

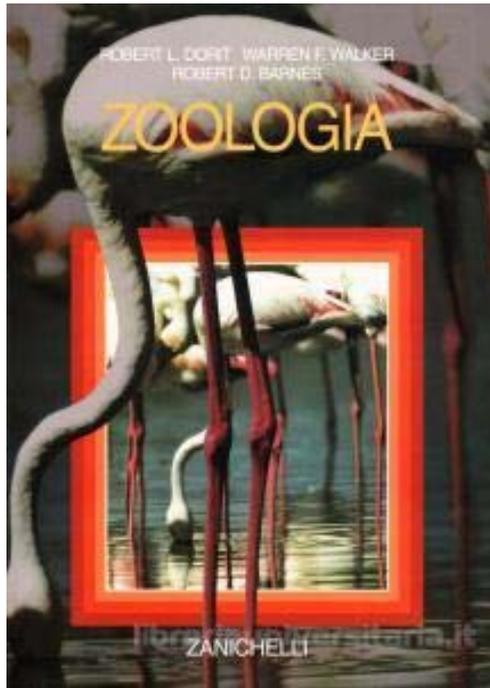
Metodologie didattiche nella Biologia Animale



SAPIENZA
UNIVERSITÀ DI ROMA

Percorso 24 Cfu – Master formazione insegnanti

Marco Oliverio & Luigi Maiorano
Dipartimento di Biologia e Biotecnologie
«Charles Darwin»



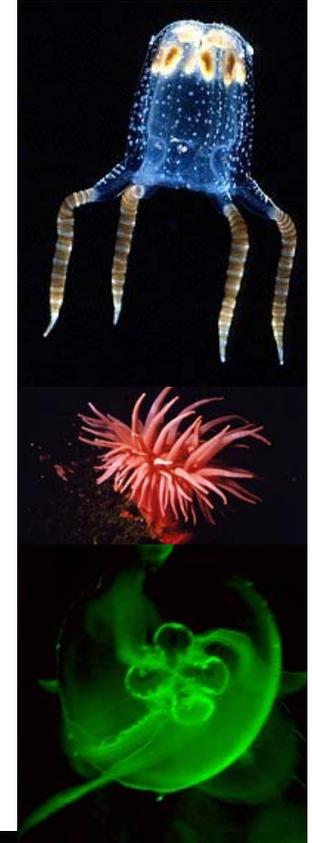
Dorit, Walker & Barnes
Zoologia
Zanichelli

Bruno Sabelli
Atlante di diversità e
Morfologia degli invertebrati
Piccin

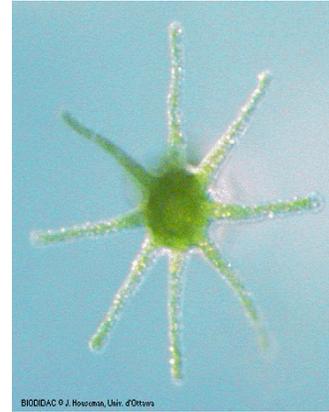
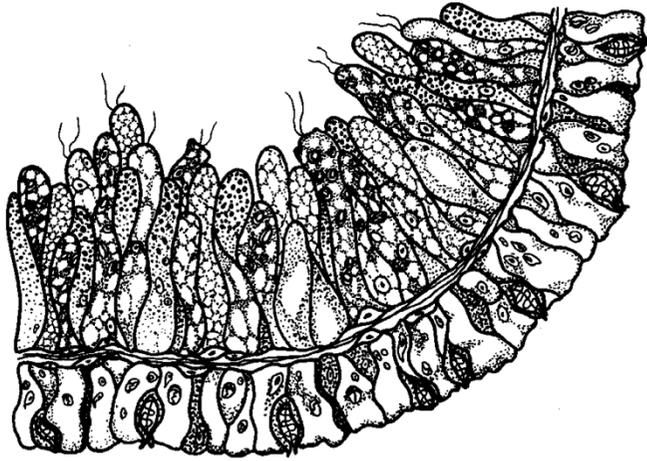
Libri di Testo:



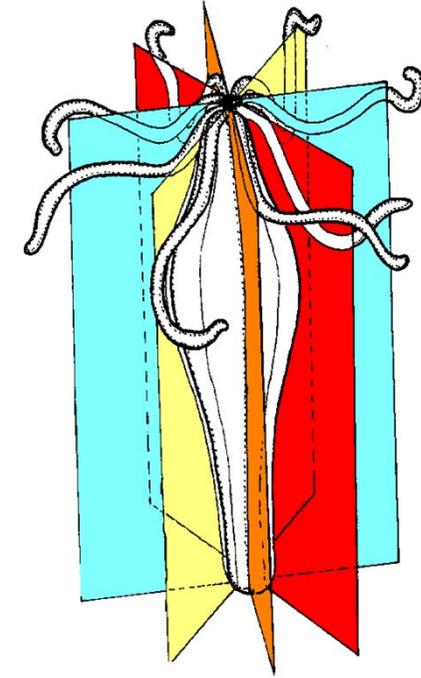
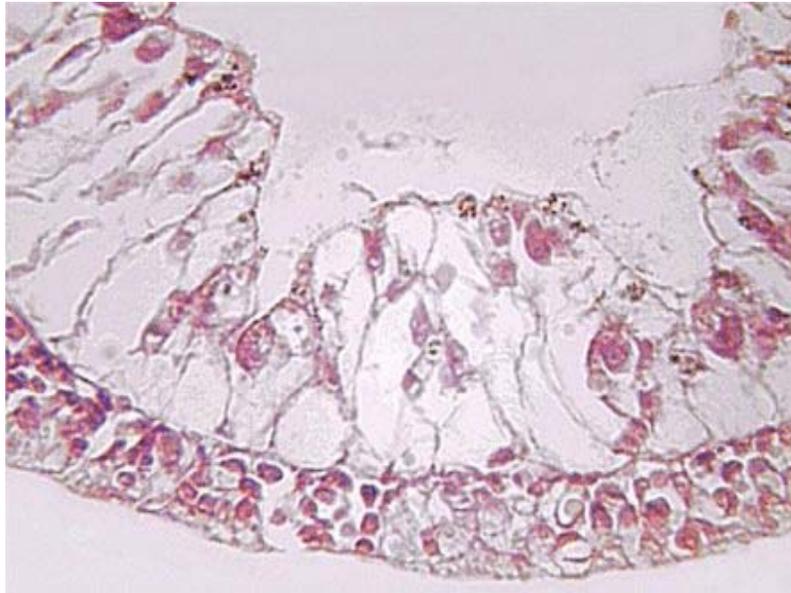
Cnidaria: i coralli, le meduse, le caravelle portoghesi



organizzazione tissutale diblastica

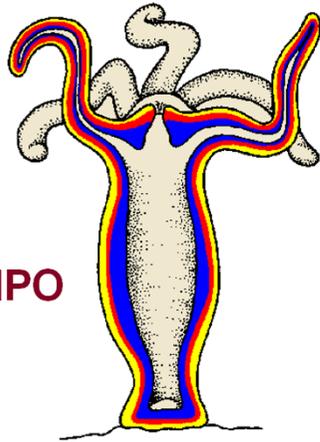


simmetria raggiata

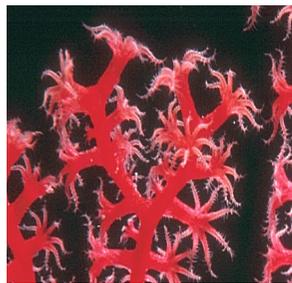
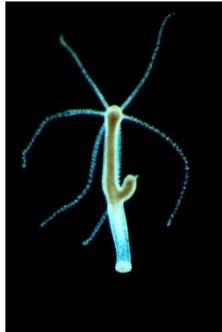
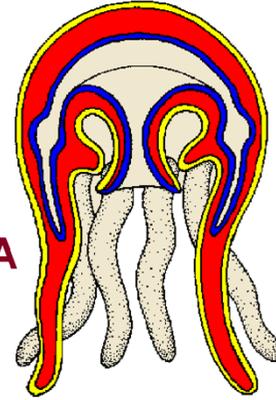


STADI VITALI

POLIPO



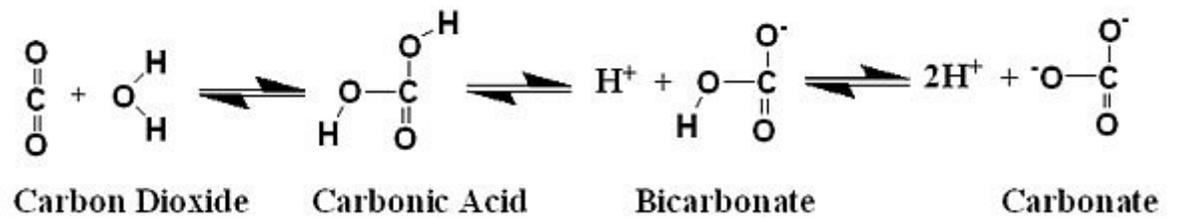
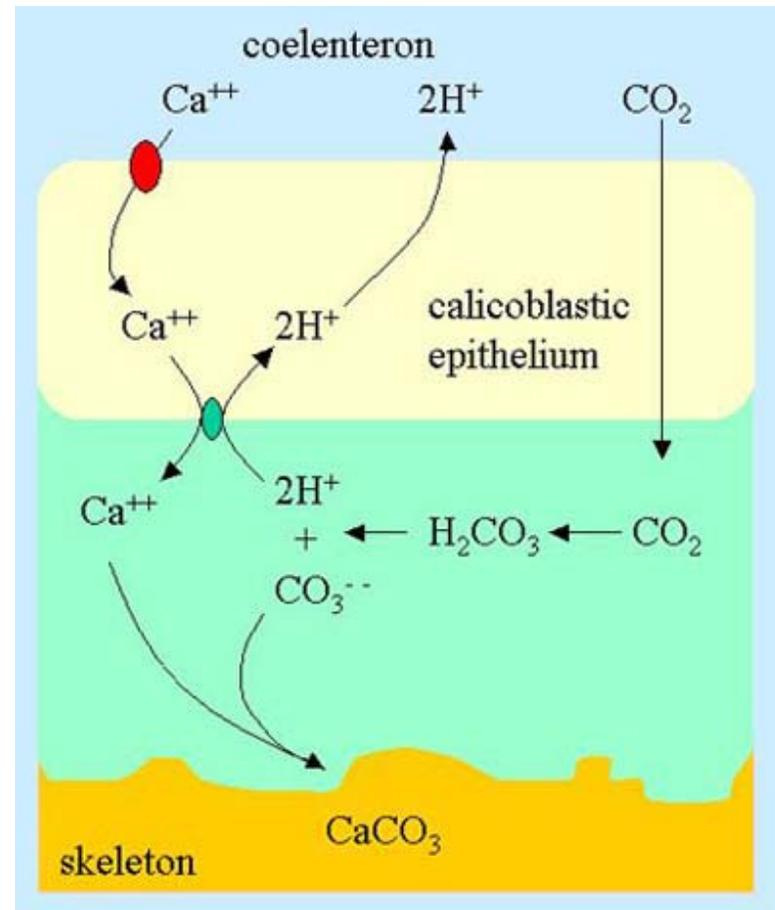
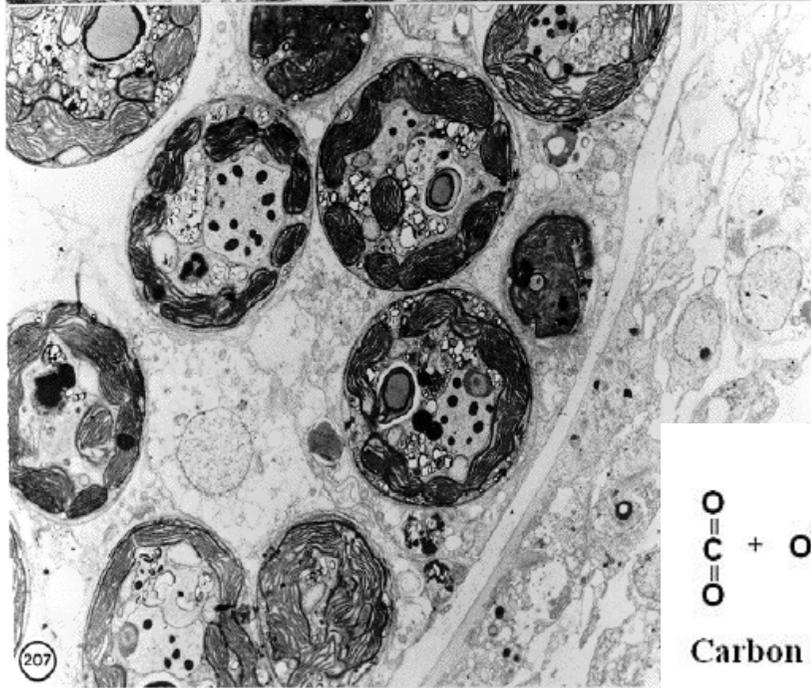
MEDUSA



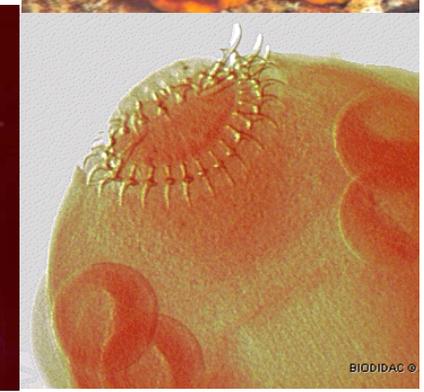
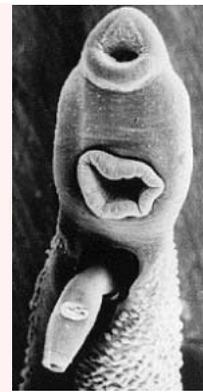
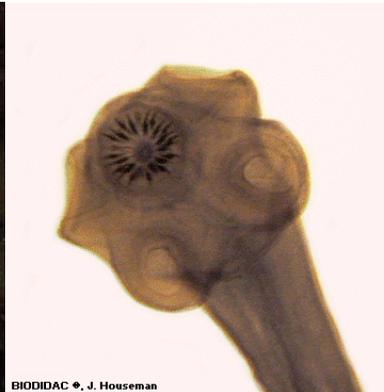
Le scogliere coralli



Simbiosi coralli-zooxantelle



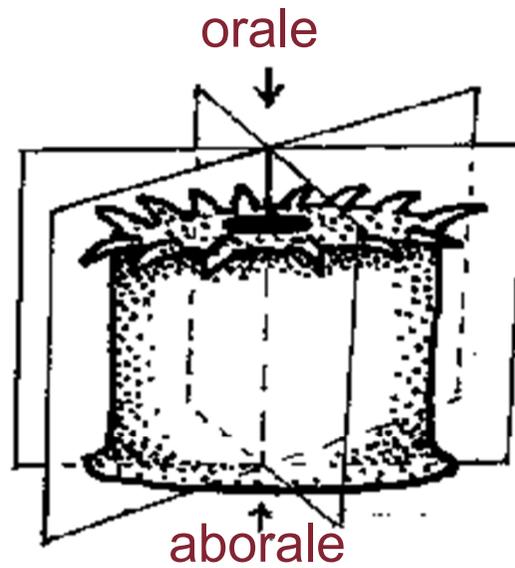
Platyhelminthes: platelminti o vermi piatti



