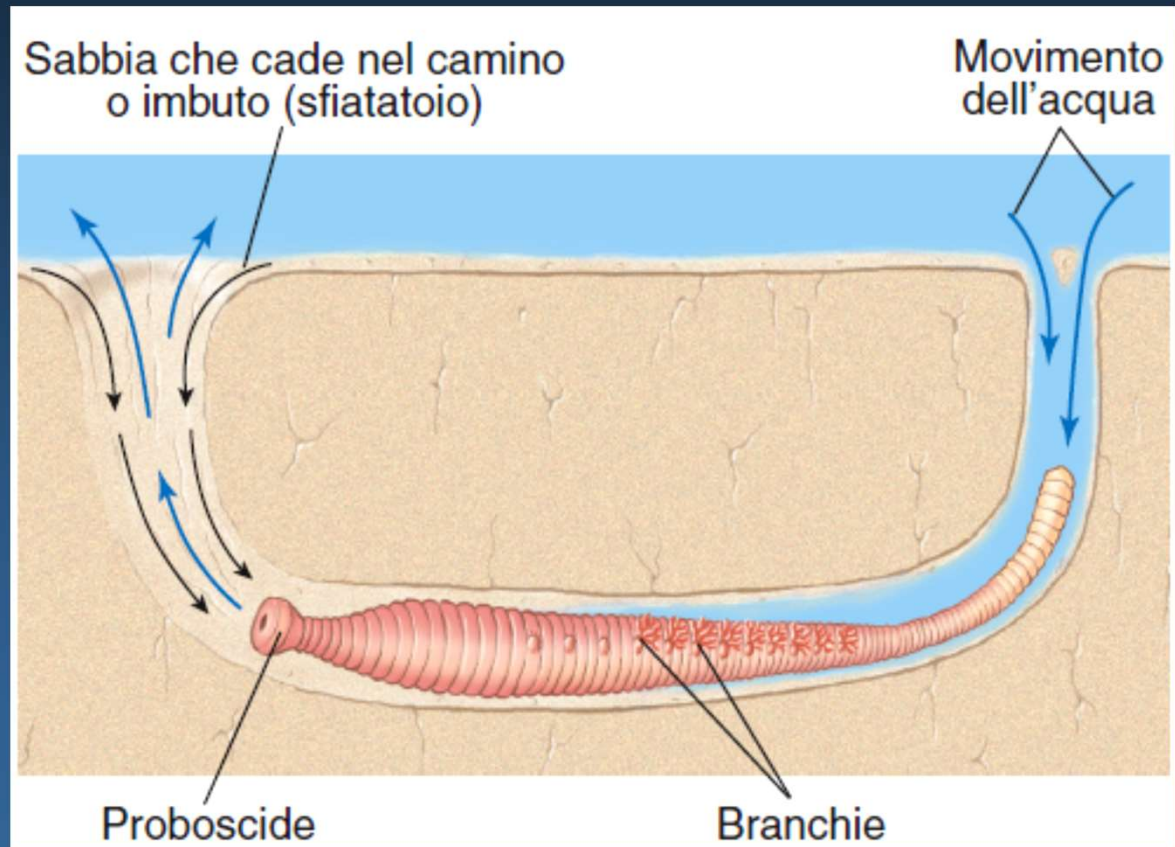
# Sedentaria filtratori



*Arenicola* sp.



Ivy Livingston © BIODIDAC



# Sedentaria filtratori

*Arenicola marina*

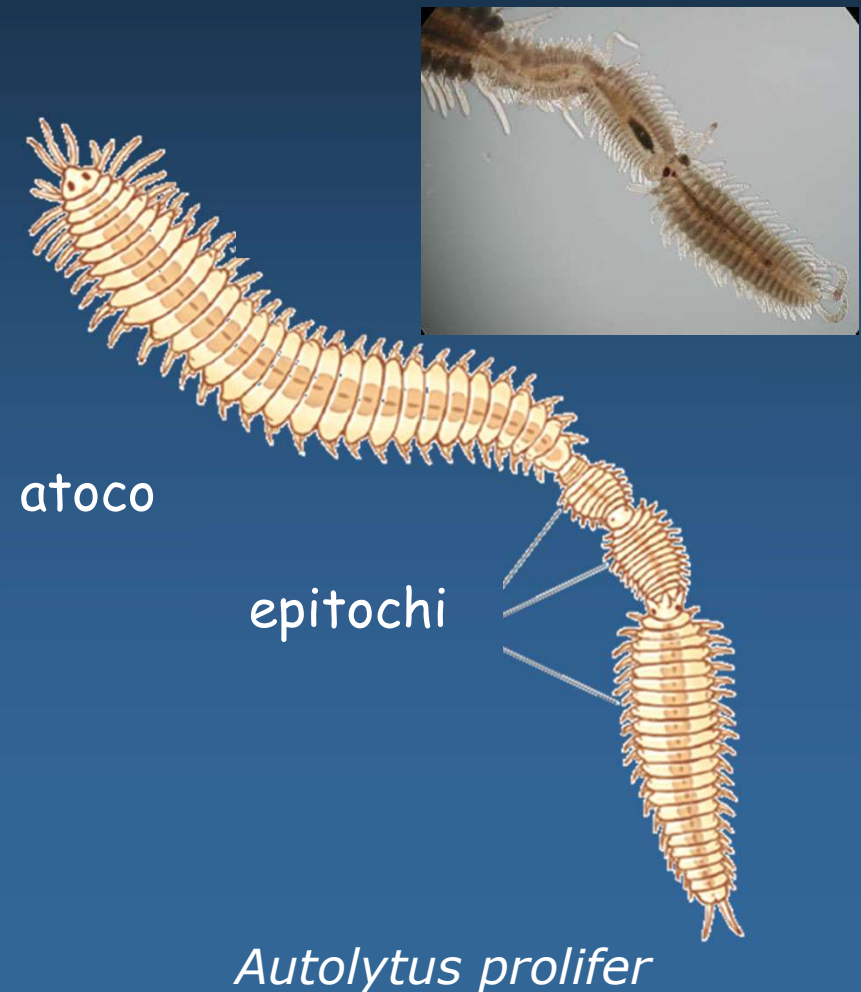






## 'Policheti' - Riproduzione

- mancano organi sessuali permanenti!
- gonadi *temporanee*, come invaginazioni del peritoneo
- dioici
- gameti nel celoma
- fecondazione esterna
- sviluppo *indiretto* (larva trocofora)





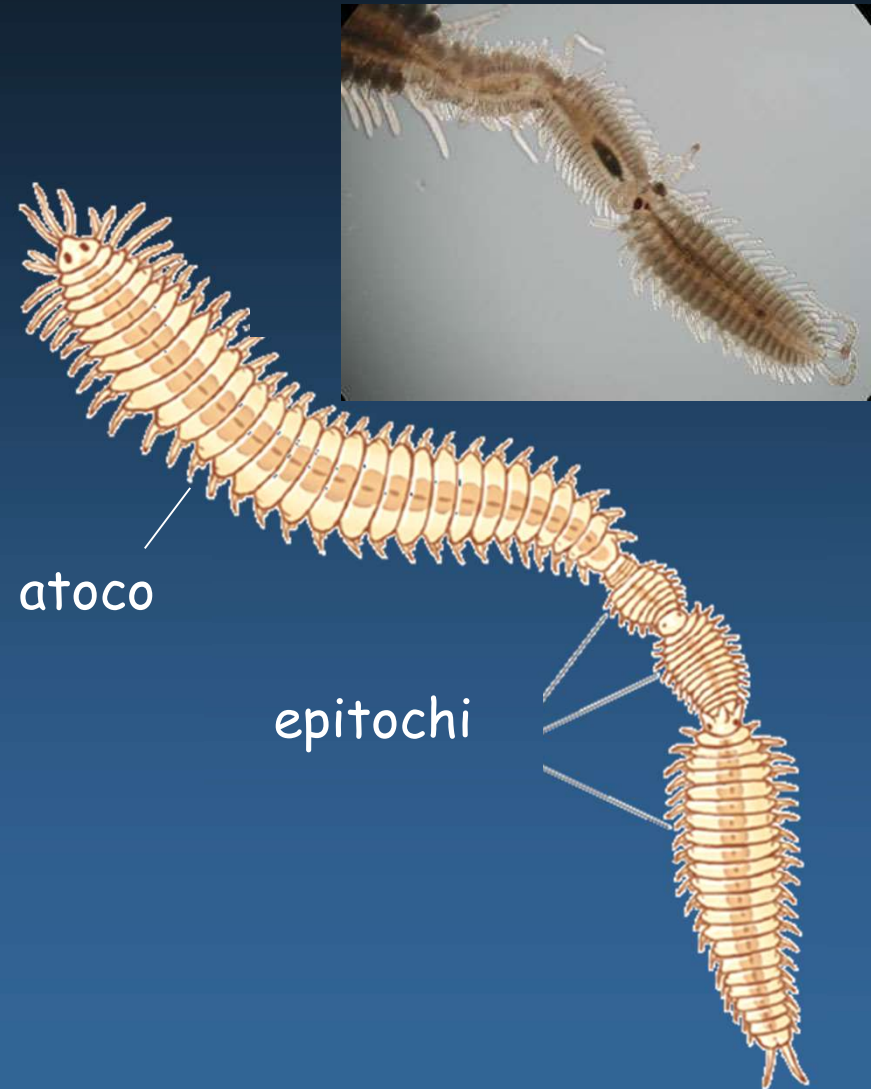
## 'Policheti' - Riproduzione

- mancano organi sessuali permanenti!
- gonadi *temporanee*, come invaginazioni del peritoneo
- dioici
- gameti nel celoma
- fecondazione esterna
- sviluppo *indiretto* (larva trocofora)



# 'Policheti' - Riproduzione

- *atoco*: porzione di individuo sessualmente immaturo
- *epitoco*: porzione di individuo sessualmente maturo (ripieno di gameti)
- sviluppo degli epitochi per trasformazione o gemmazione degli atochi
- *sciamatura*: rilascio simultaneo degli epitochi da parte di più individui



*Autolytus prolifer*

# 'Policheti' - Riproduzione



*Eunice viridis*  
(verme palolo)

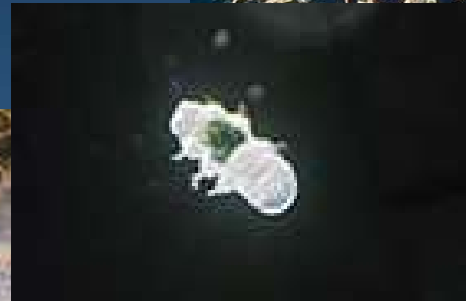
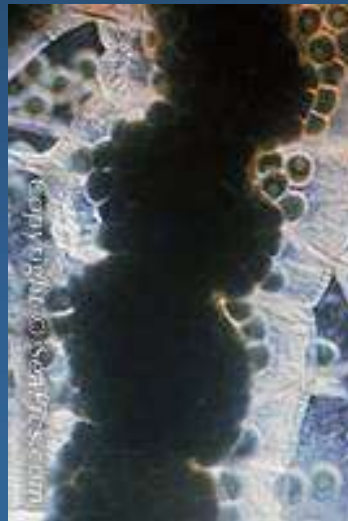




# 'Policheti' - Riproduzione



*Eunice viridis*  
(verme palolo)







## Clado Siboglinidae (Pogonophora)

- ~ 150 specie
- 5-85 cm di lunghezza
- sessili, in tubi chitinosi
- sui fondali marini, a oltre 200 m di profondità
- setole e cuticola ma segmentazione poco evidente