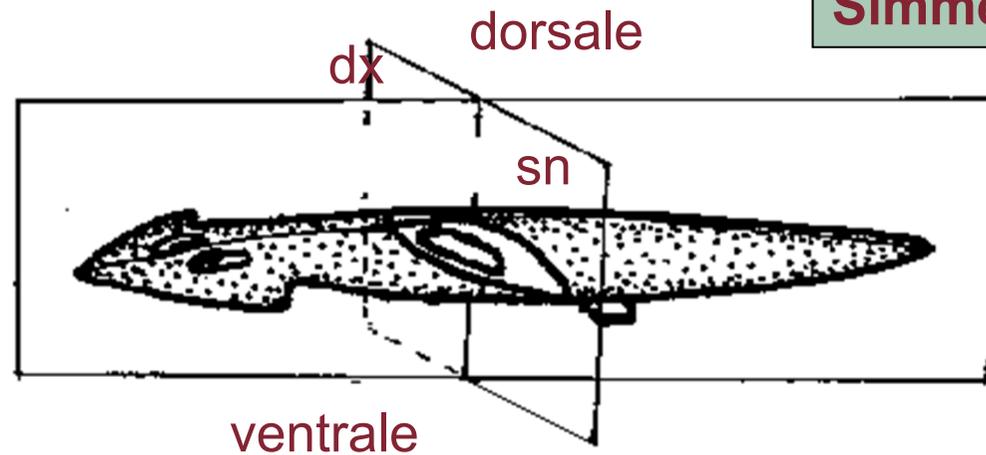
BIDDIDAC ©, J. Houseman

BIDDIDAC ©





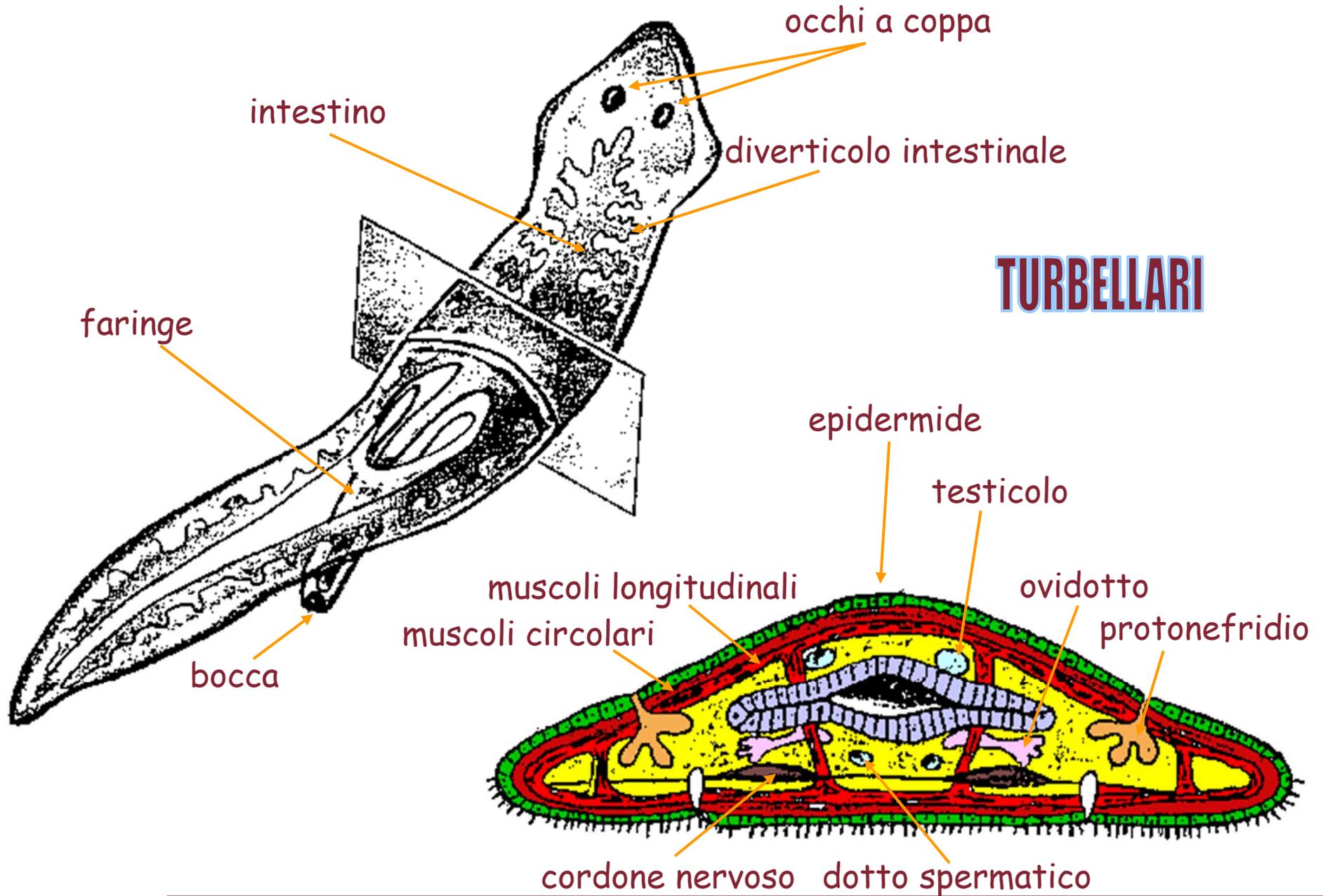
Simmetria raggiata



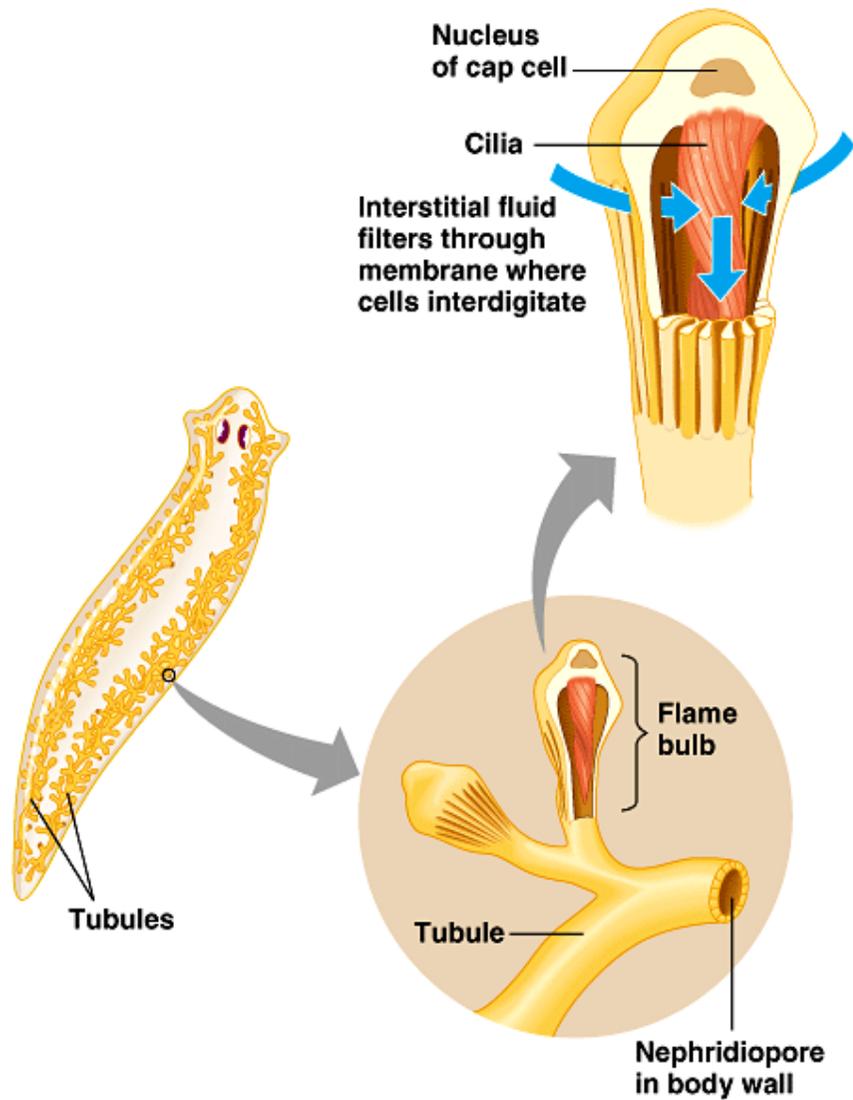
Simmetria bilaterale



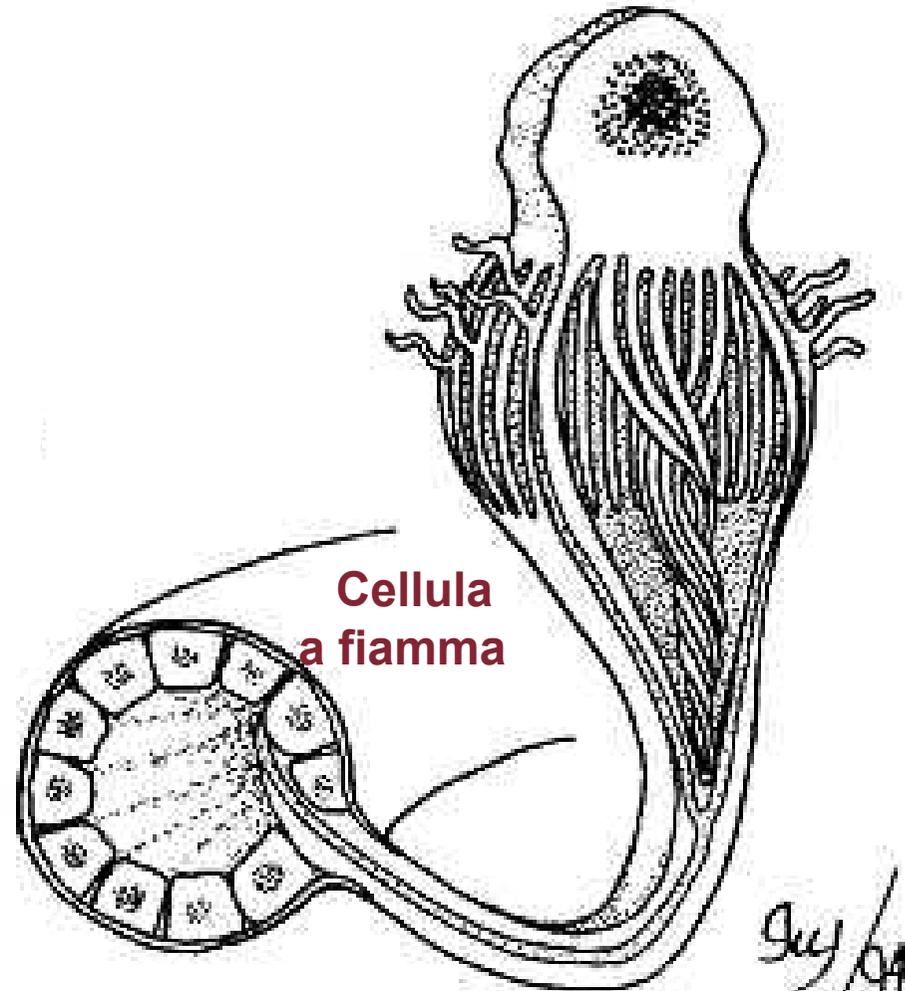
TURBELLARI



Escrezione

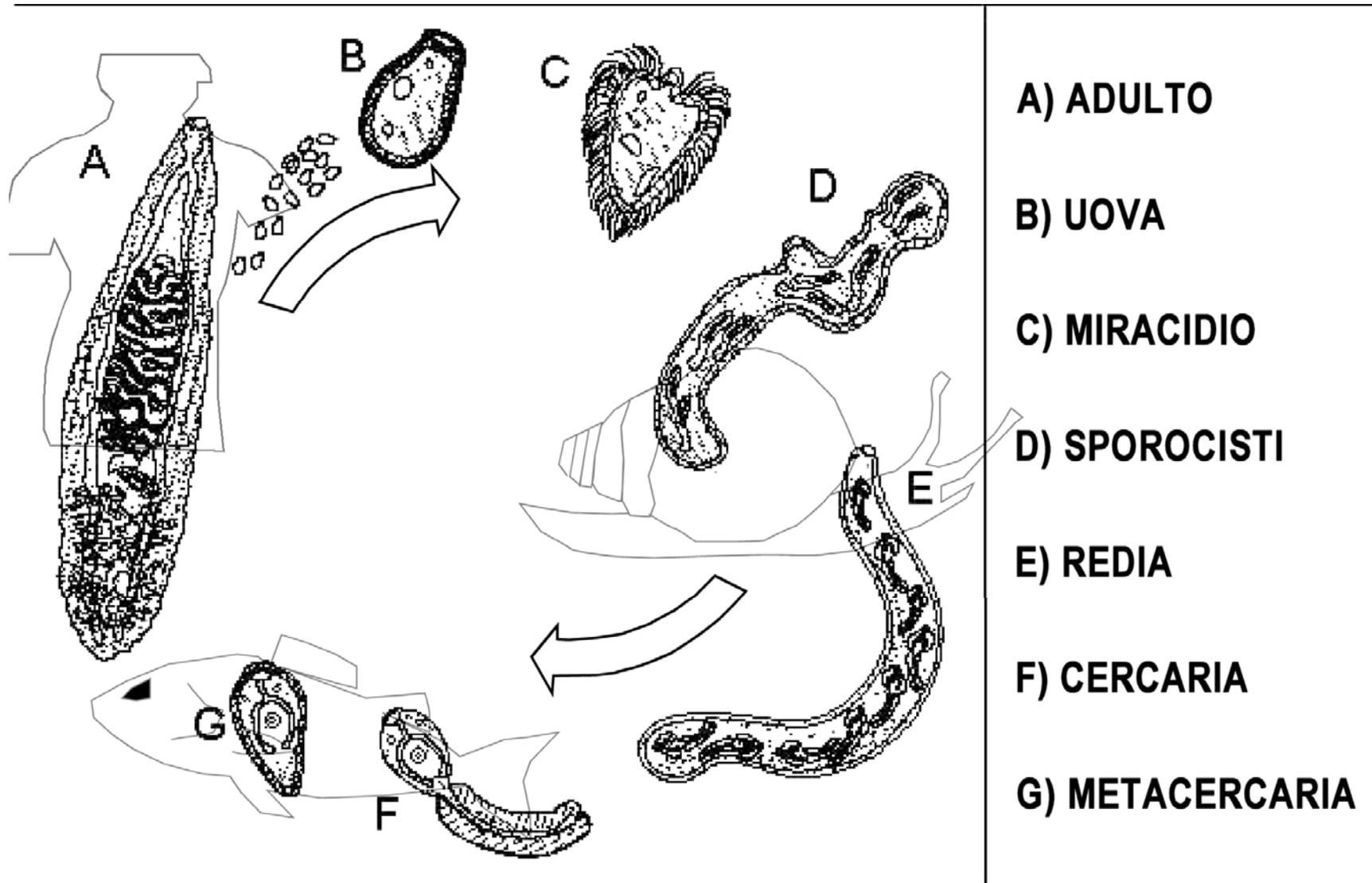


Dronofridi



9/11/94

TREMATODI



A) ADULTO

B) UOVA

C) MIRACIDIO

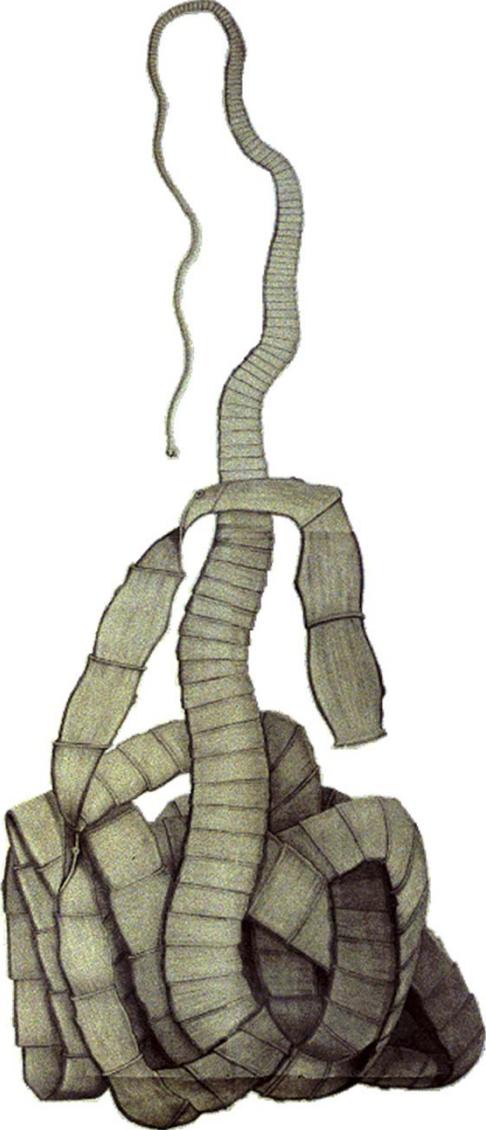
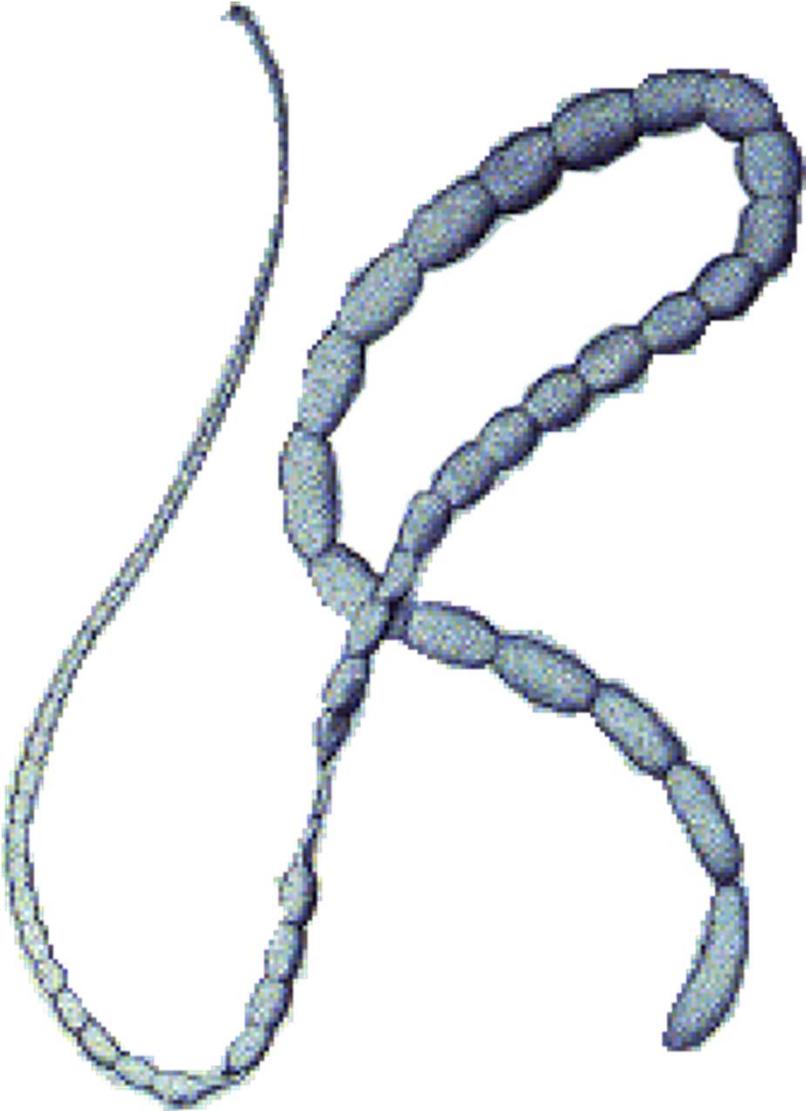
D) SPOROCISTI

E) REDIA

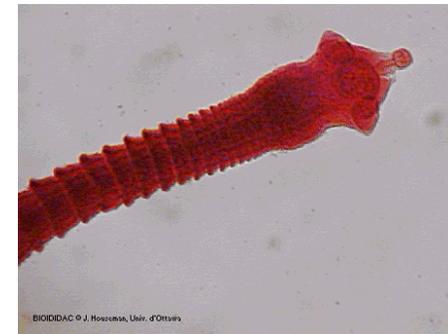
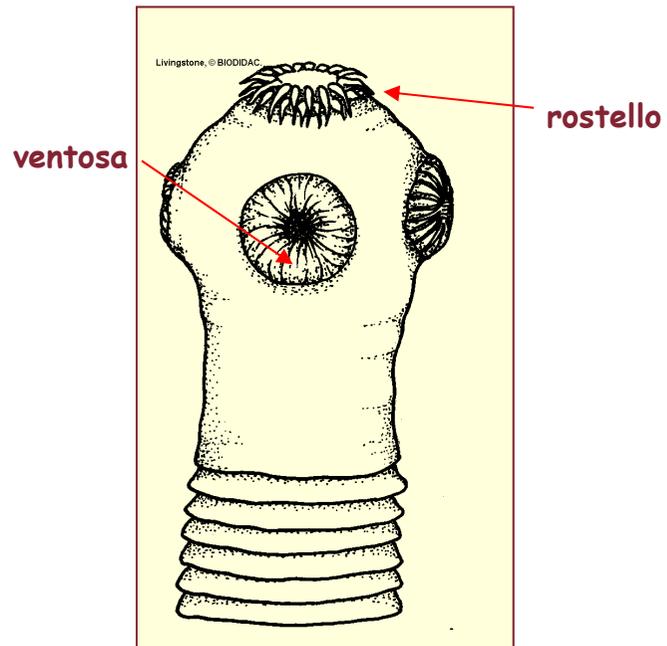
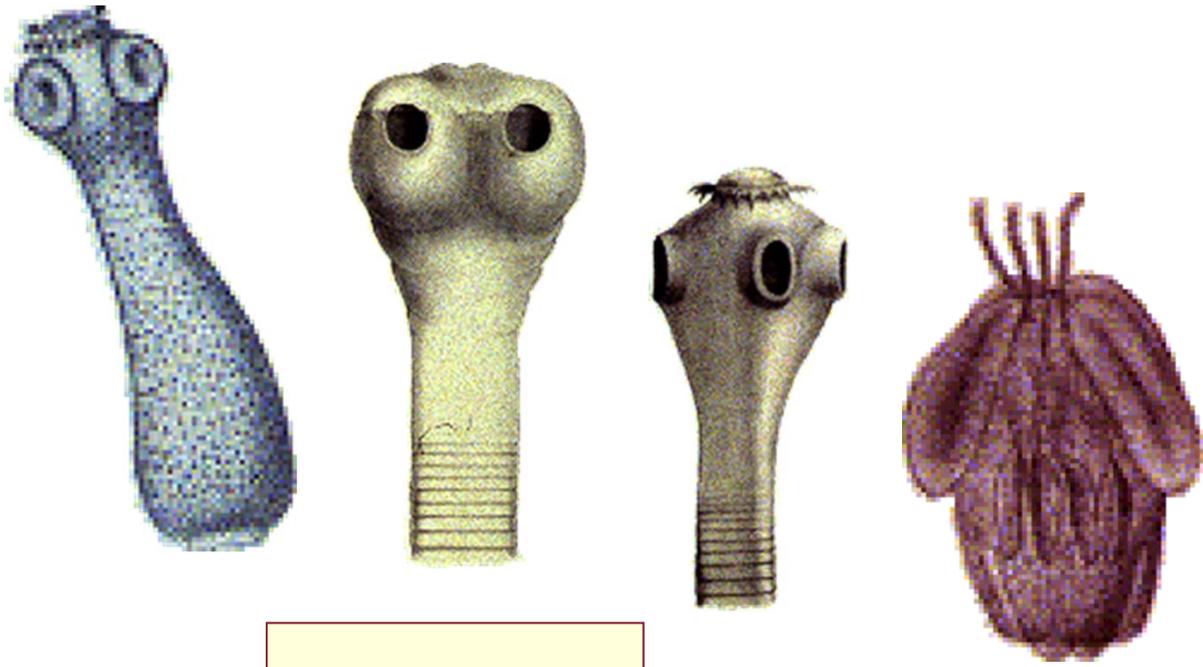
F) CERCARIA