## Clado Siboglinidae (Pogonophora)



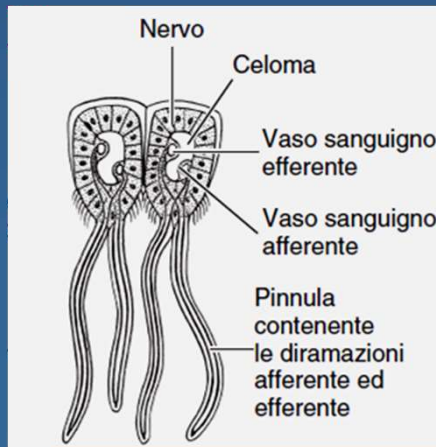
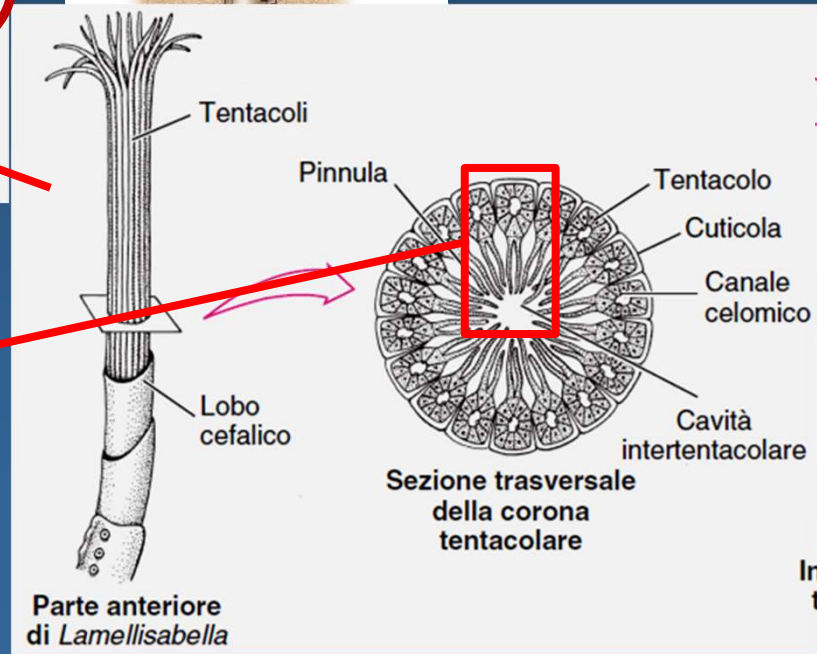
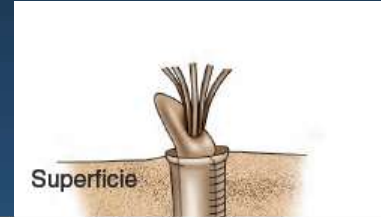
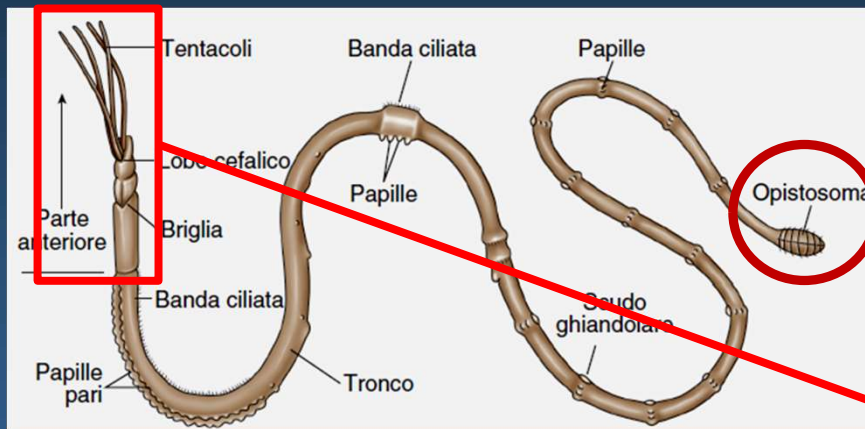
- secernono un tubo chitinoso
- batteri chemioautotrofi ( $H_2S$ ) simbiotici (*trofosoma*)



*Lamellibrachia luymesii*



# Clado Siboglinidae (Pogonophora)







## Clado Siboglinidae (Pogonophora)



*Riftia pachyptila*  
(Pogonoforo gigante, 3 m x 5 cm)





## Clado Siboglinidae (Pogonophora)



*Osedax* sp.

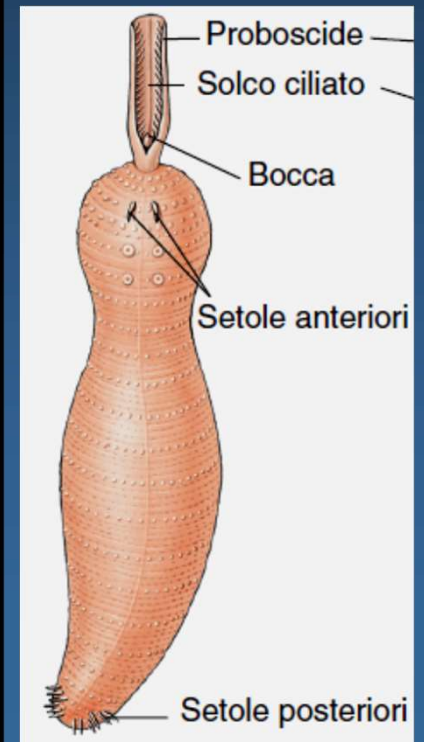
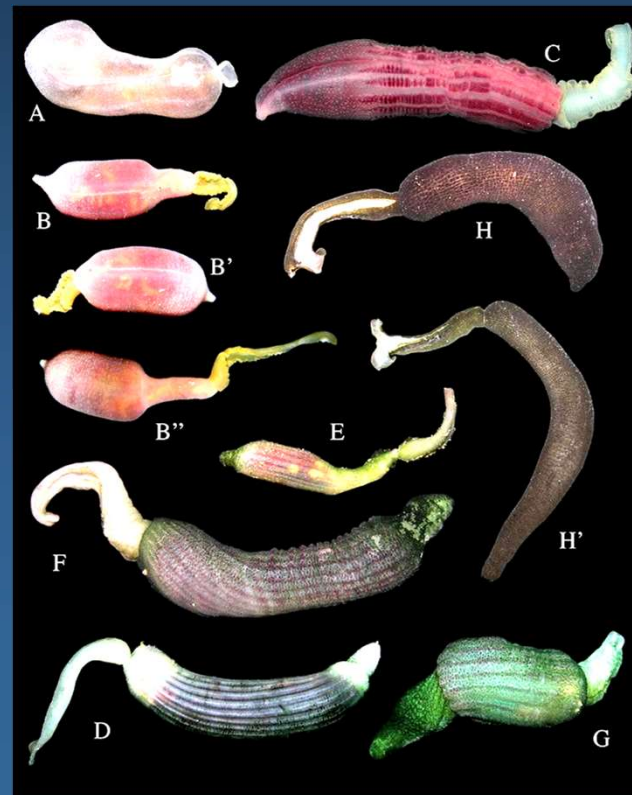




# Clado Echiuridae

(gr. *echis* 'serpente' + *oura* 'coda')

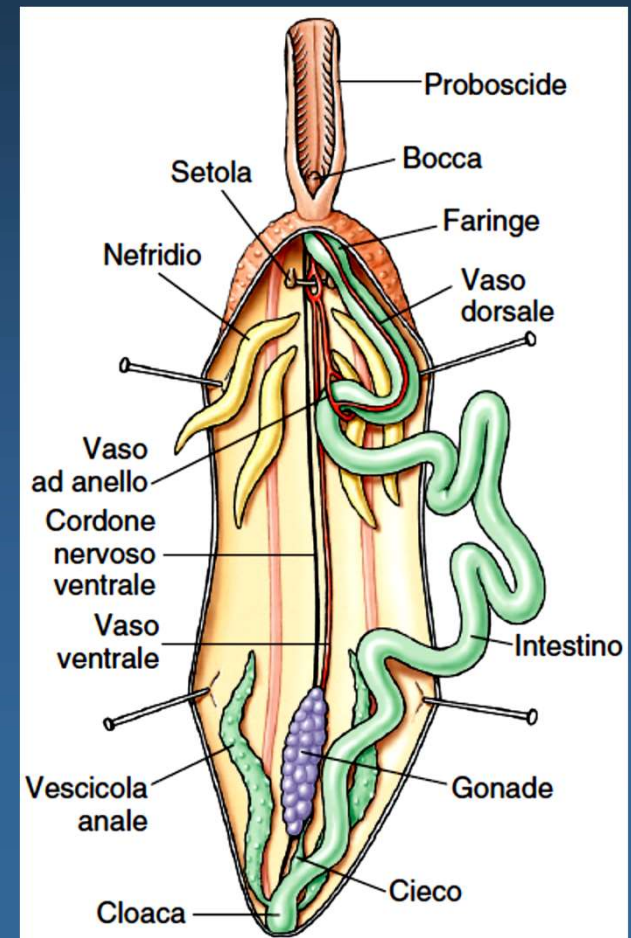
- ~ 140 specie
- marine, bentoniche
- in tutti gli oceani, nelle zone litoranee
- lunghi da pochi mm a 30-40 cm
- detritivori, sospensivori





## Clado Echiuridae

- proboscide (omologo del prostomio) con solco ciliato
- cervello nella proboscide, mancano organi di senso
- sistema circolatorio chiuso (sangue incolore)
- dioci, fecondazione esterna
- larva trocofora

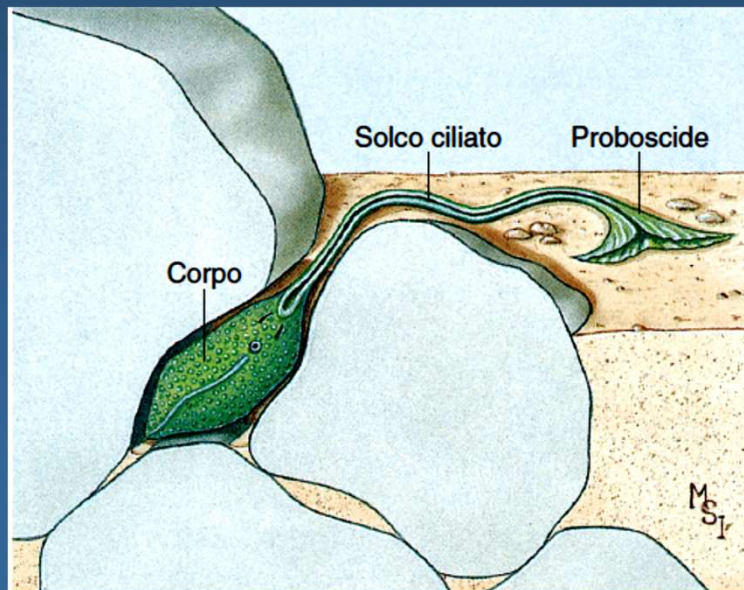






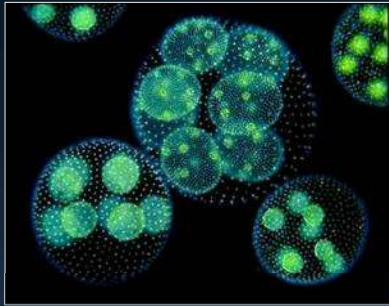
## Clado Echiuridae

- solco ciliato per trasporto attivo di alimenti



*Bonellia viridis*





## Clado Echiuridae



*Urechis* sp.