G) METACERCARIA

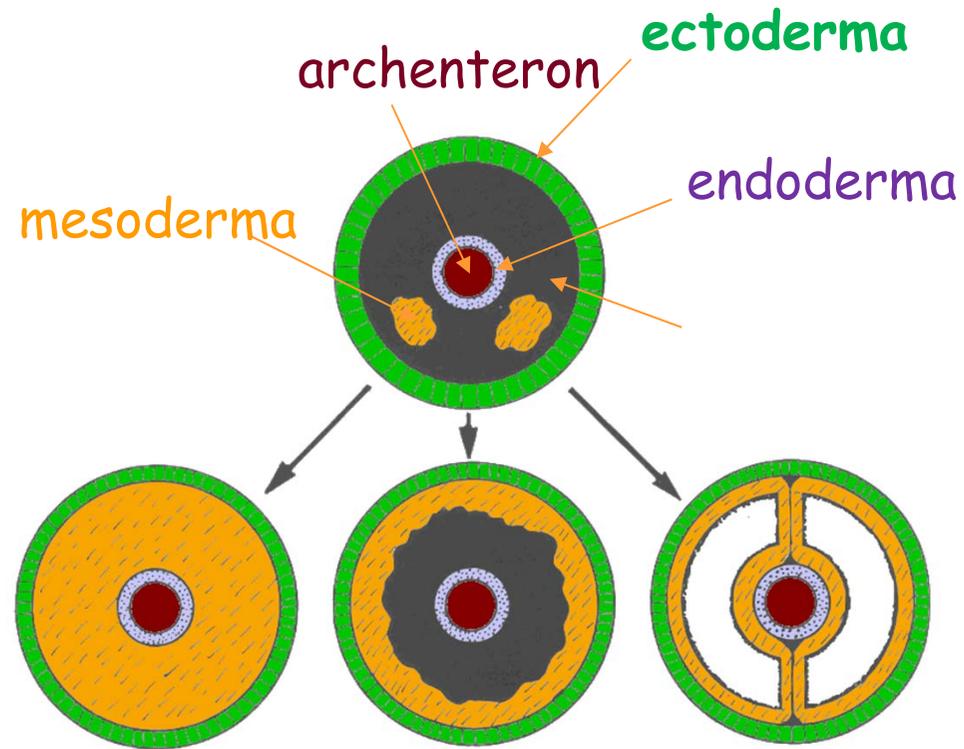
CESTODI

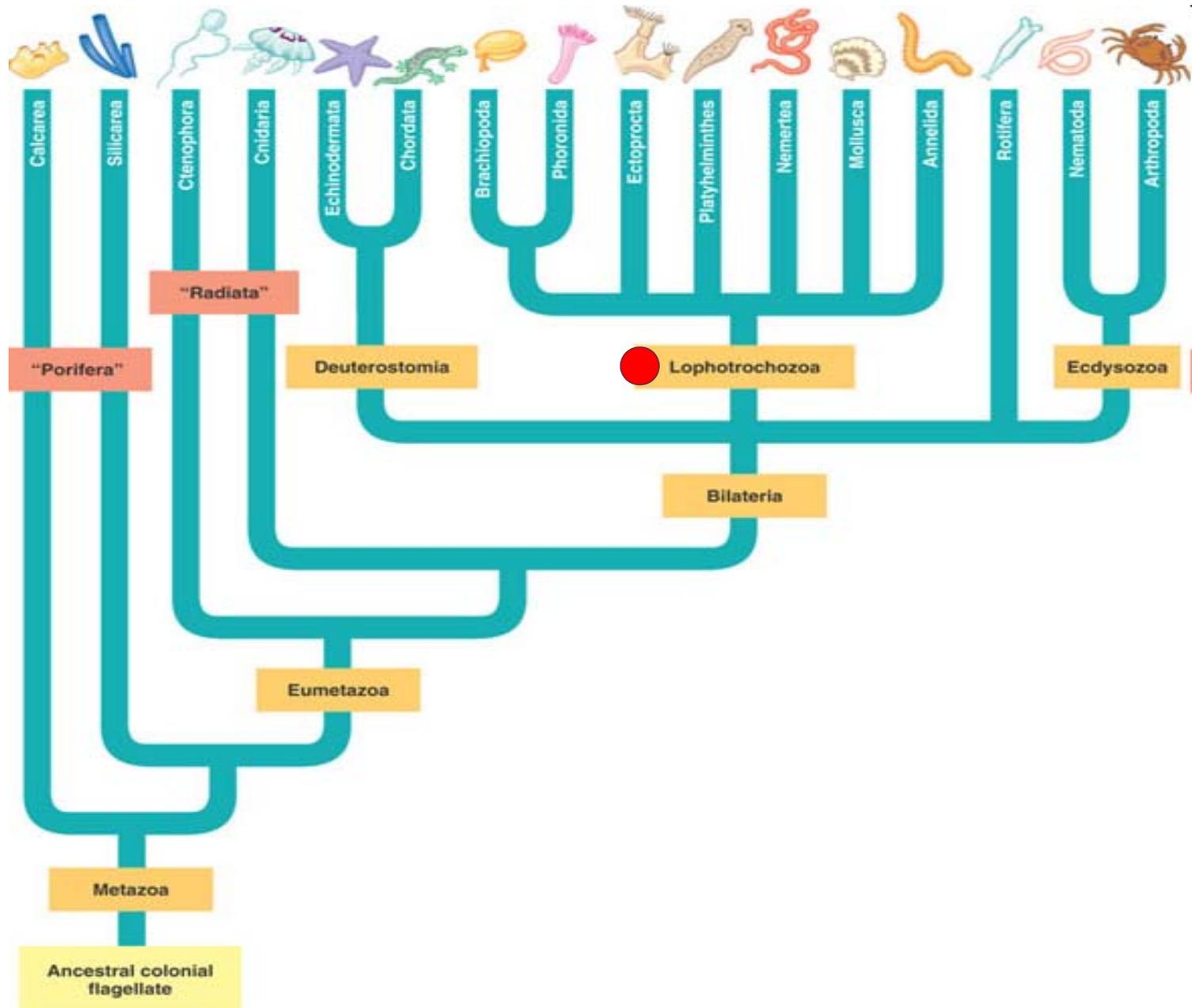


CESTODI



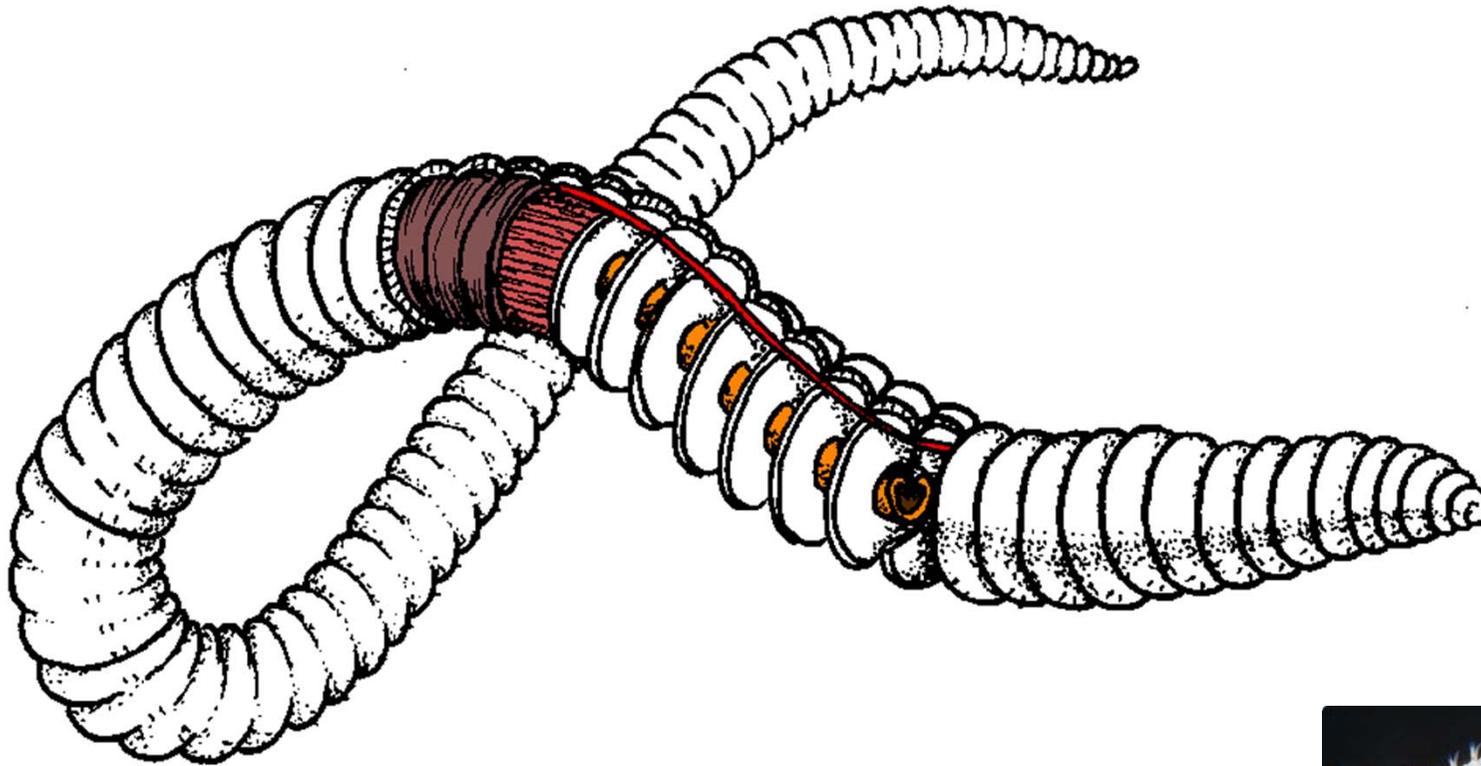
Cavit  del corpo





Anellidi

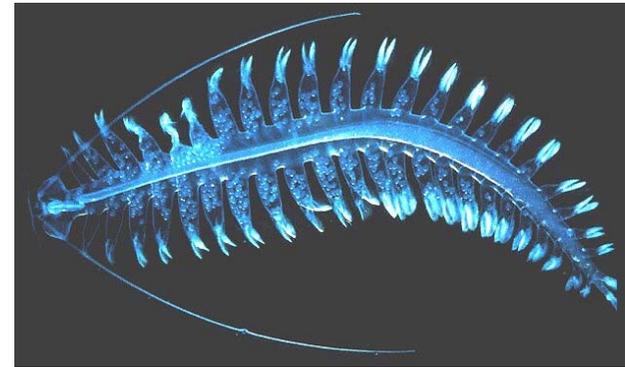
METAMERIA



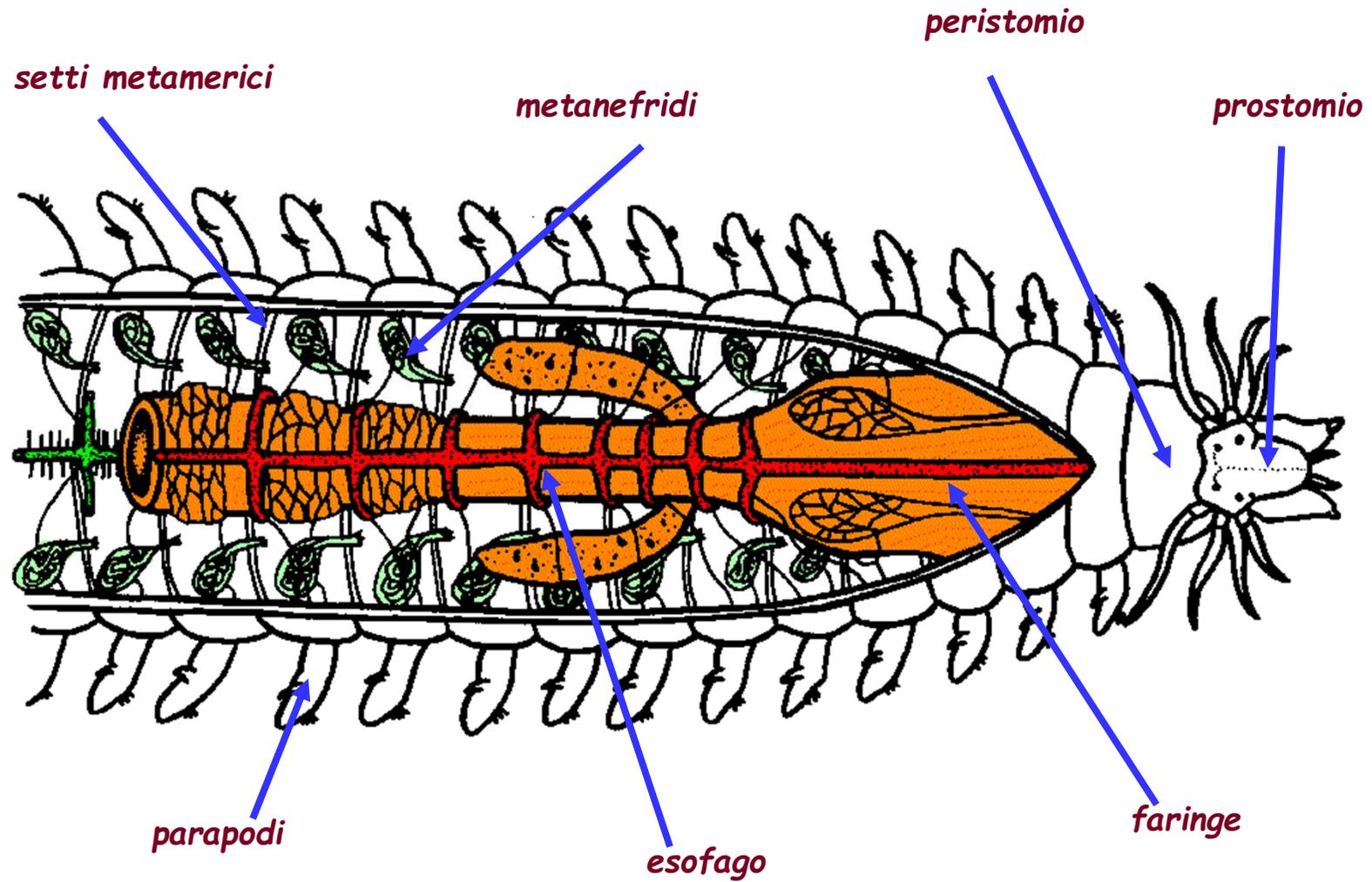
© Dieter Flieg

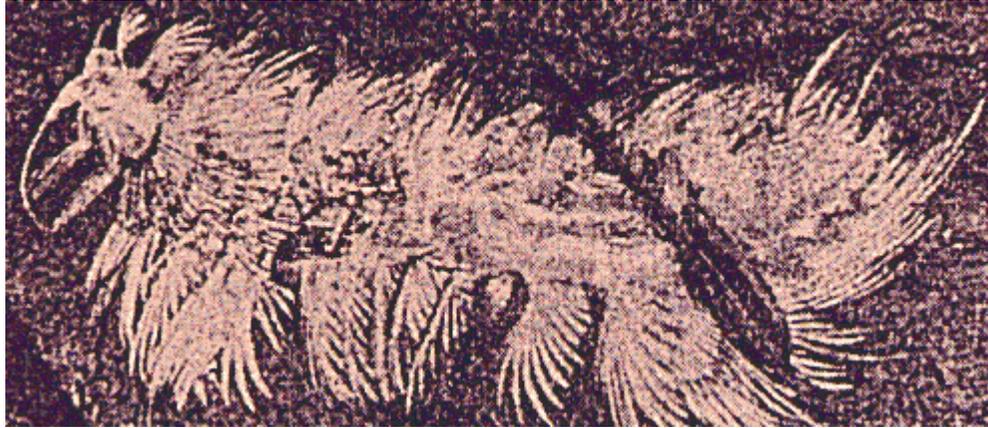
POLICHETI

11.000-14.000 specie



POLICHETI - struttura

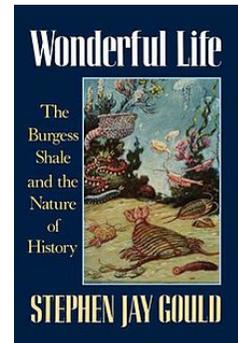




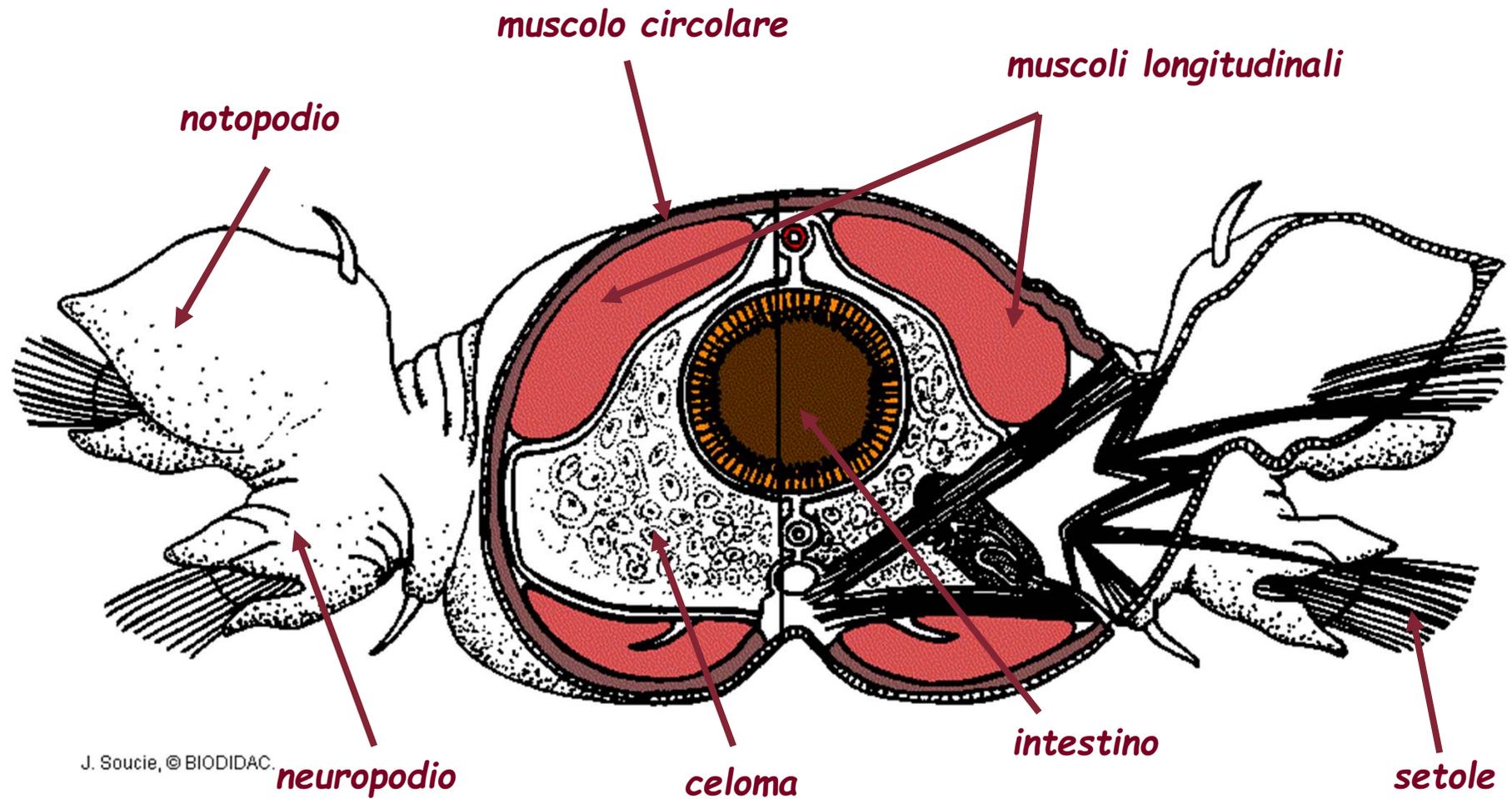
Canada, Lower-Middle Cambrian, Burgess Shale (British Columbia)



Scolecodonti (Cretaceo)