# Clado Echiuridae



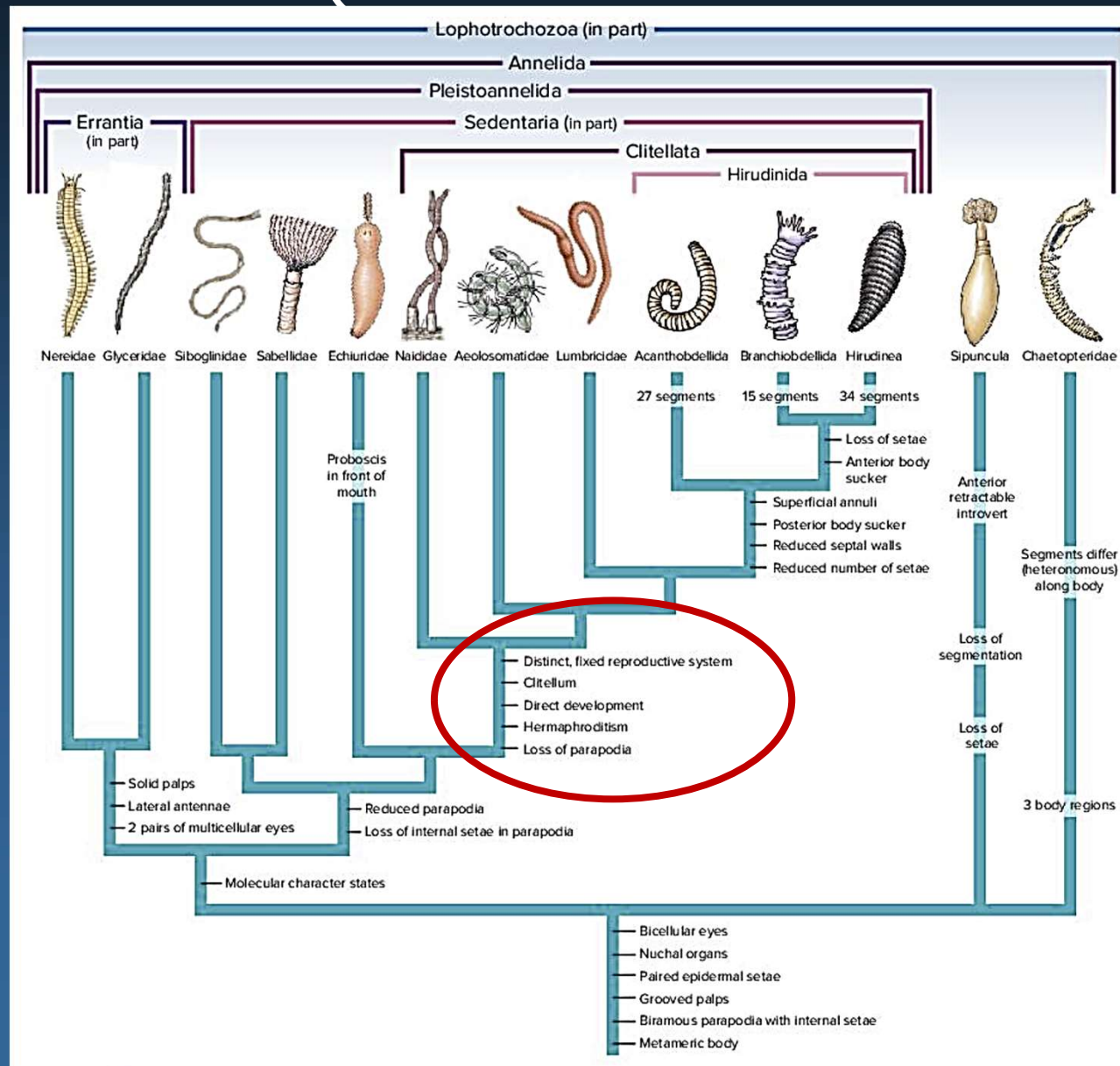


## Clado Echiuridae: 'Intestini di mare'





# Classificazione degli Anellidi: cladi gerarchici (Hickman et al. XVI ed.)





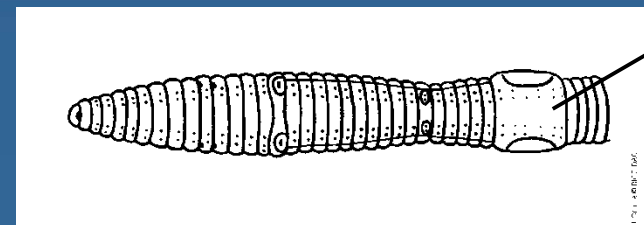
## Clitellata 'Oligochaeta'

(gr. *oligos* 'poco' + *chaite* 'lungo capello')

- 'Oligocheti' non sono un clado monofiletico
- 3.600 specie, per lo più terrestri e d'acqua dolce
- importate ruolo ecologico
- assenza di parapodi
- setole di vario tipo, ma meno numerose che nei Policheti
- *clitello* sempre visibile



clitello





Big-picture ecologist generates  
buzz and backlash p. 432

Race-blind algorithms cause  
racial disparities pp. 423 & 447

Tomorrow's Earth  
pp. 422, 443, & 444

# Science

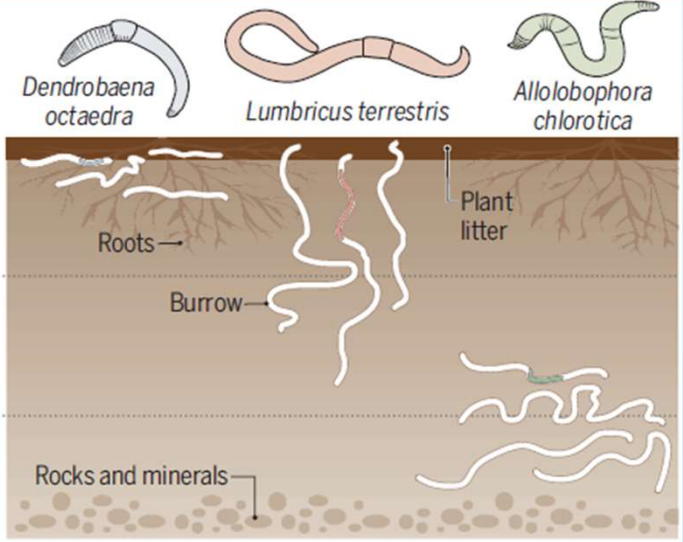
\$15  
25 OCTOBER 2019  
science.org

AAS



## WORMS OF THE WORLD

The global diversity and biogeography  
of earthworms pp. 421 & 430



### Epigeic

Live close to the  
soil's surface and  
feed on plant litter

### Anecic

Feed on plant litter and  
soil and form nearly  
vertical burrows

### Endogeic

Live at various depths  
in mineral soil horizons  
and feed on soil

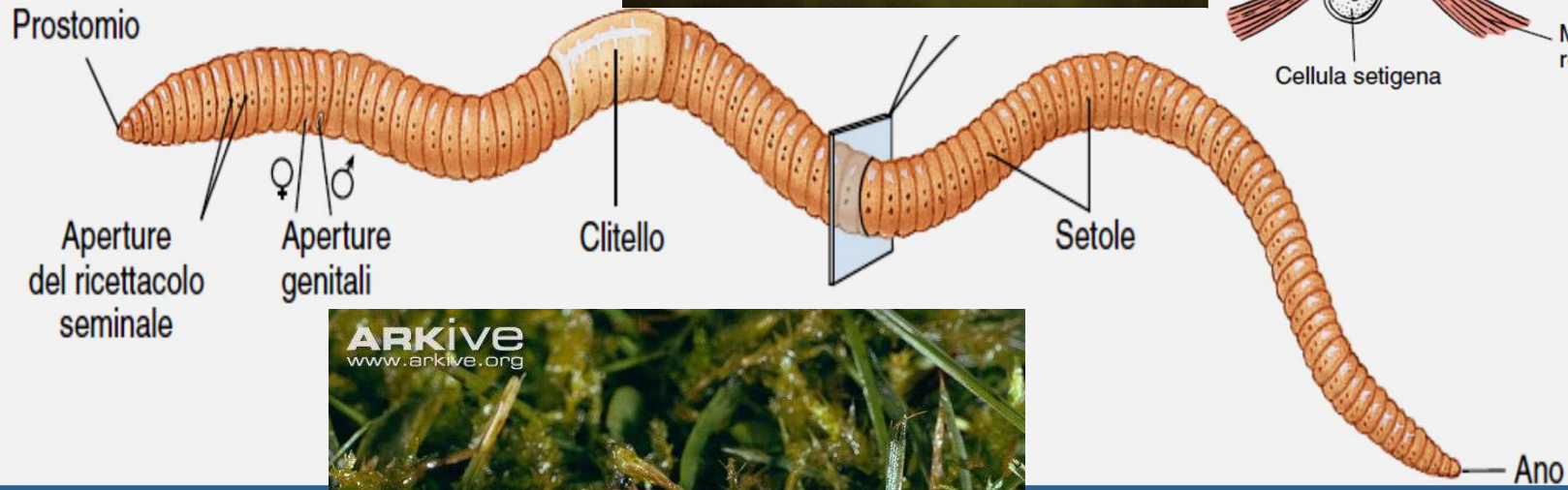
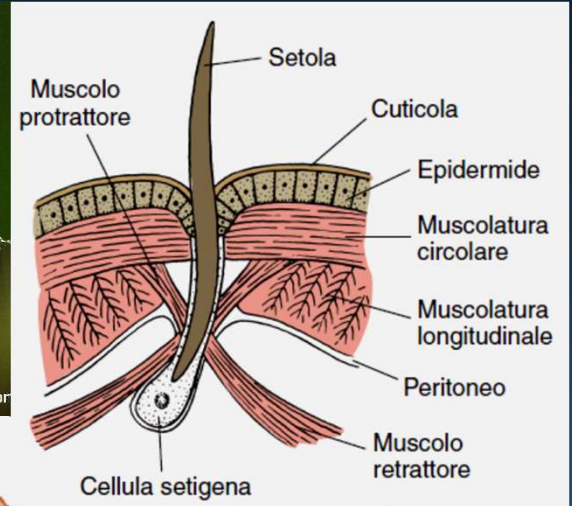