POLICHETI - struttura

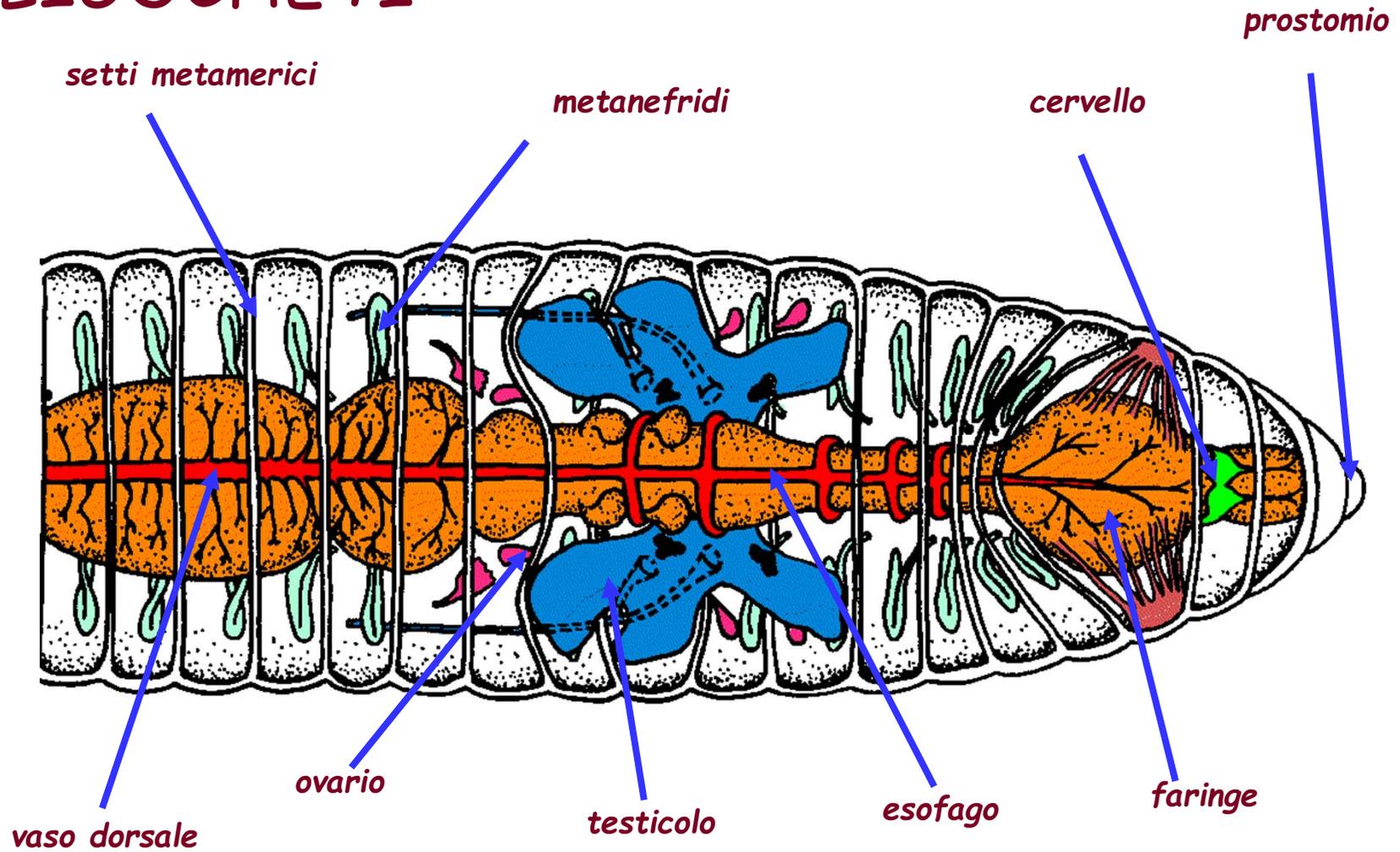


OLIGOCHETI

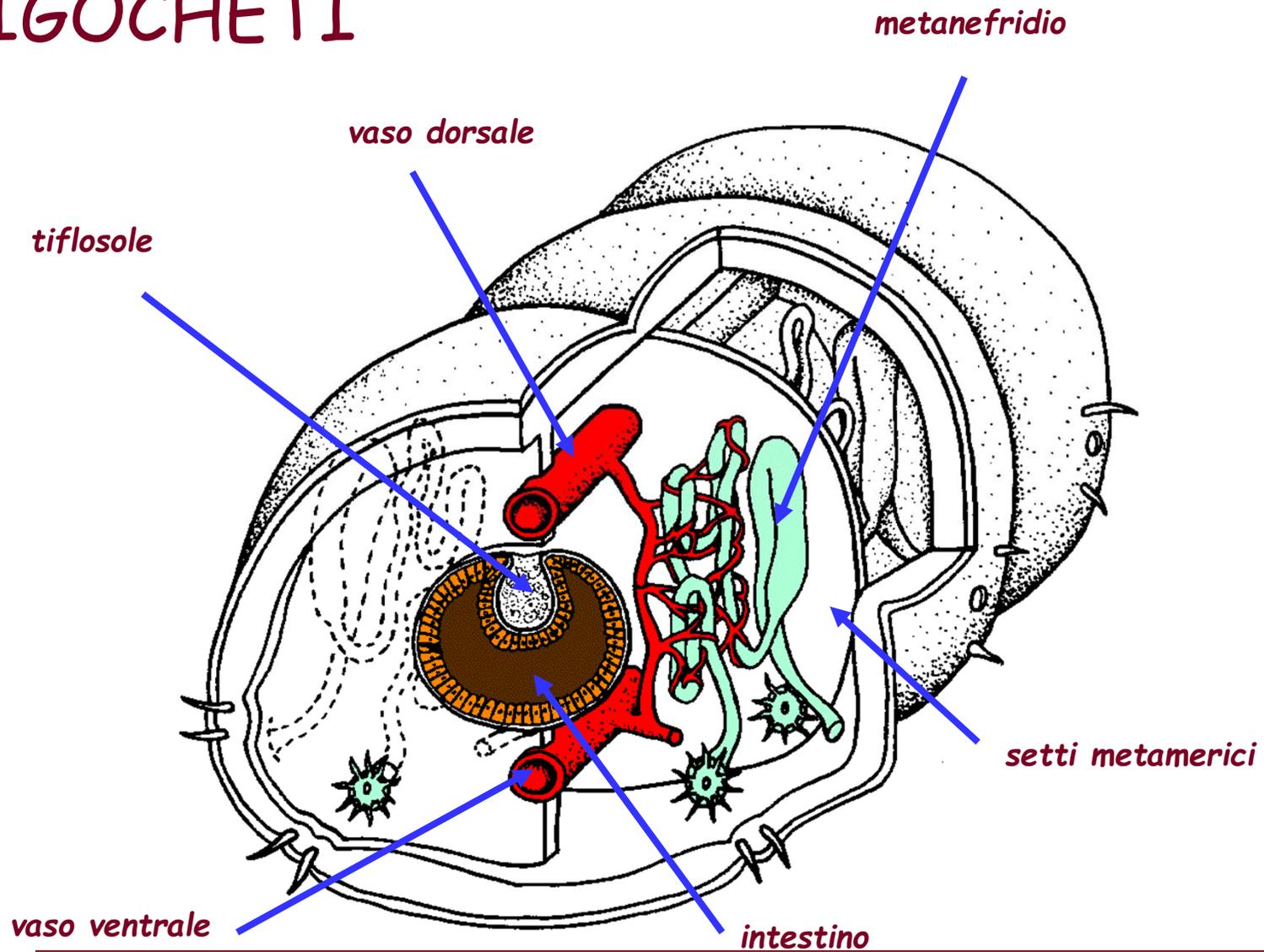
6.000-7.000 specie



OLIGOCHETI



OLIGOCHETI

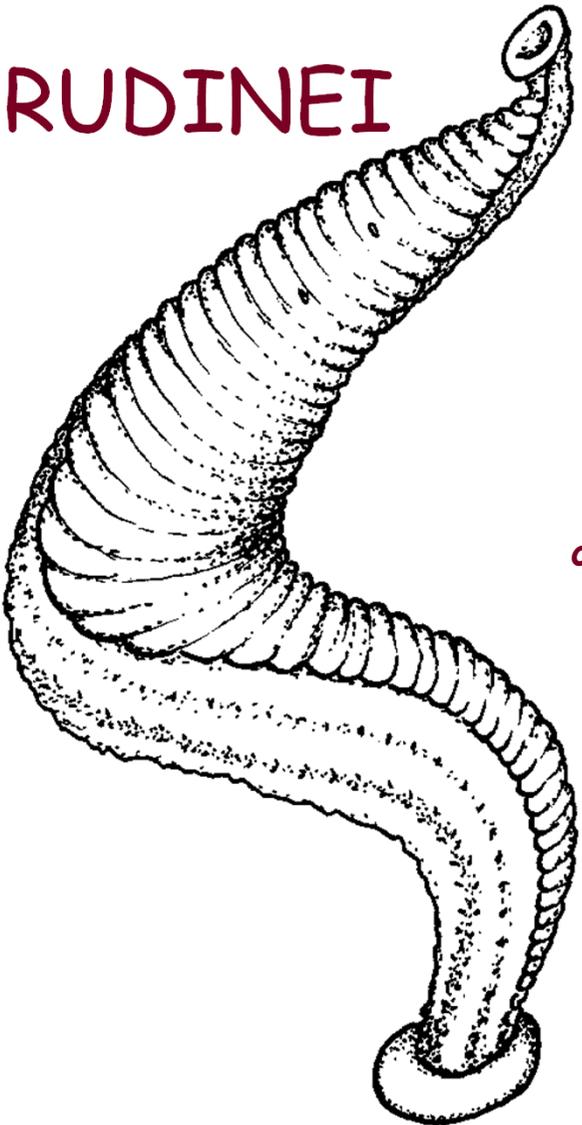


IRUDINEI

2.000-3.000 specie

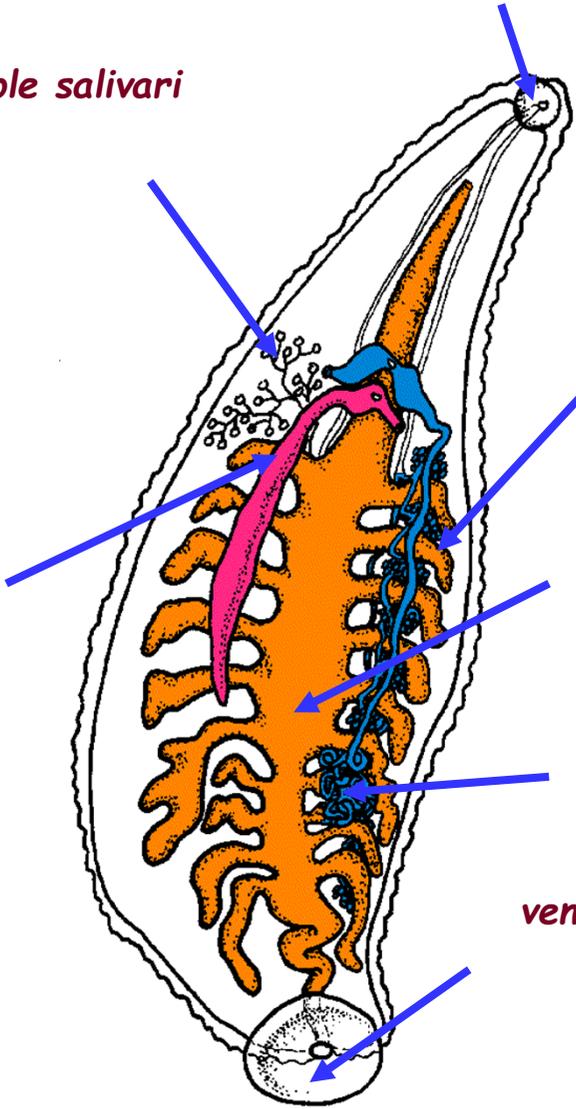


IRUDINEI



ghiandole salivari

ovario



ventosa anteriore

diverticoli intestinali

intestino

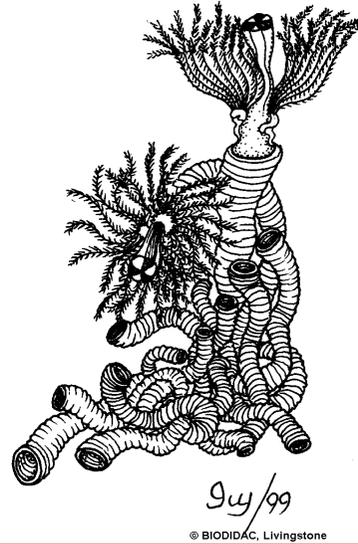
testicolo

ventosa posteriore



Serpulidi

Sedentari
tubicoli

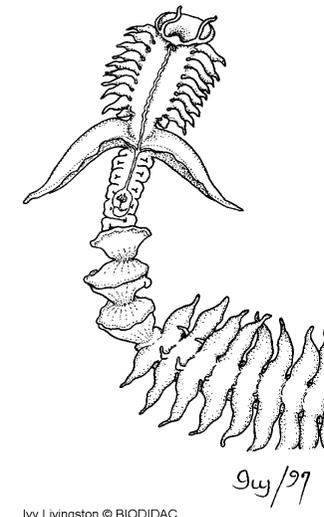
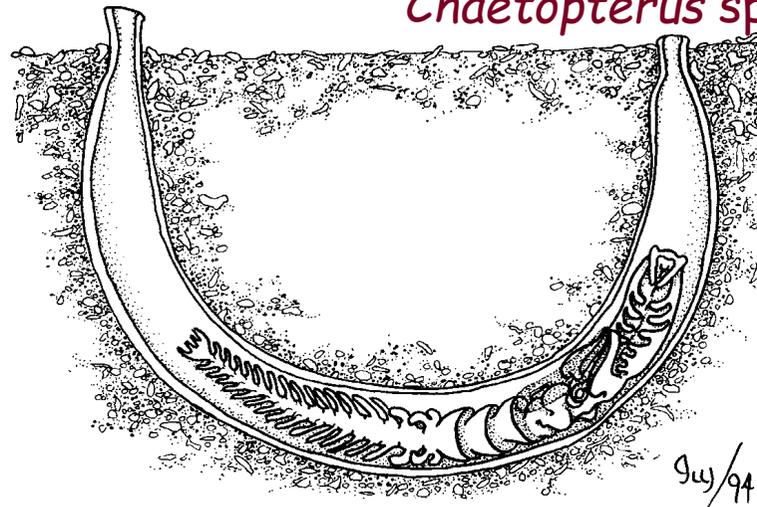


© BIODIDAC, Livingstone



Sedentari
fossori

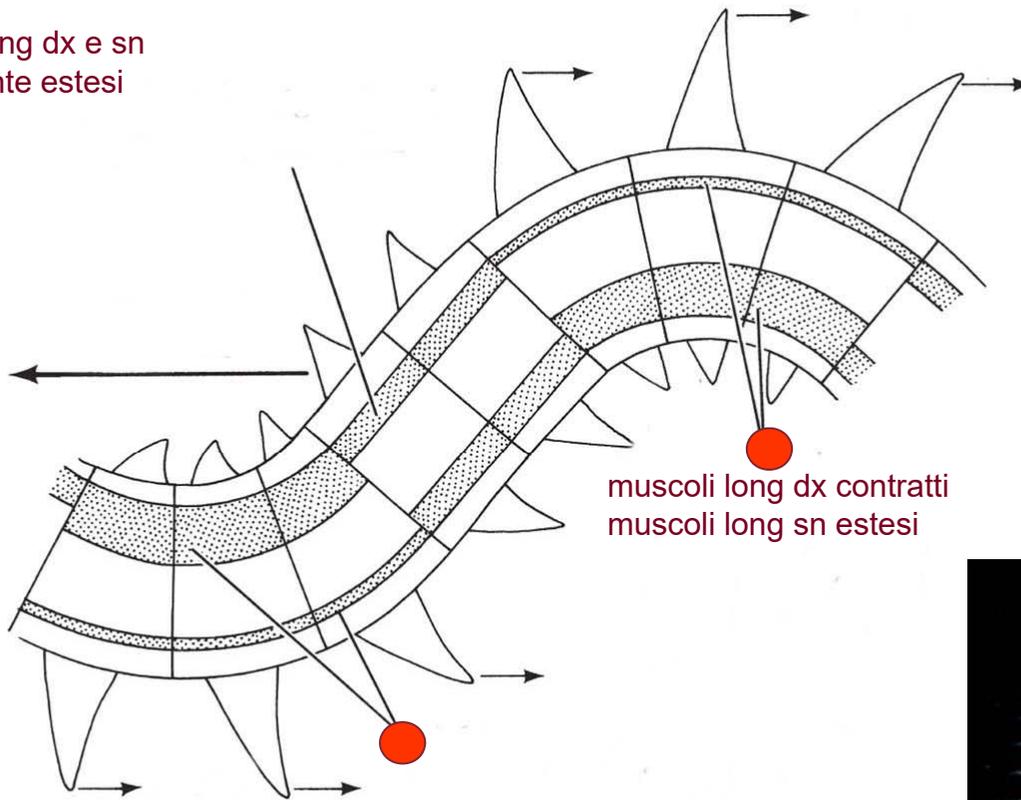
Chaetopterus sp.