# Clitellata Oligochaeta



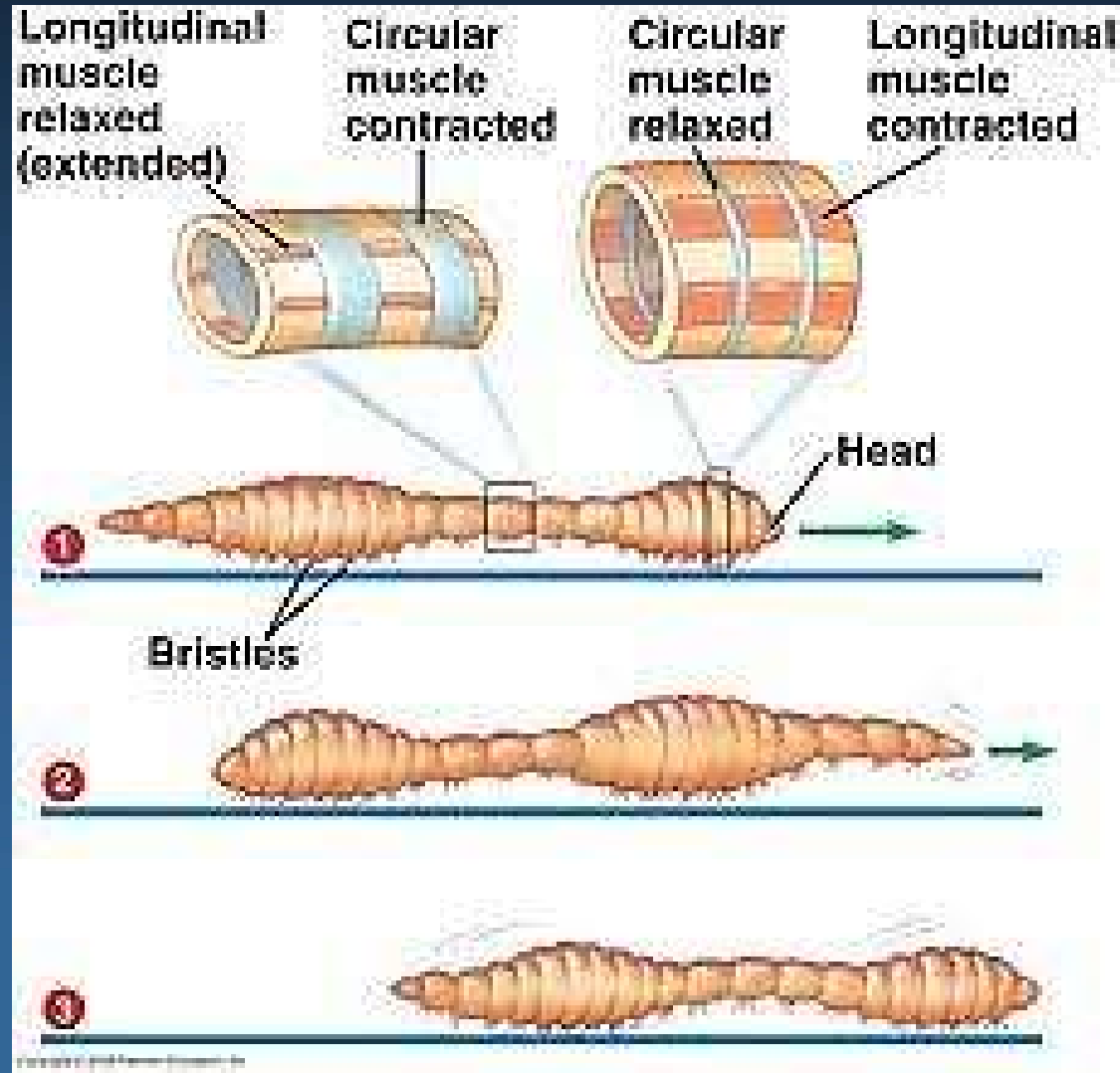


# Clitellata 'Oligochaeta'



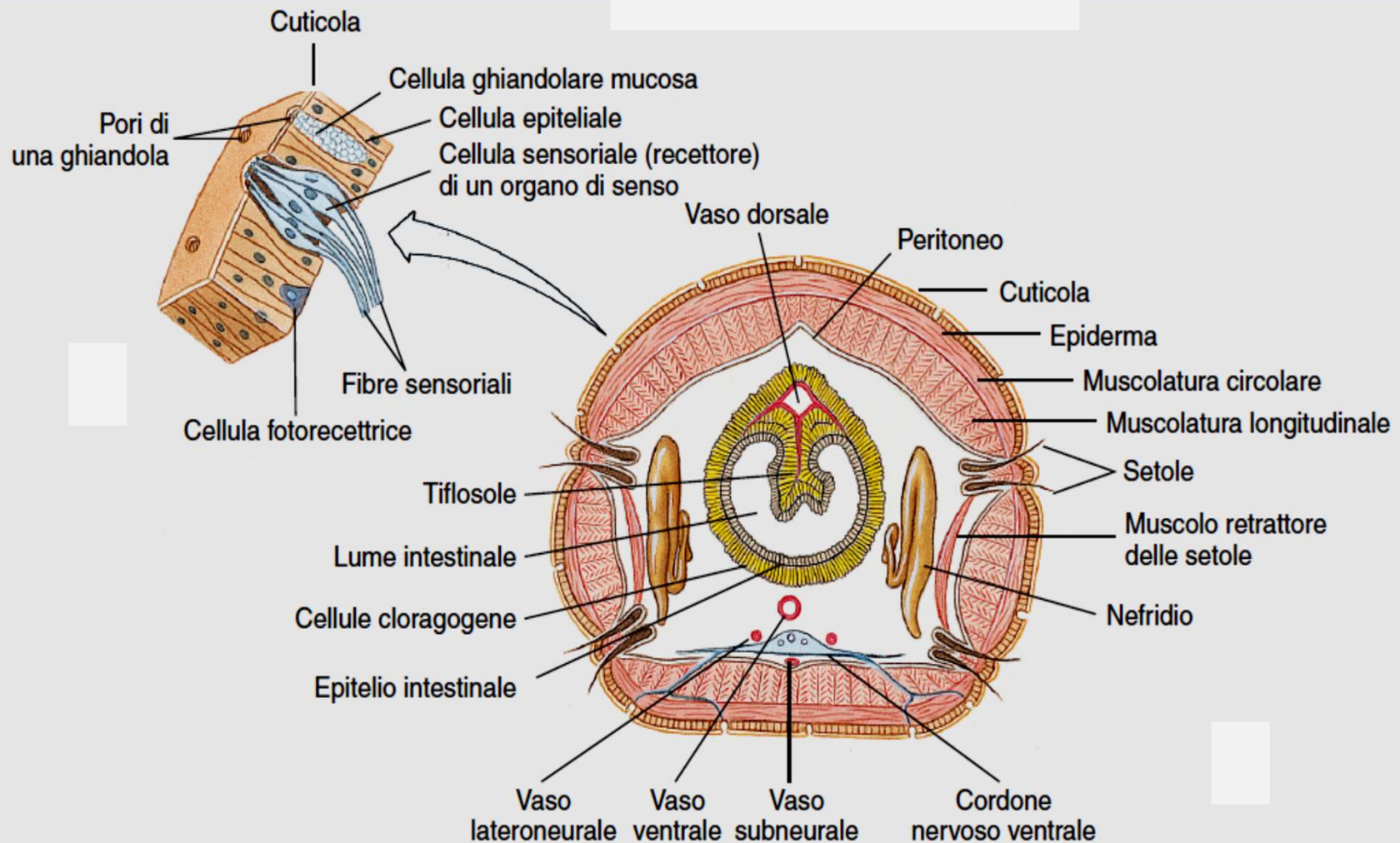
# Clitellata 'Oligochaeta'

- Movimento per contrazioni *peristaltiche*

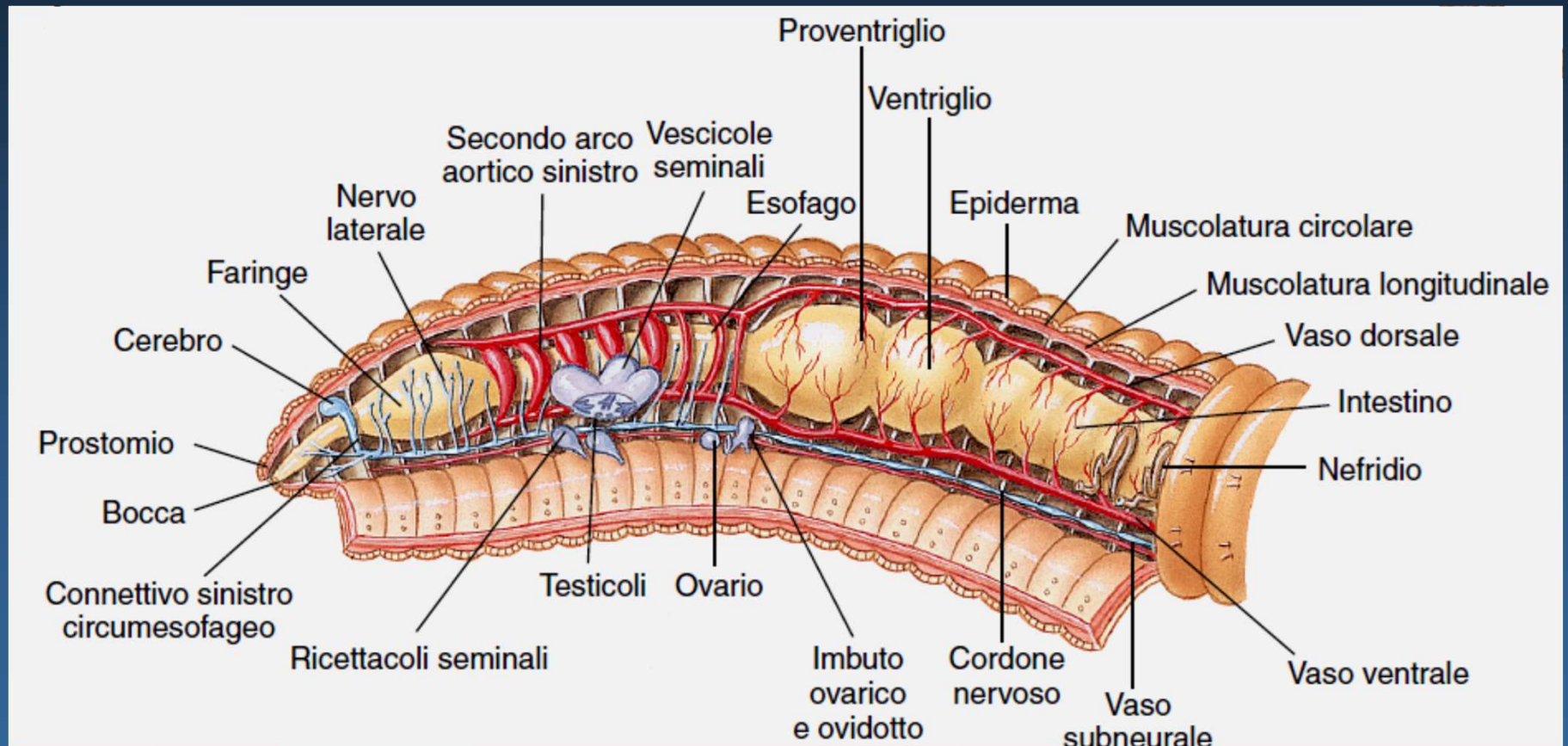




# Clitellata Oligochaeta

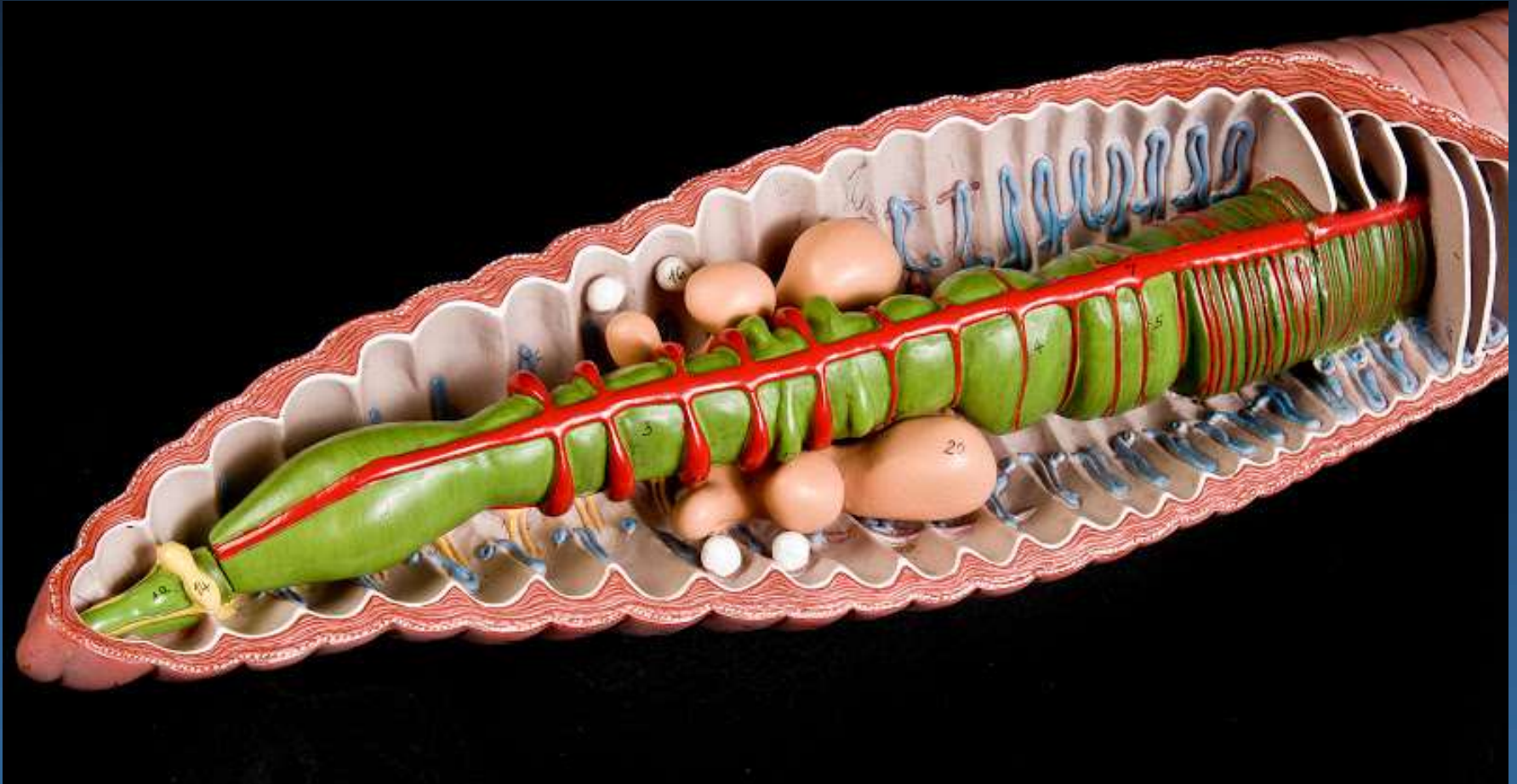


# Clitellata Oligochaeta



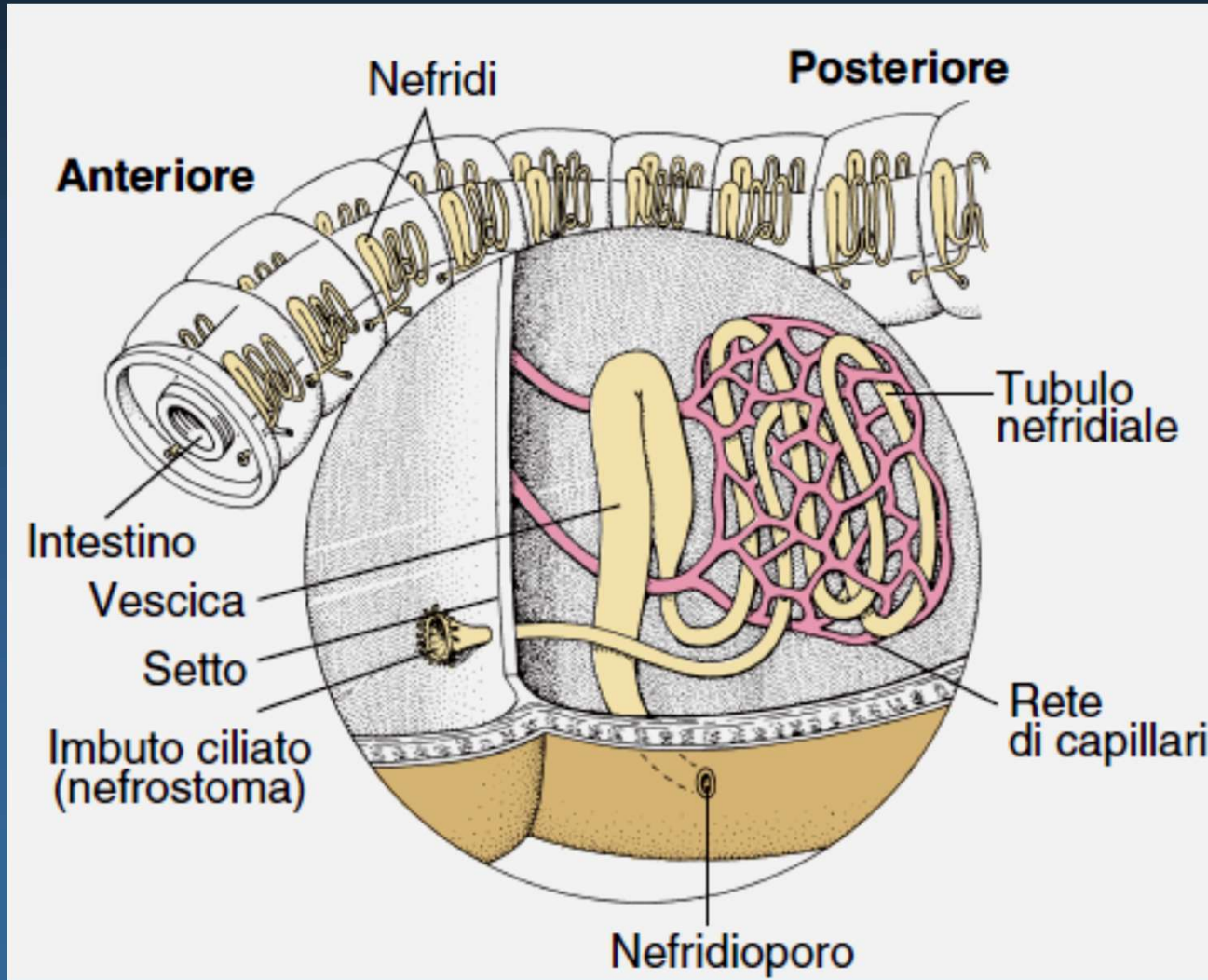


# Clitellata Oligochaeta



# Clitellata 'Oligochaeta'

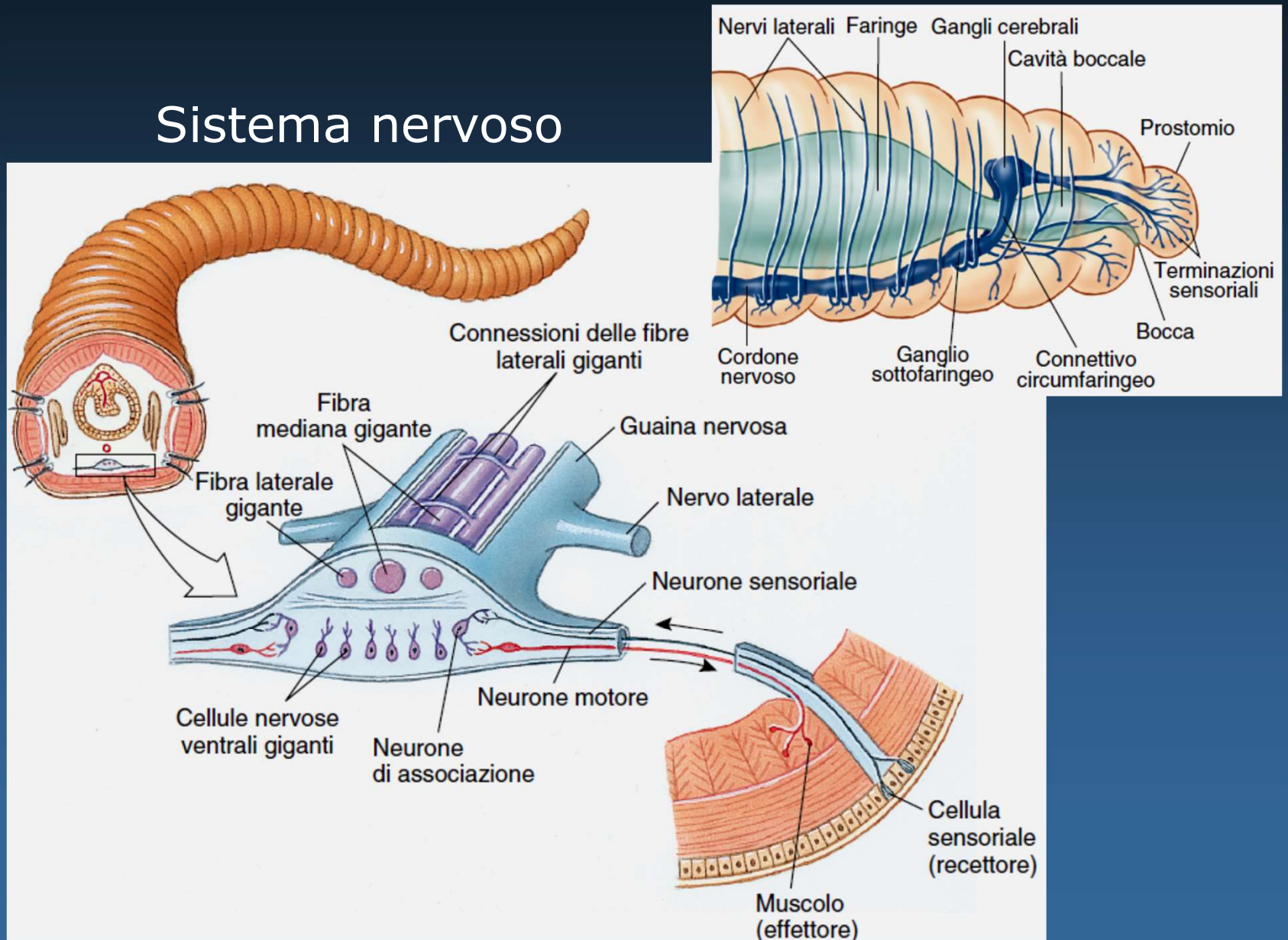
## Nefridio e Sistema escretore





# Clitellata Oligochaeta

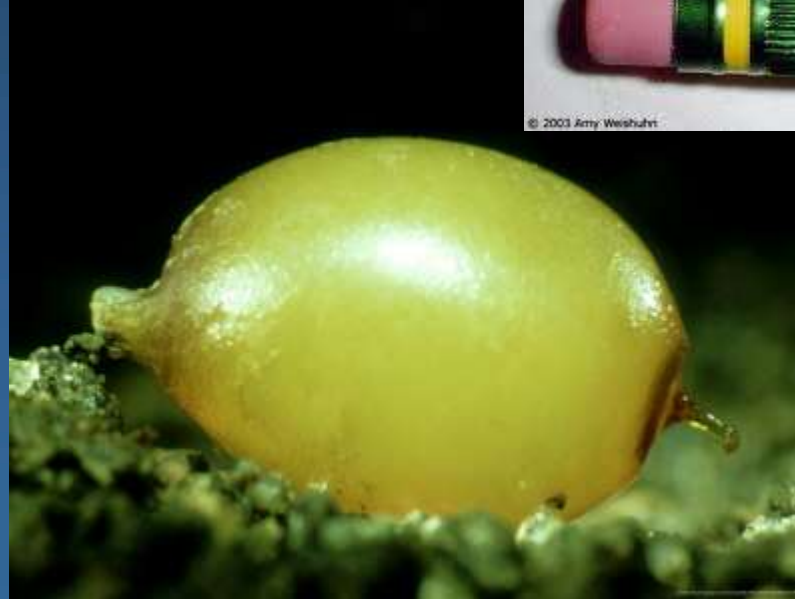
## Sistema nervoso





# Clitellata Oligochaeta

- ermafroditi insufficienti
- scambio di spermatozoi tra individui accoppiati
- spermatozoi immagazzinati nel *ricettacolo seminale*
- fecondazione all'interno del *bozzolo*

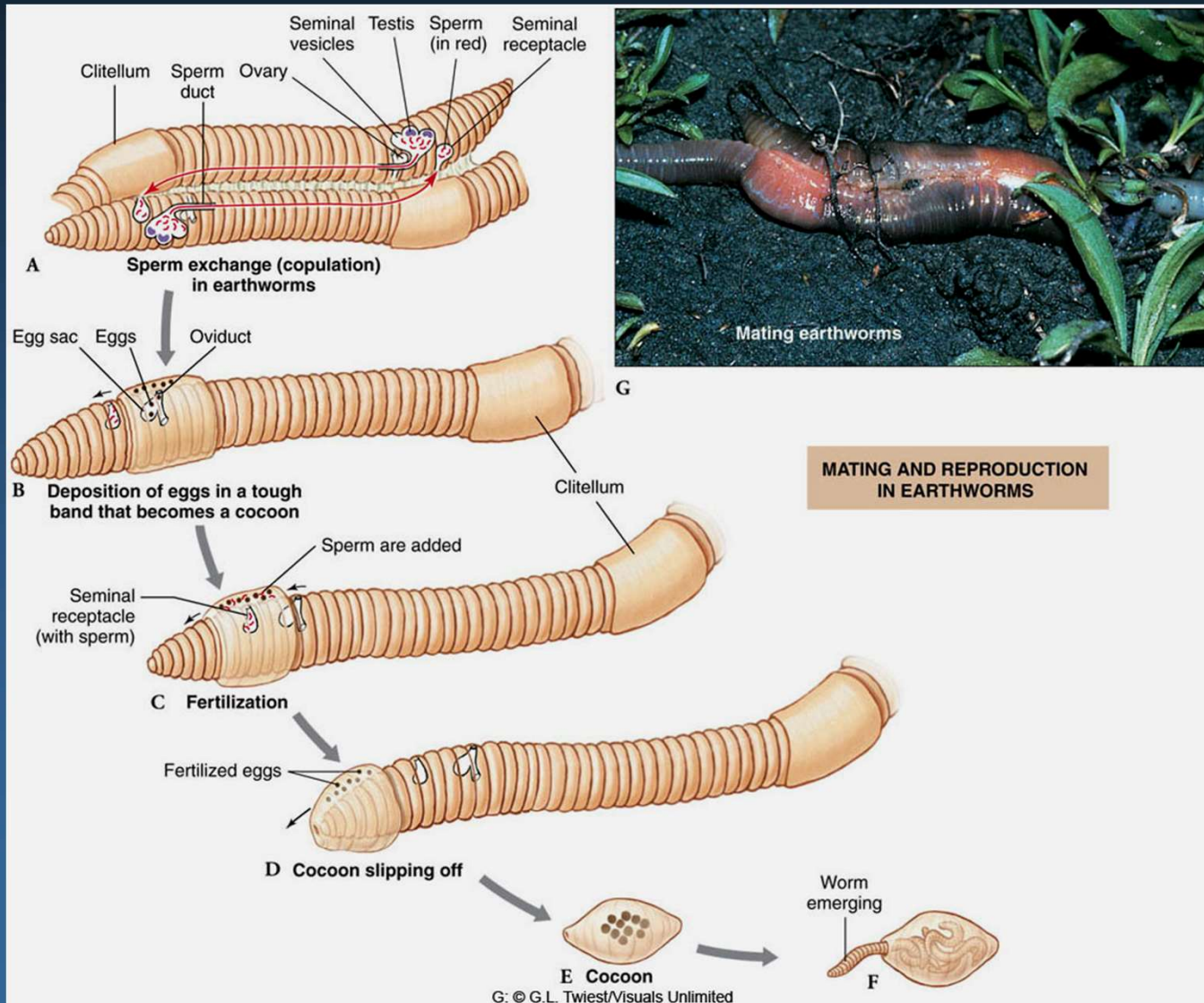


life / naturepl.com



# Clitellata Oligochaeta

## Fecondazione e formazione del bozzolo



# Classe Oligochaeta

## Lombrichi tropicali giganti



*Microchaetus rappi*



*Megascolides australis*



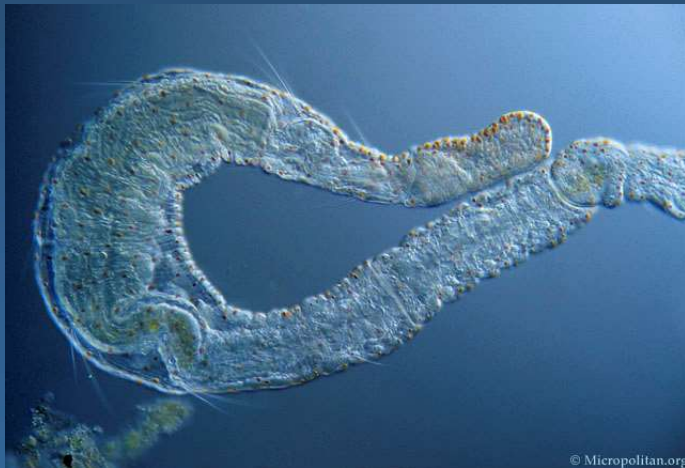
# Clitellata Oligochaeta



*Dero* sp.