Ivy Livingston © BIODIDAC

Locomozione

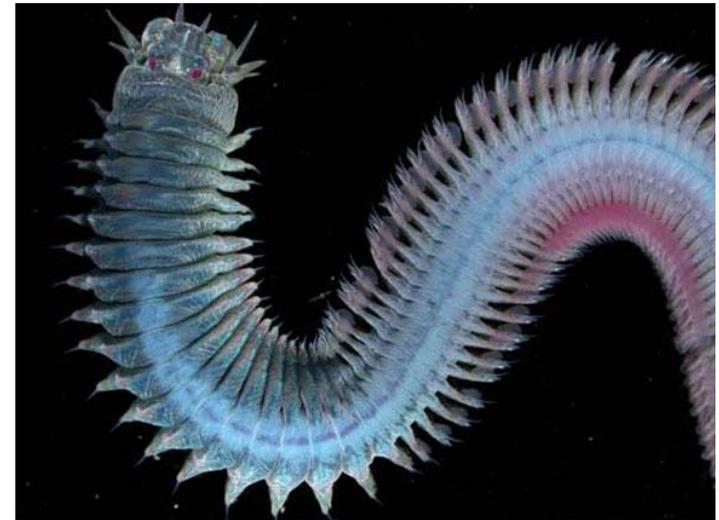
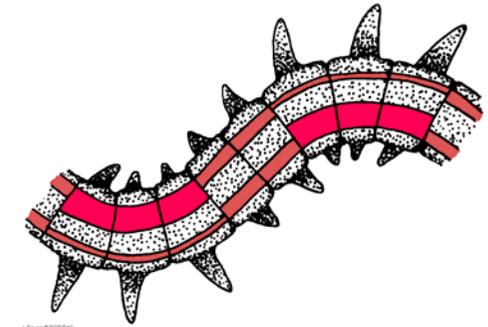
muscoli long dx e sn
mediamente estesi



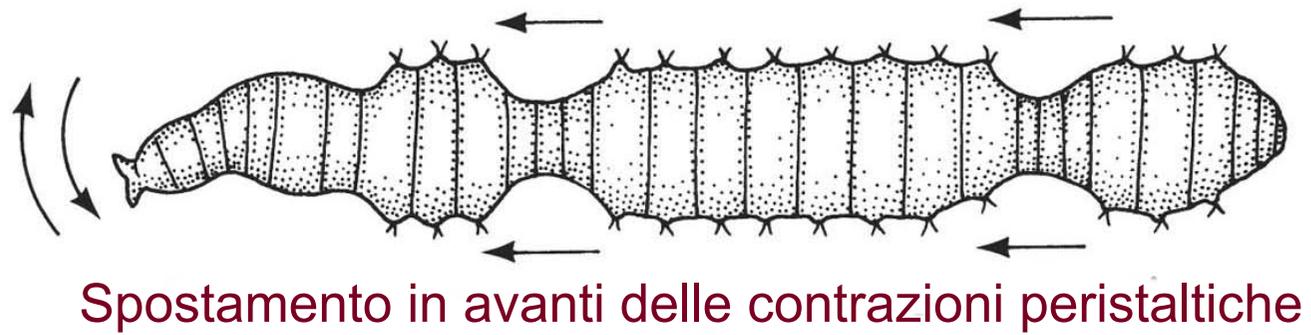
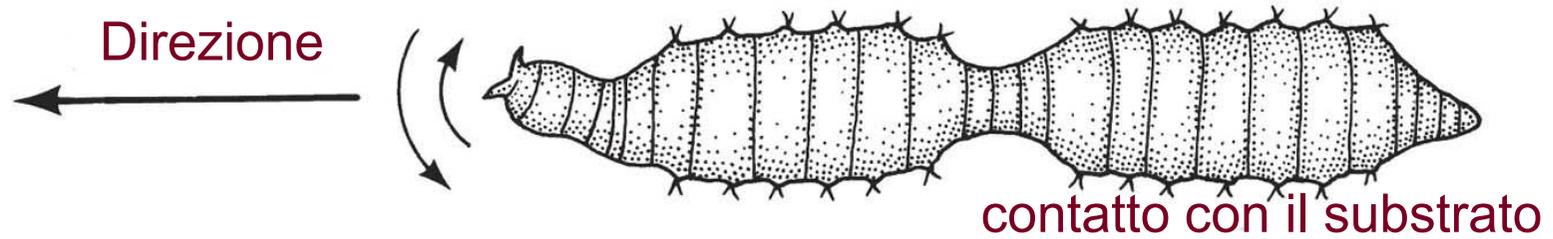
parapodi estesi
in contatto col substrato

muscoli long dx contratti
muscoli long sn estesi

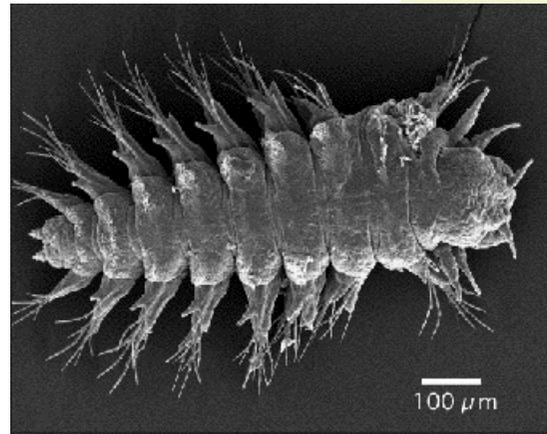
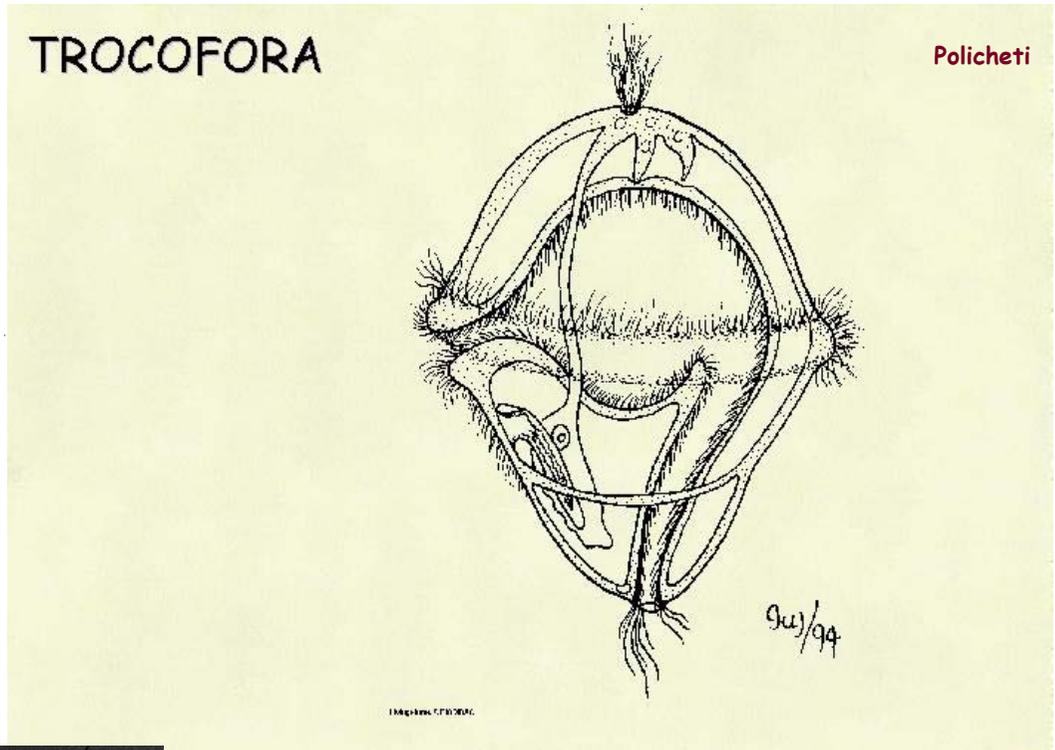
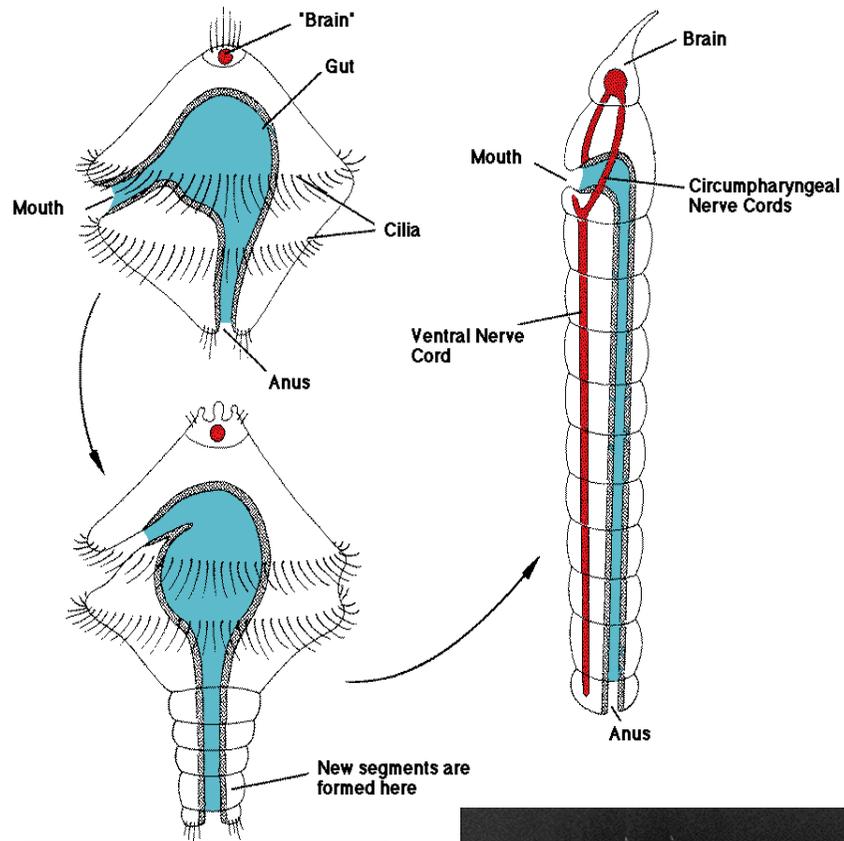
parapodi estesi
in contatto col substrato



Locomozione



Riproduzione

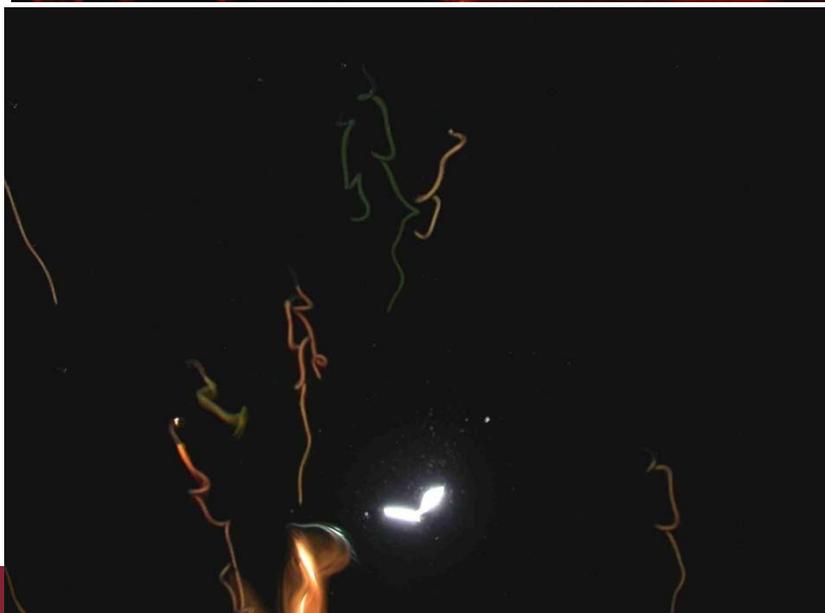


Riproduzione



Riproduzione

Epitochia: il palolo



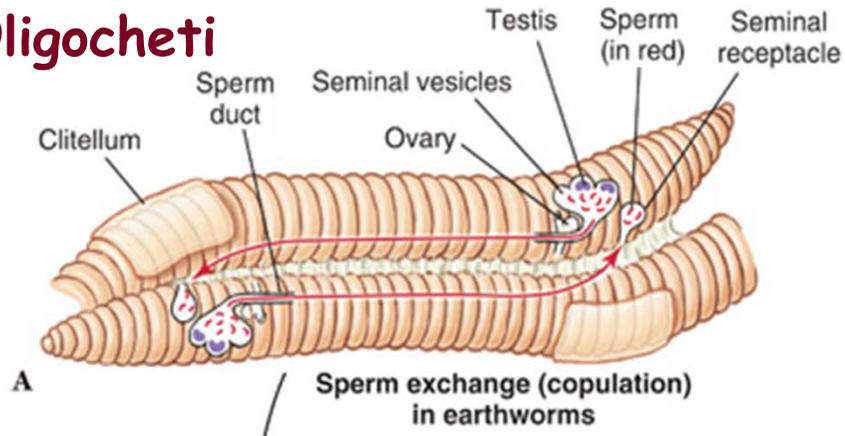
Policheti

Riproduzione

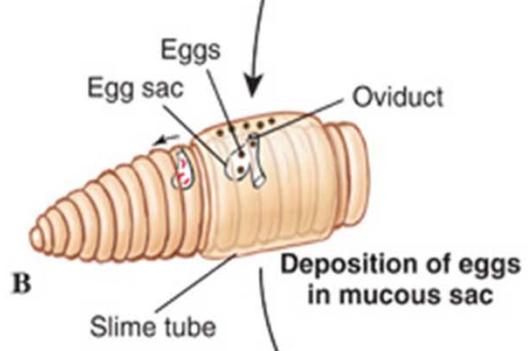


Oligocheti

Riproduzione



Mating earthworms

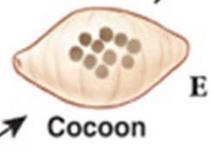
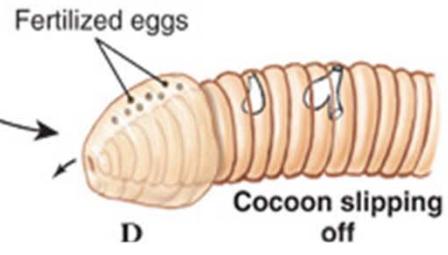
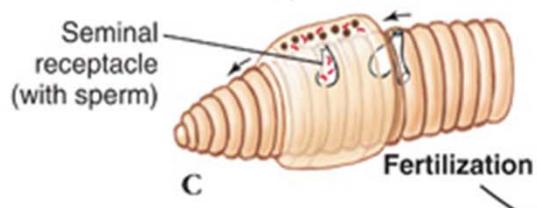