*Tubifex* sp.



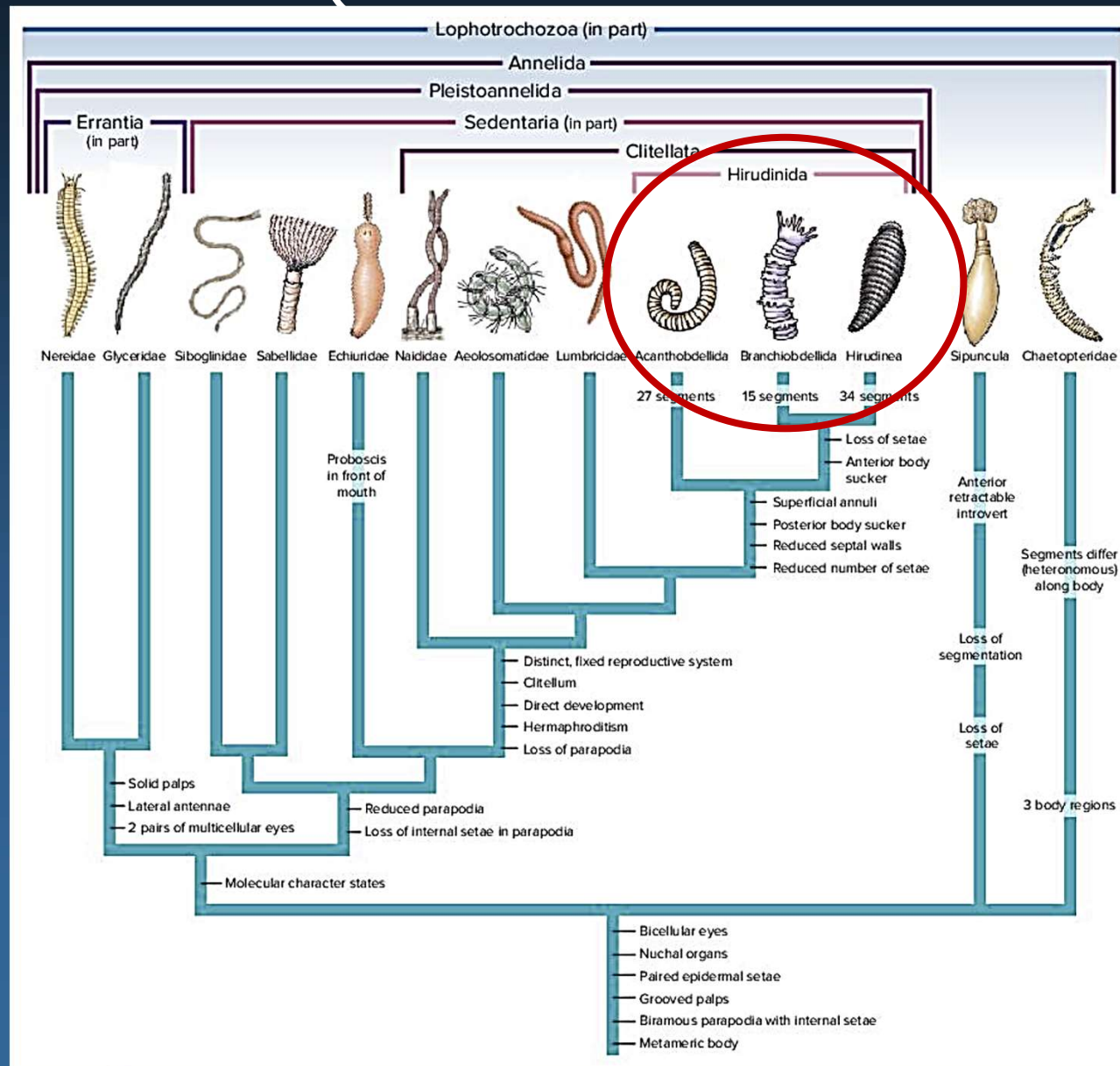
*Aelosoma* sp.



*Stylaria* sp.

Oligocheti d'acqua dolce

# Classificazione degli Anellidi: cladi gerarchici (Hickman et al. XVI ed.)







## Classe Hirudinida

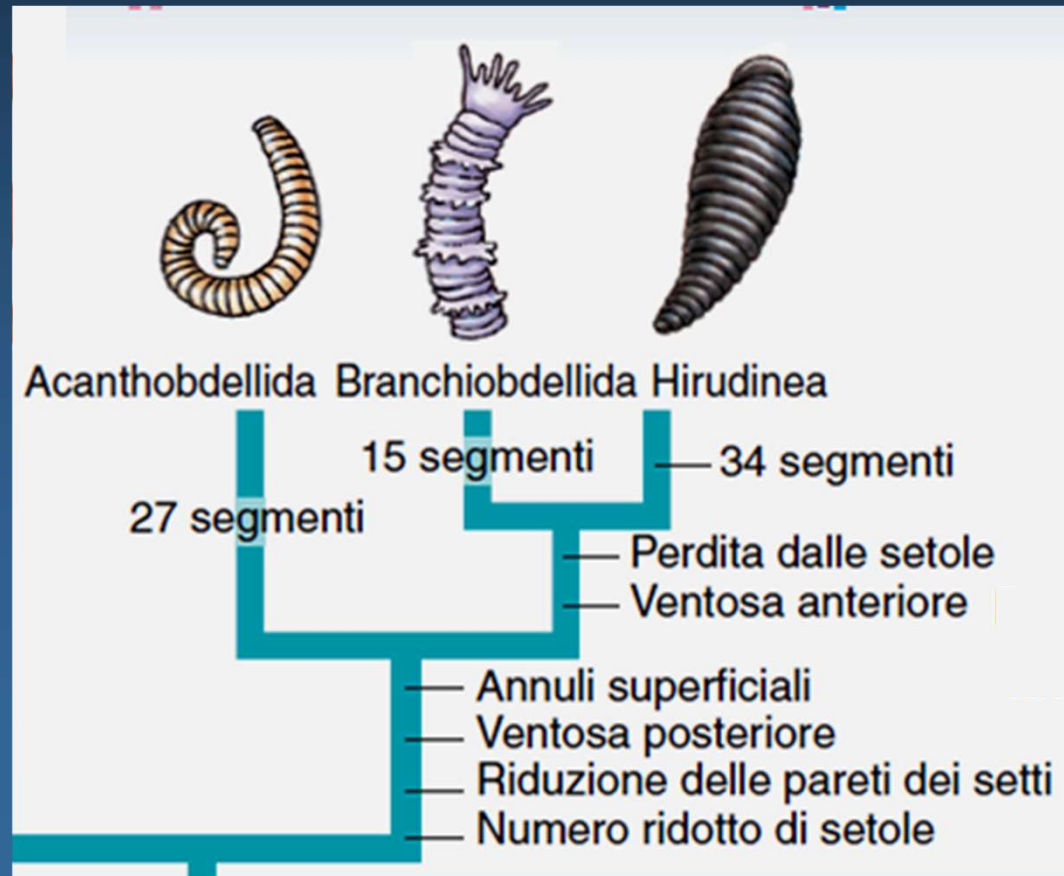
- ~ 500 specie
- essenzialmente d'acqua dolce, poche terrestri e marine
- parassiti temporanei o permanenti, alcuni predatori di piccoli invertebrati
- 2-6 cm (fino a 20 cm)
- numero fisso di segmenti, riduzione dei setti, setole ridotte o assenti



*Hirudo medicinalis*

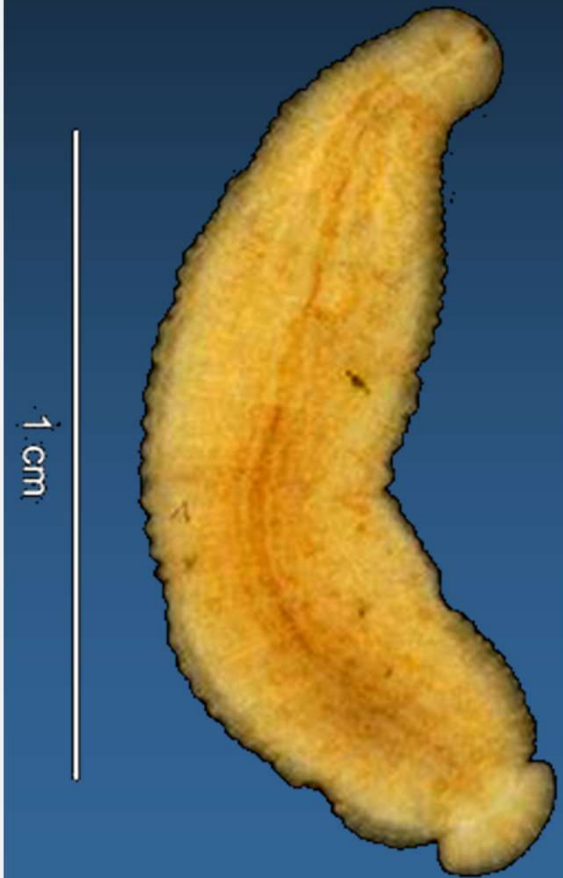
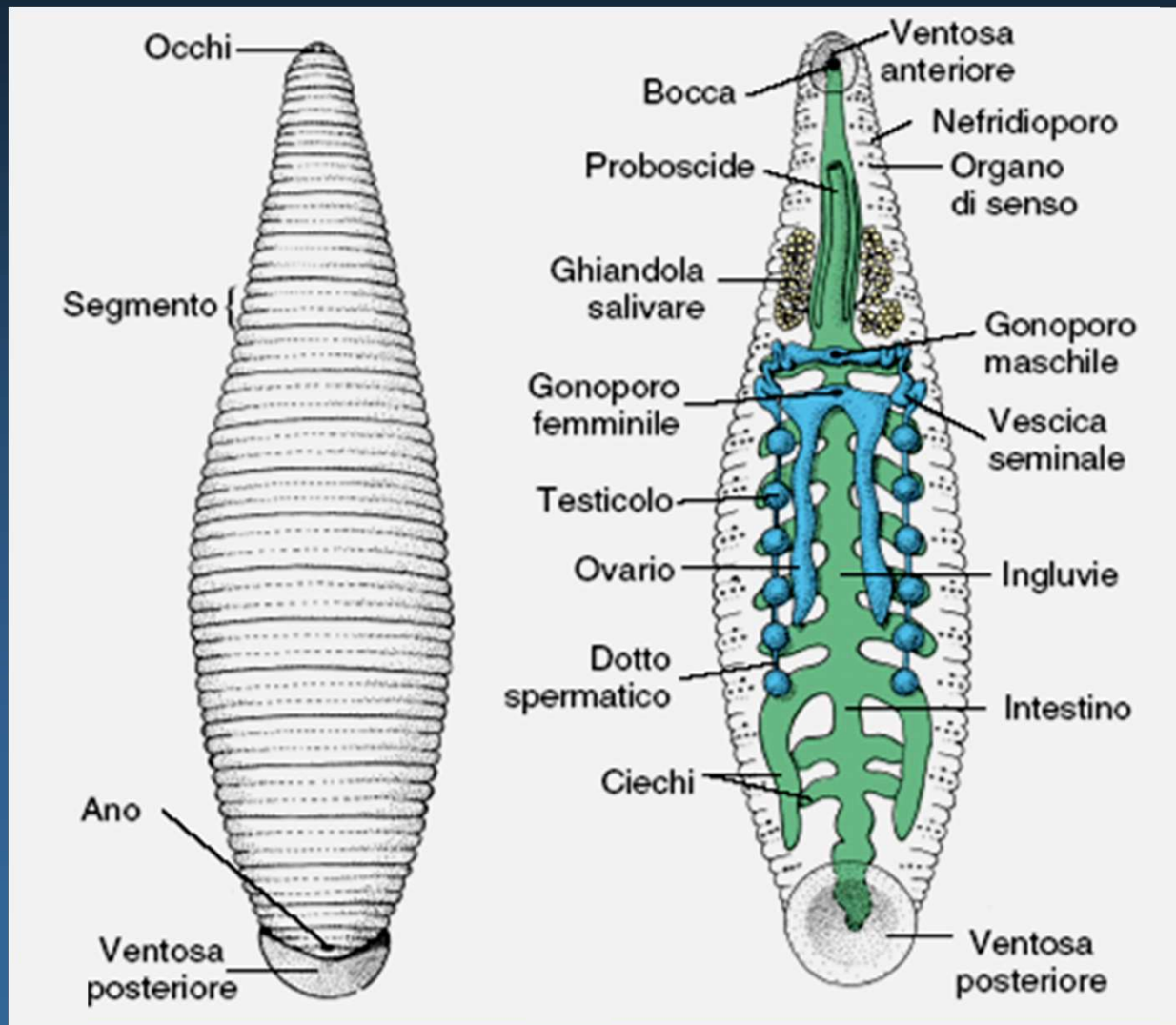


# Hirudinida





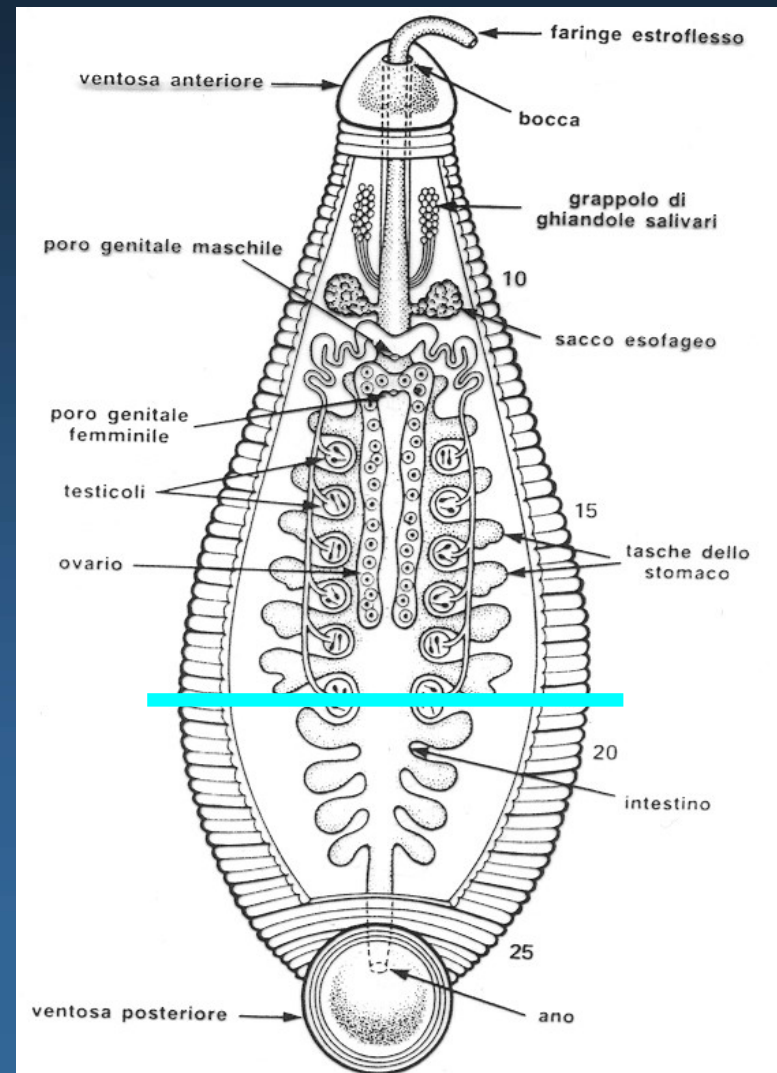
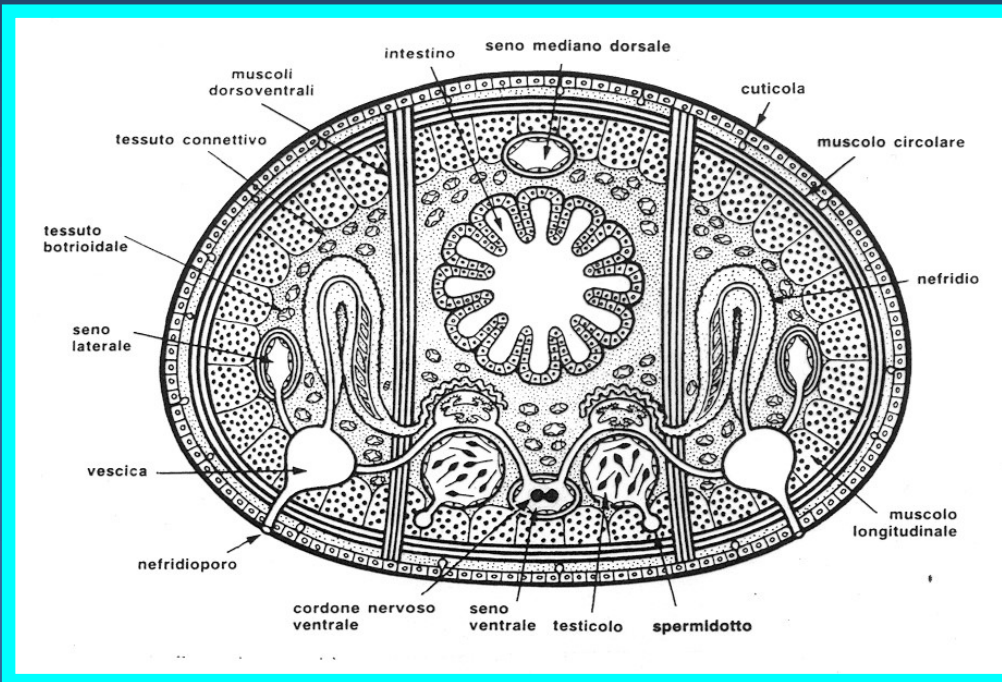
# Hirudinida - Hirudinei



*Placobdella* sp.

# Hirudinida

- sistema circolatorio, nervoso ed escretore simile agli oligocheti
- *sensilli* sull'epidermide





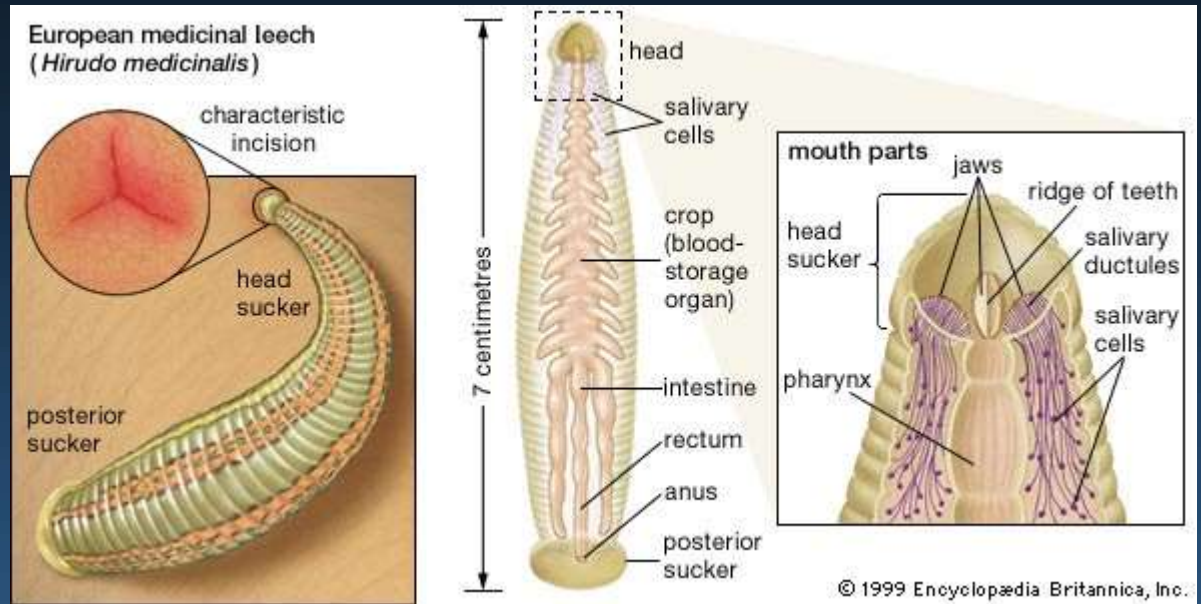


## Hirudinida

- ermafroditi insufficienti
- spermatozoi trasferiti per penetrazione ipodermica
- clitello evidente solo nella stagione riproduttiva
- fecondazione all'interno del *bozzolo*



# Hirudinida



*Hirudo medicinalis*





# Classe Hirudinida



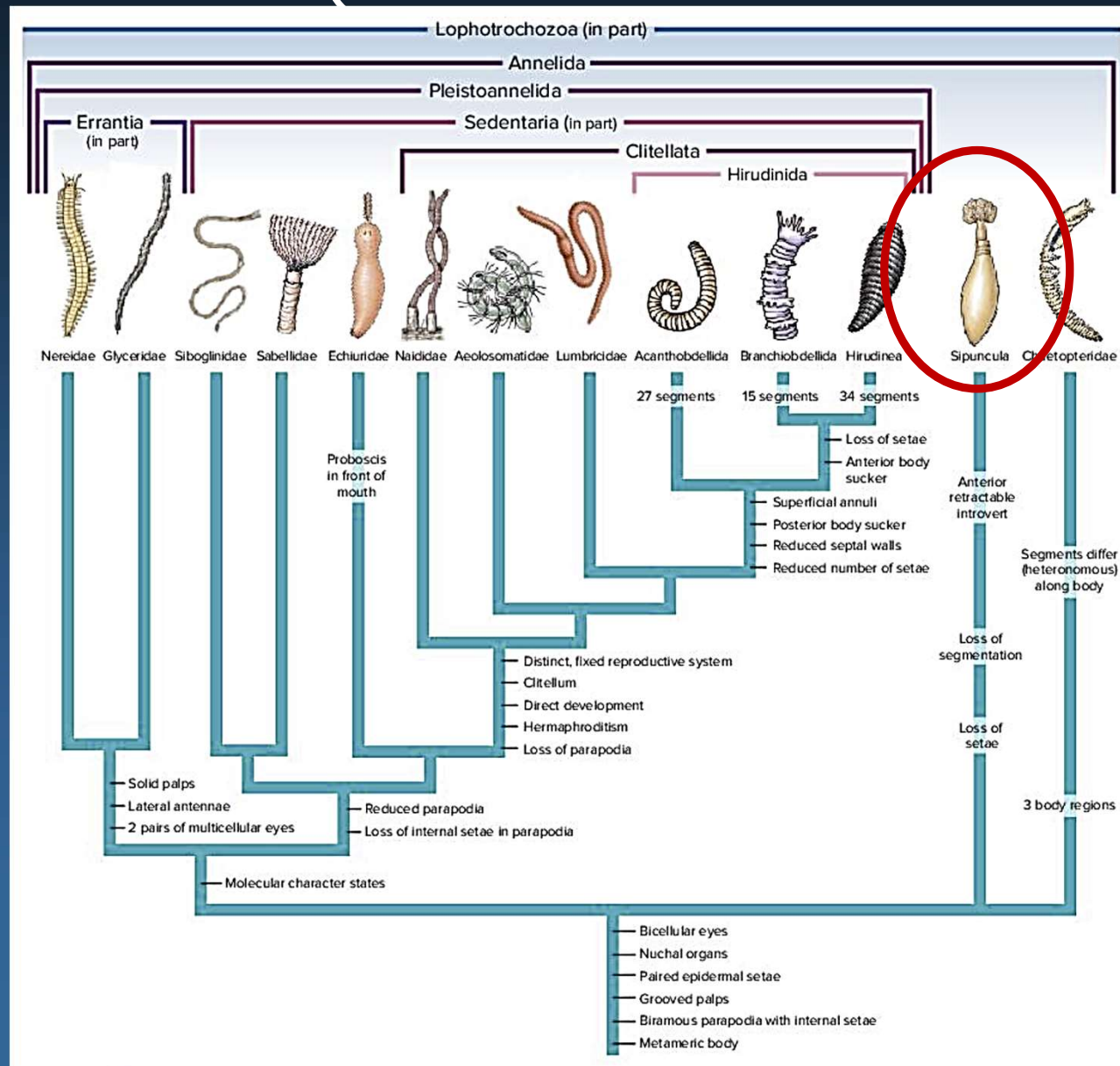
# Classe Hirudinida



Predazione di lombrico da Acanthobdellide



# Classificazione degli Anellidi: cladi gerarchici (Hickman et al. XVI ed.)

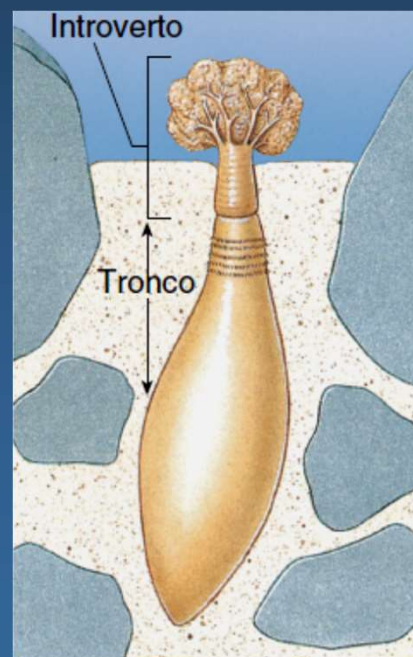




# Clado SIPUNCULA

(Lat. *sipunculus* 'piccolo sifone')