MATING AND REPRODUCTION IN EARTHWORMS

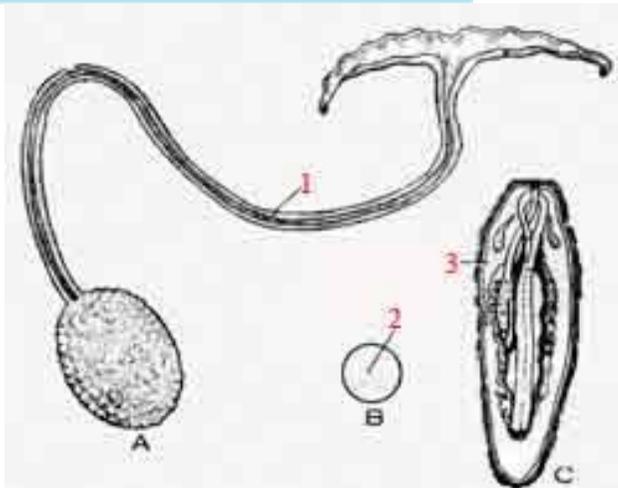
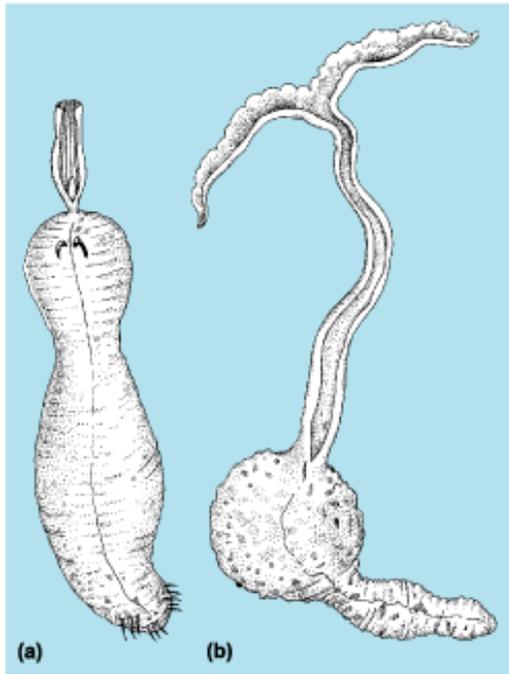


Worm cocoons

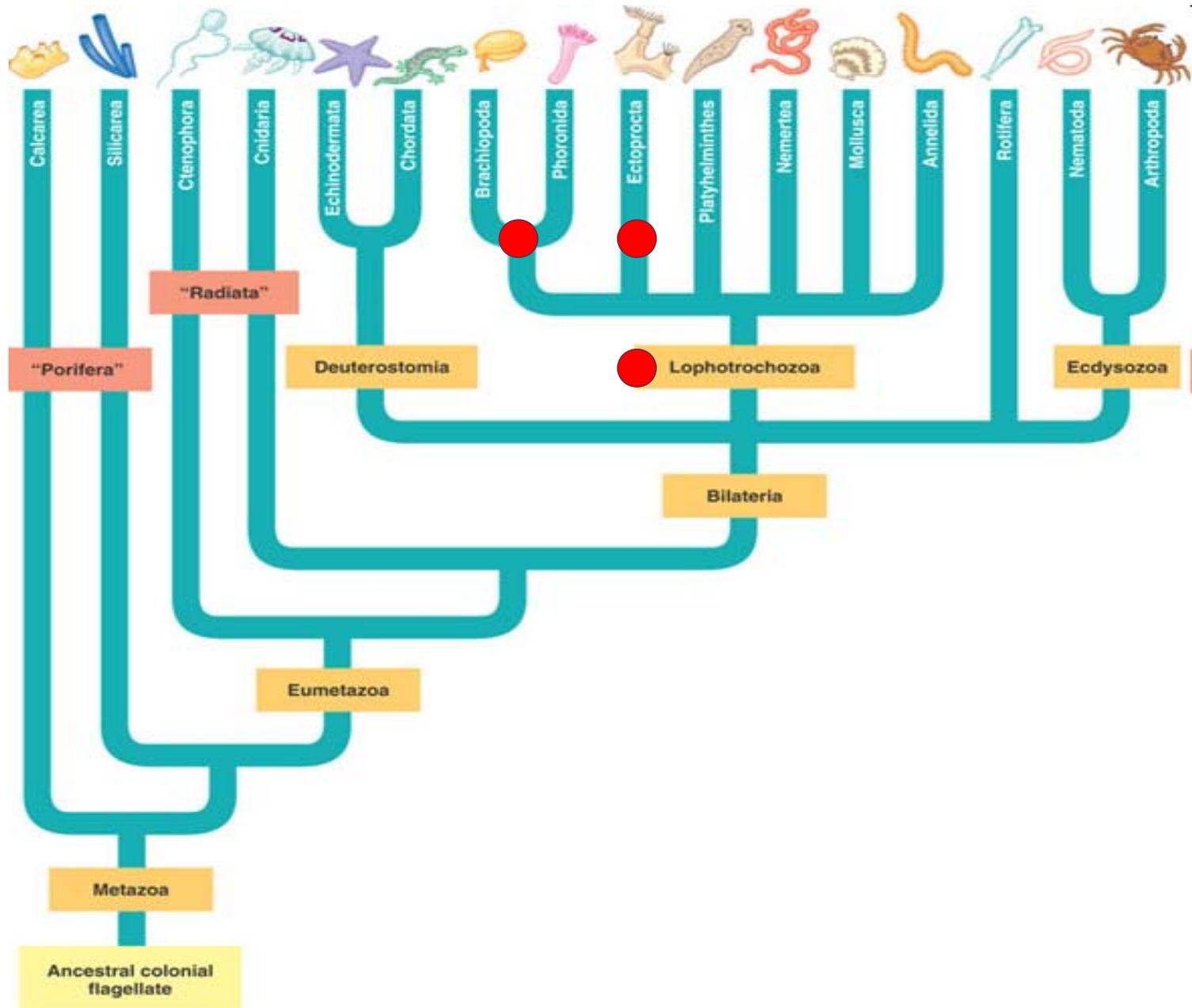
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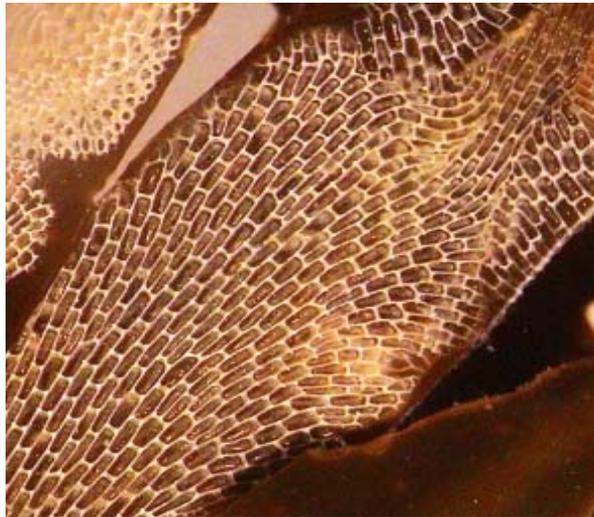
ECHIURA



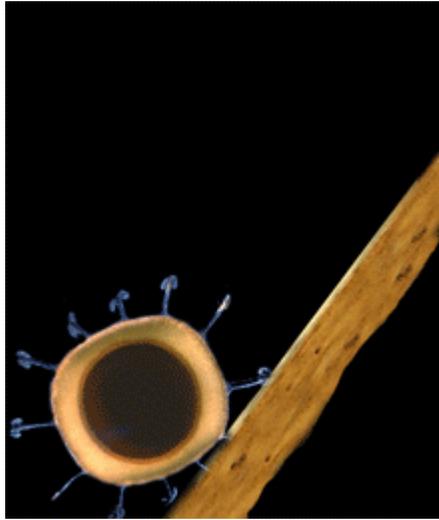
**Determinazione
epigenetica del sesso**

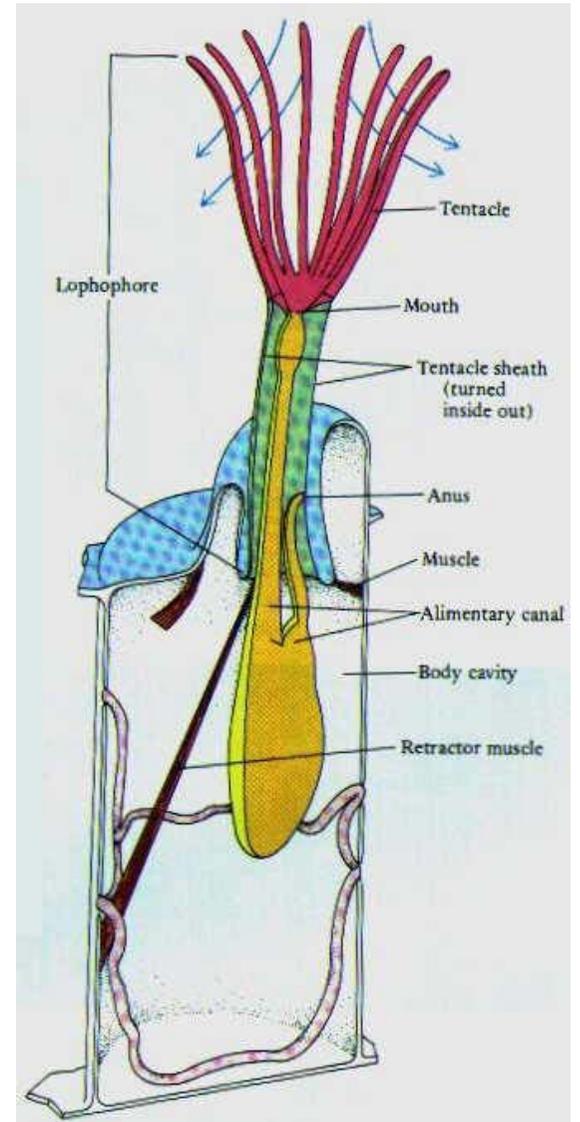
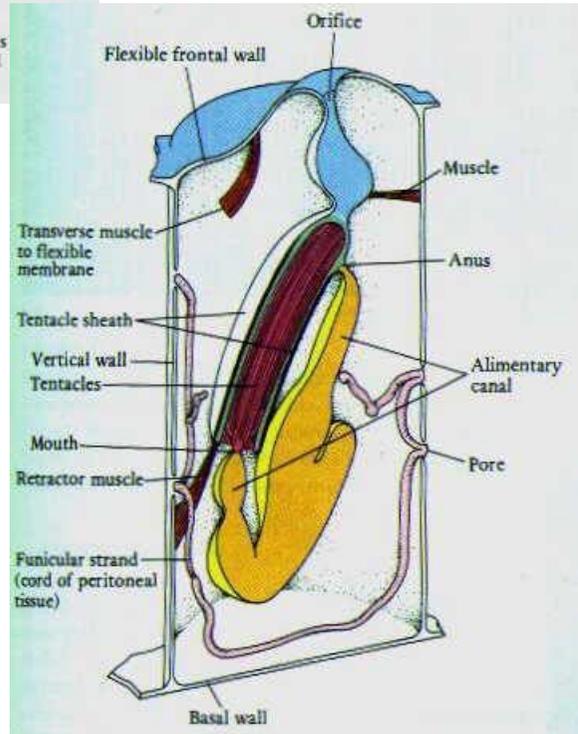
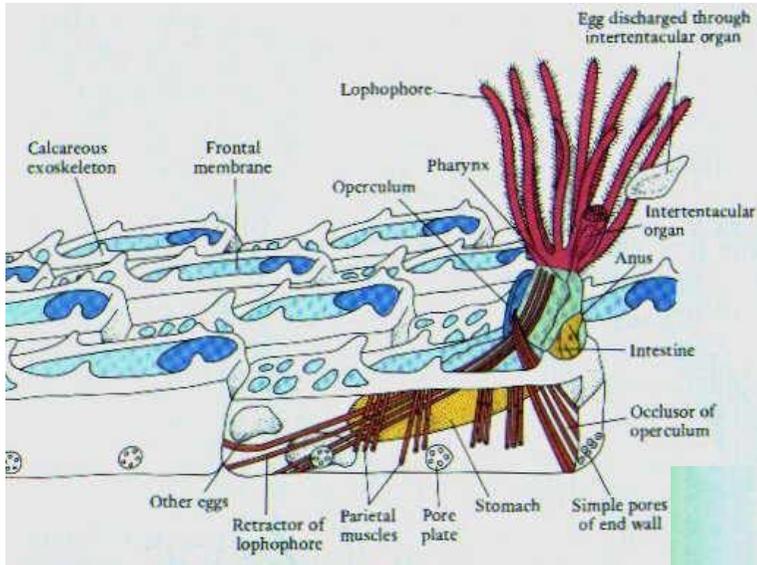


Lofoforati: briozoi, foronidei, brachiopodi

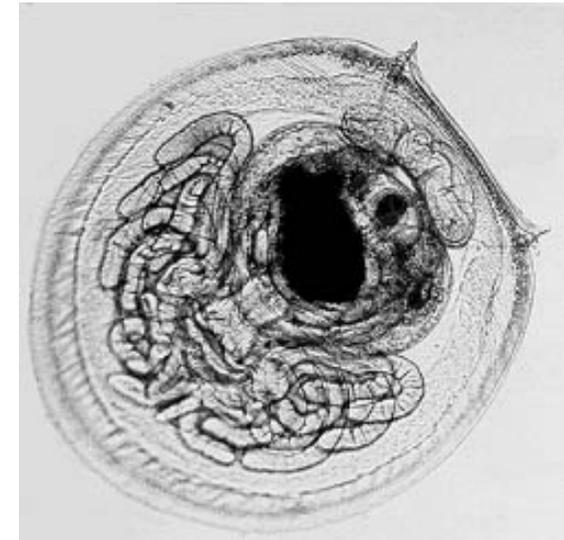
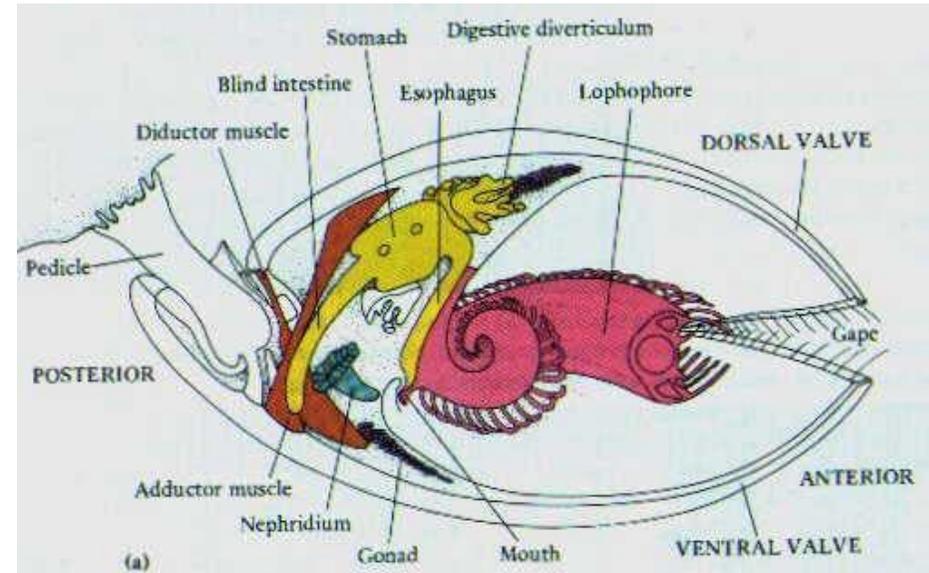