- ~ 250 specie
- marine, bentoniche
- essenzialmente nelle zone tropicali
- lunghi da 3-10 cm
- non hanno segmentazione, né setole

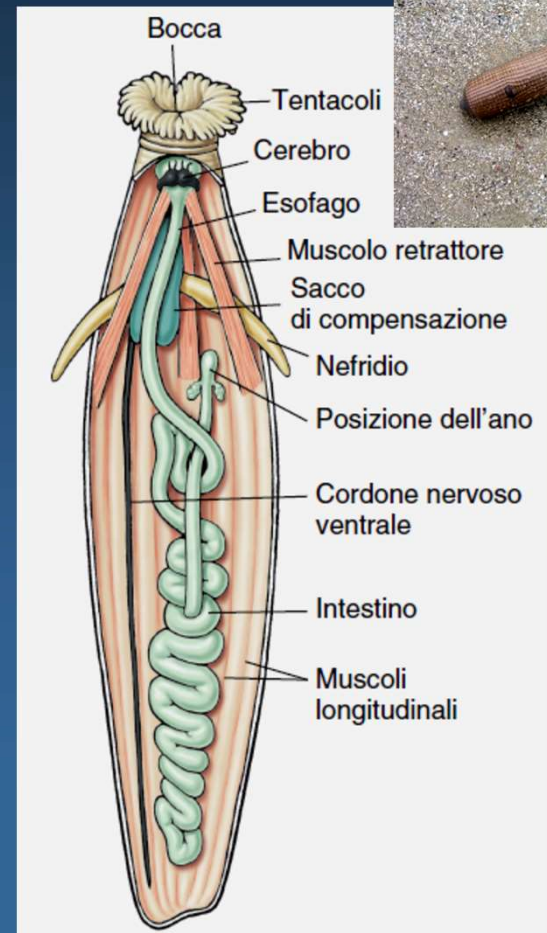






# SIPUNCULA

- manca sistema circolatorio (cellule con *emeritrina* nel celoma)
- dioici, gonadi temporanee dal tessuto connettivo
- fecondazione esterna, larva trocofora
- riproduzione a sessuale per scissione



*Sipunculus* sp.



# SIPUNCULA



*Sipunculus* sp.



*Phascolosoma* sp.



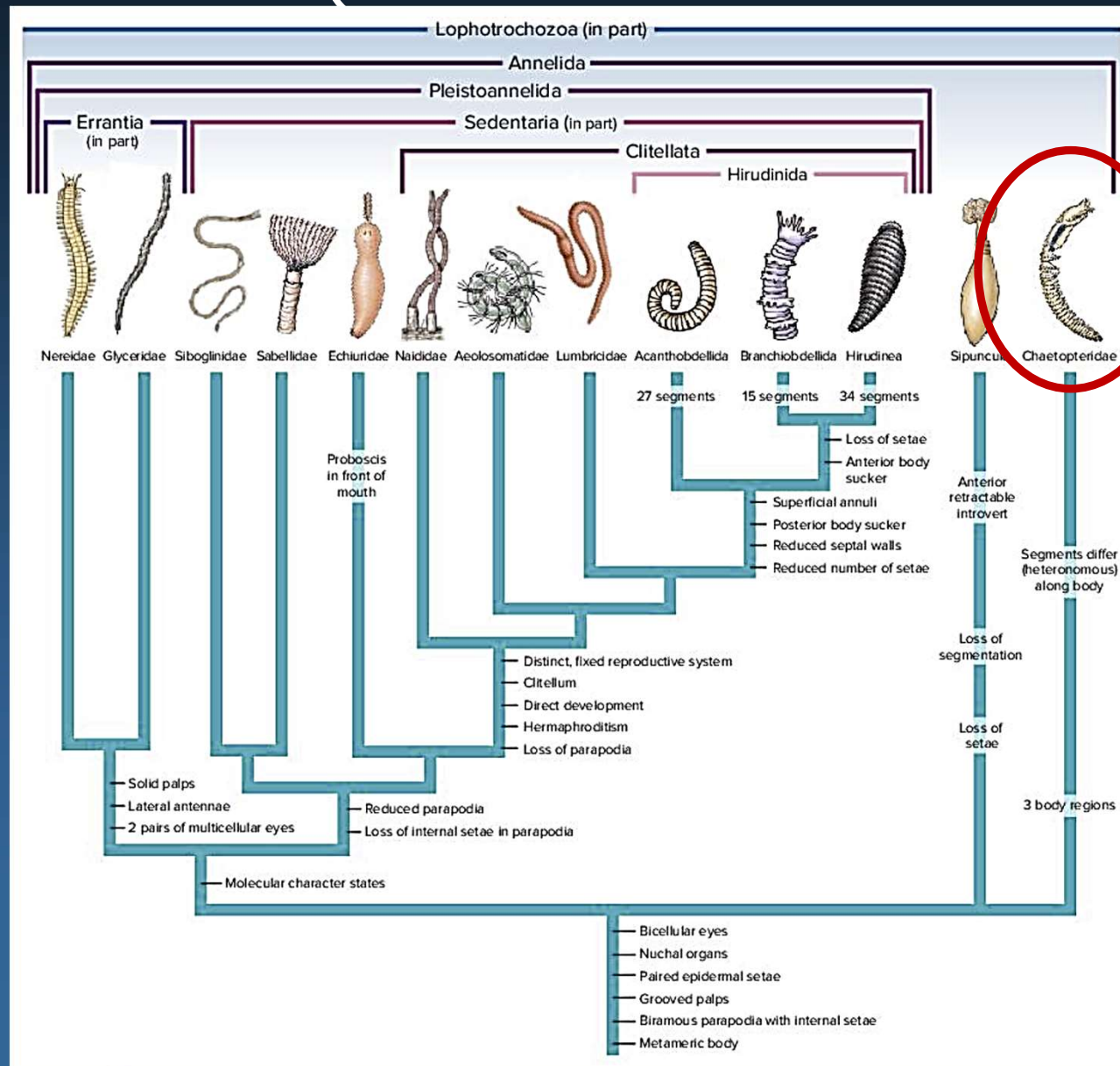
*Aspidosiphon* sp.



*Aspidosiphon* sp.



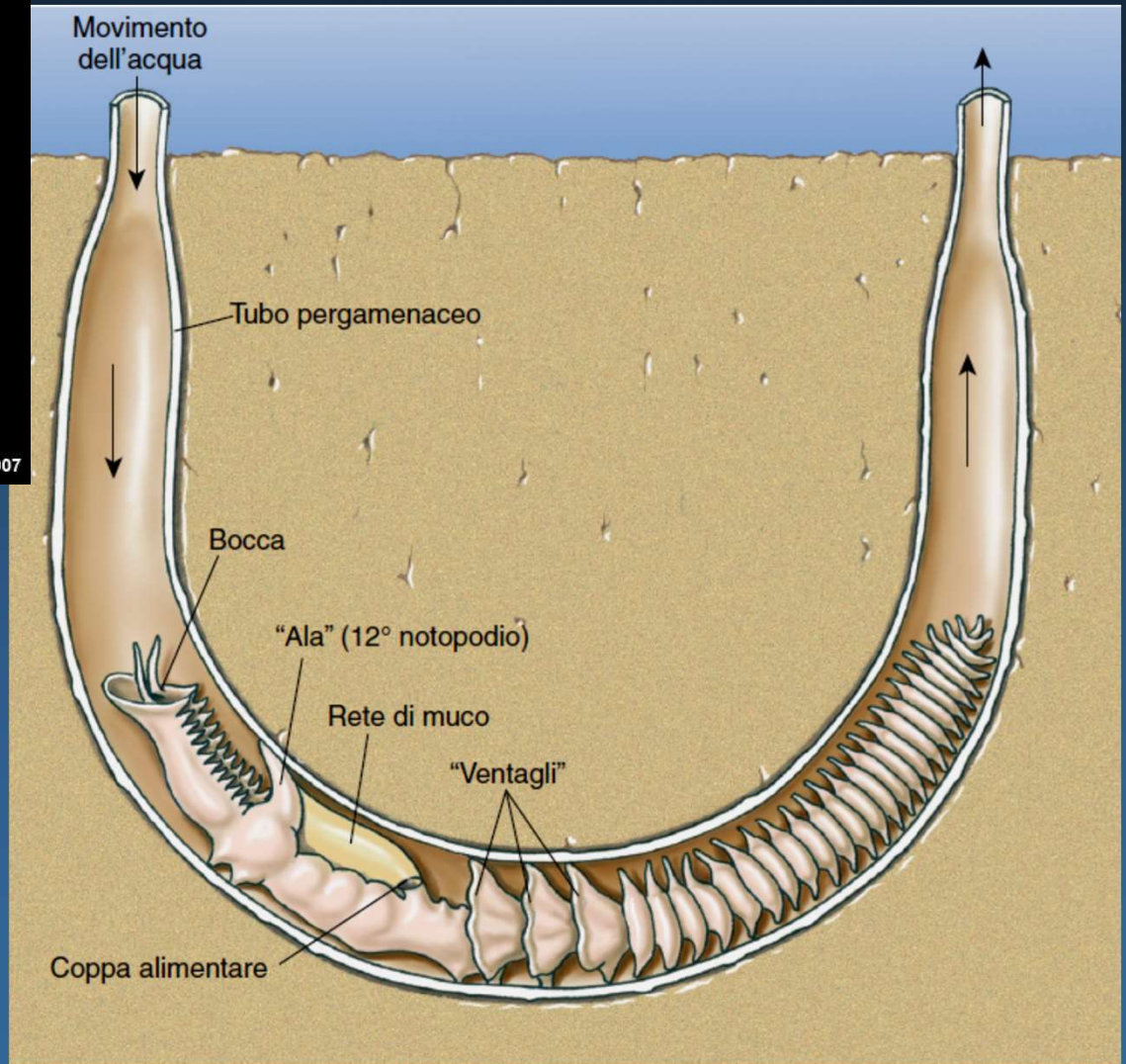
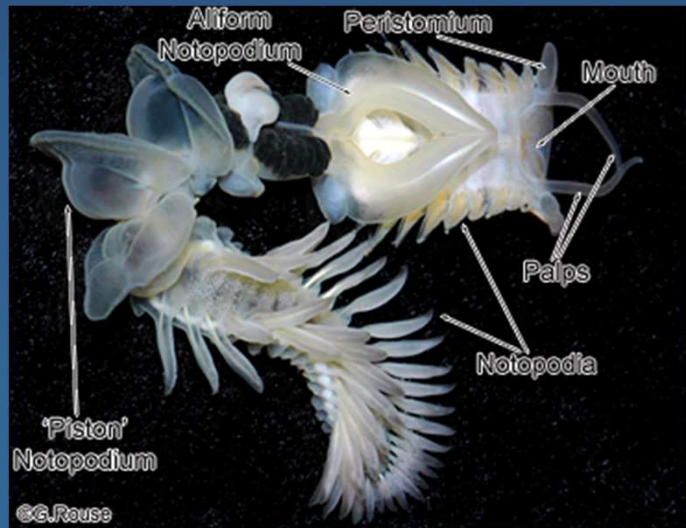
# Classificazione degli Anellidi: cladi gerarchici (Hickman et al. XVI ed.)



# Clado CHAETOPTERIDAE



*Chaetopterus sp.*







## Di cosa abbiamo parlato:

- con gli Anellidi si afferma la metameria
- le potenzialità di un celomato segmentato si riscontrano nell'aumento della dimensioni e complessità corporea (sist. nervoso, circolatorio, escretore)
- gli anellidi sono cosmopoliti e presenti in una gran varietà di ambienti
- profonda revisione tassonomica degli Anelidae (Pleistonanellidi, Chaetopteridae, Echiuridi, Sipunculidi...)