Bryozoa = Ectoprocta

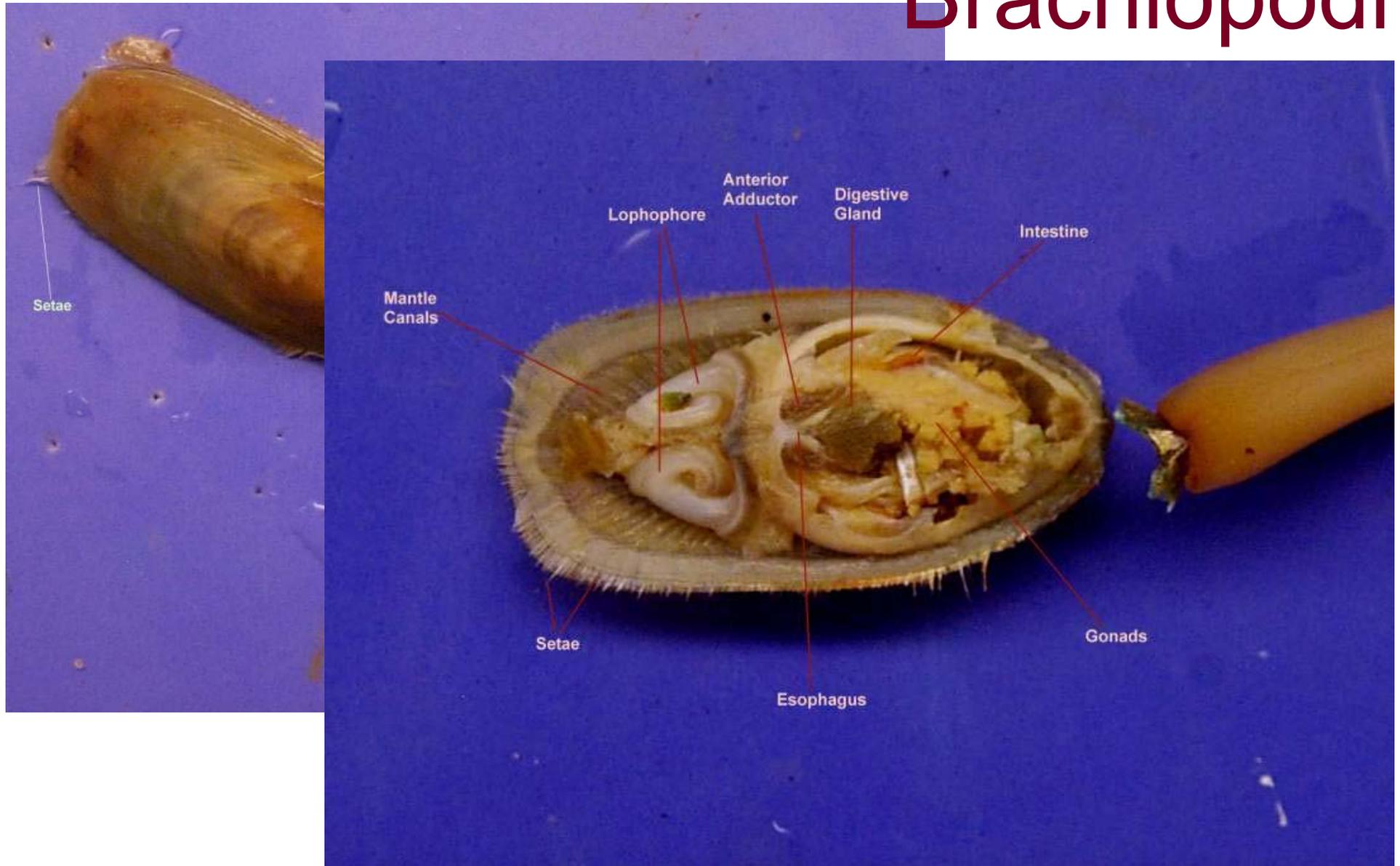


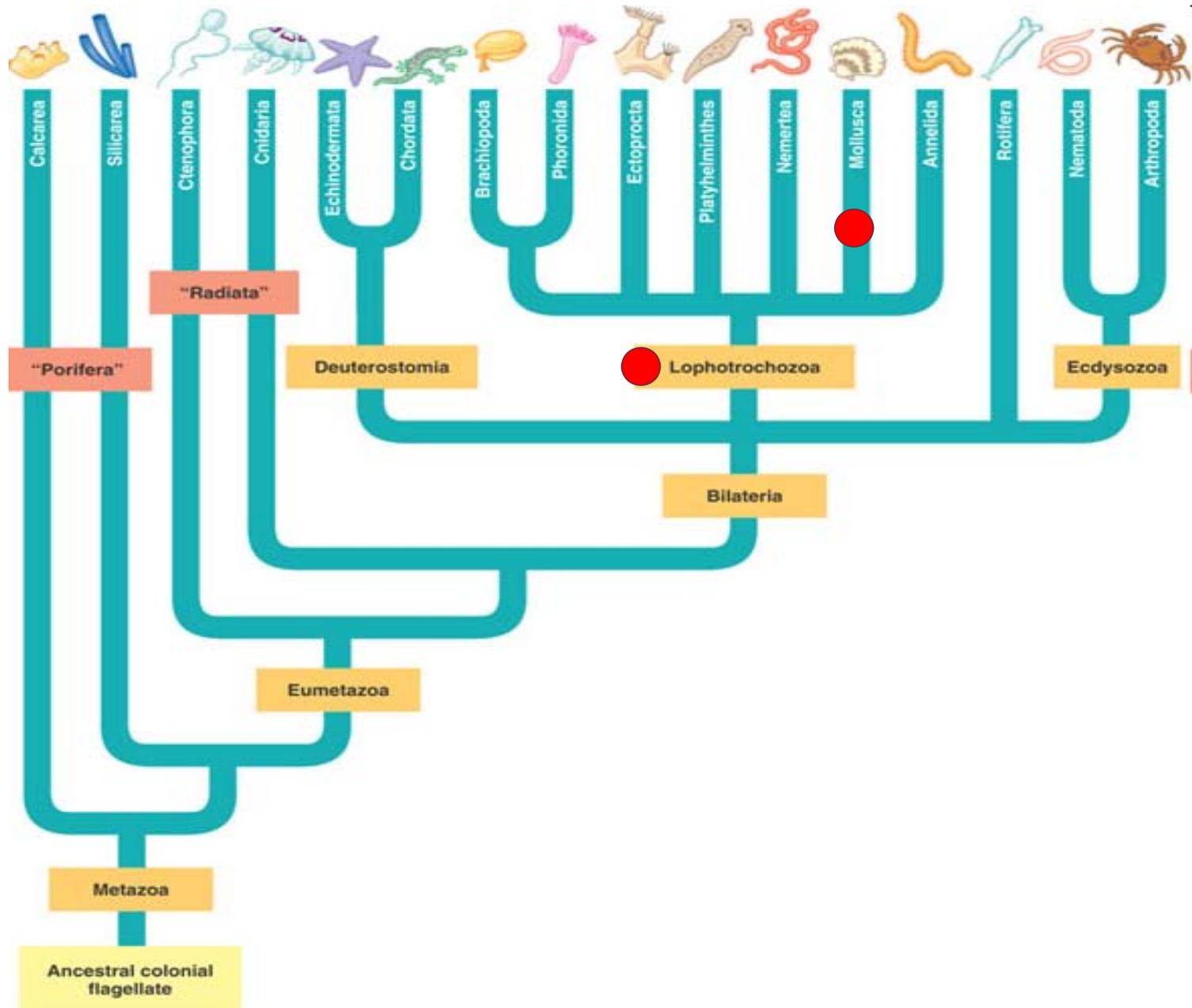


Brachiopodi

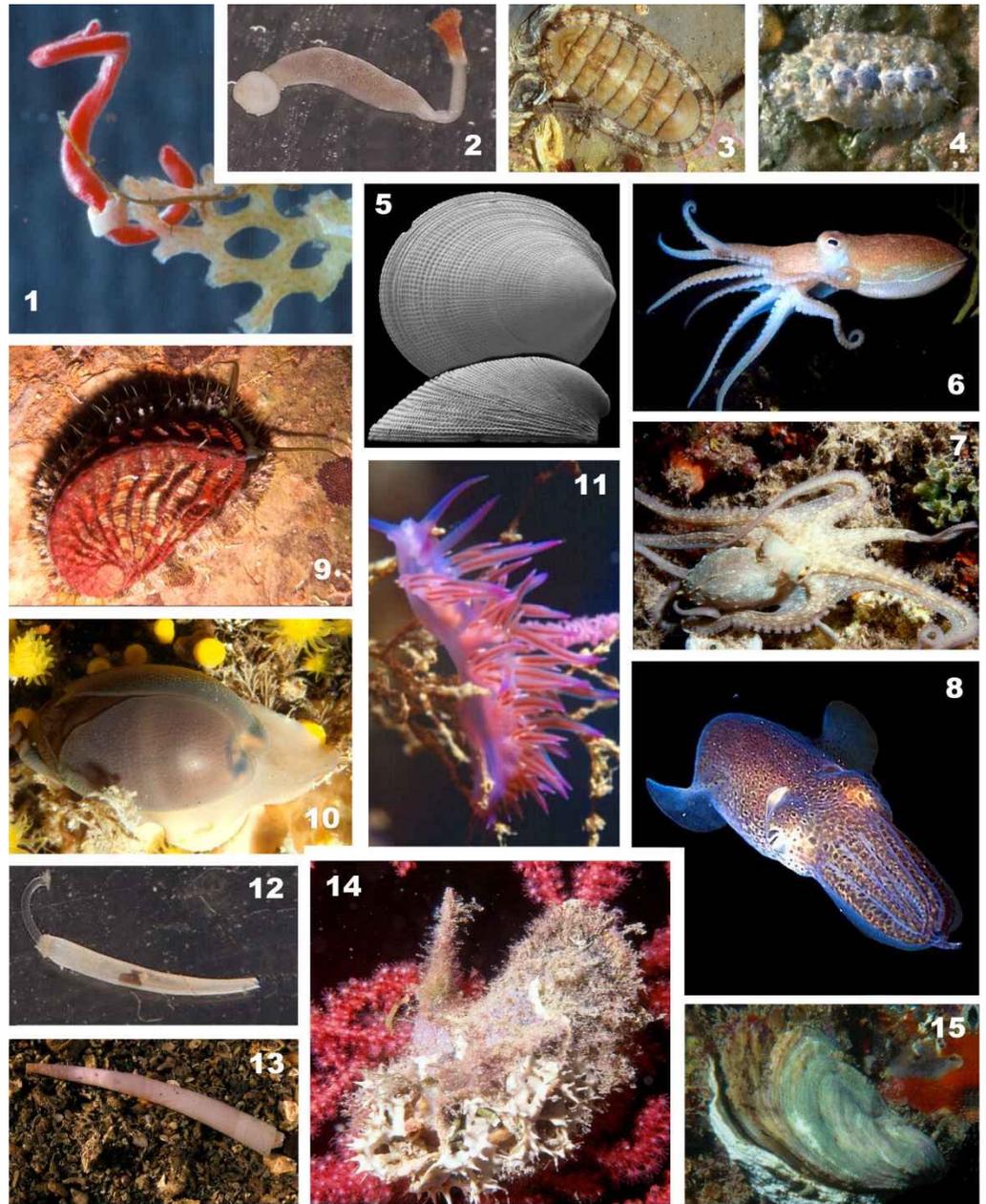


Brachiopodi

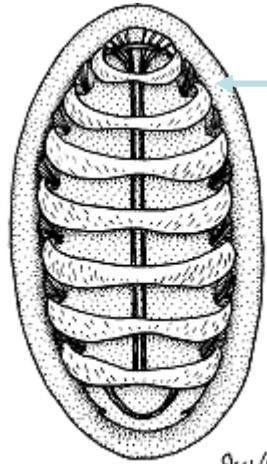




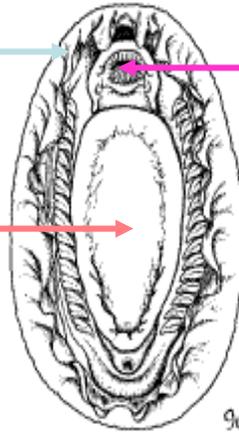
MOLLUSCHI



POLIPLACOFORI



perinoto

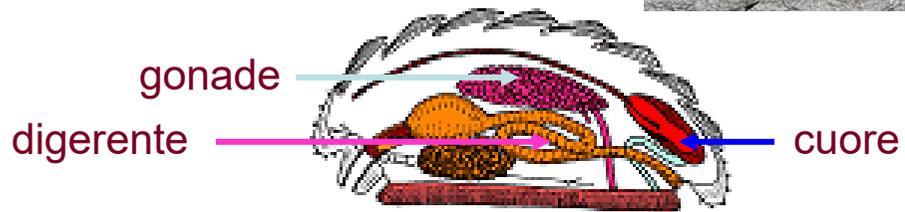


bocca

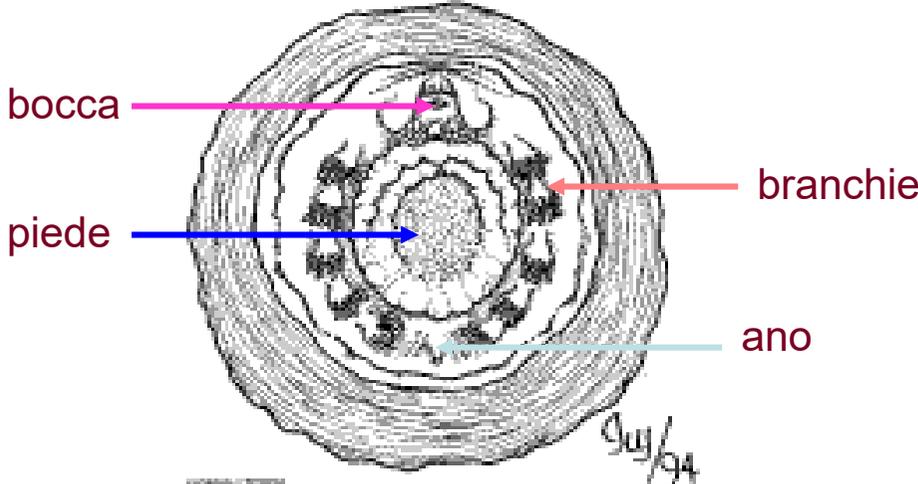
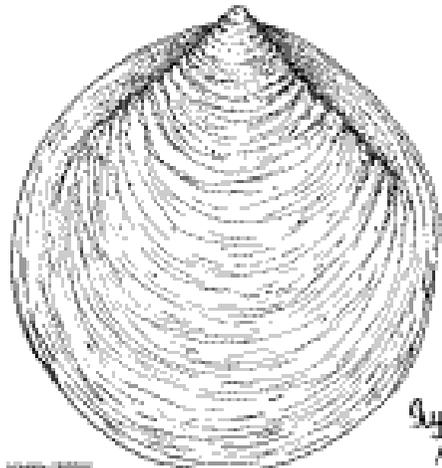
piede



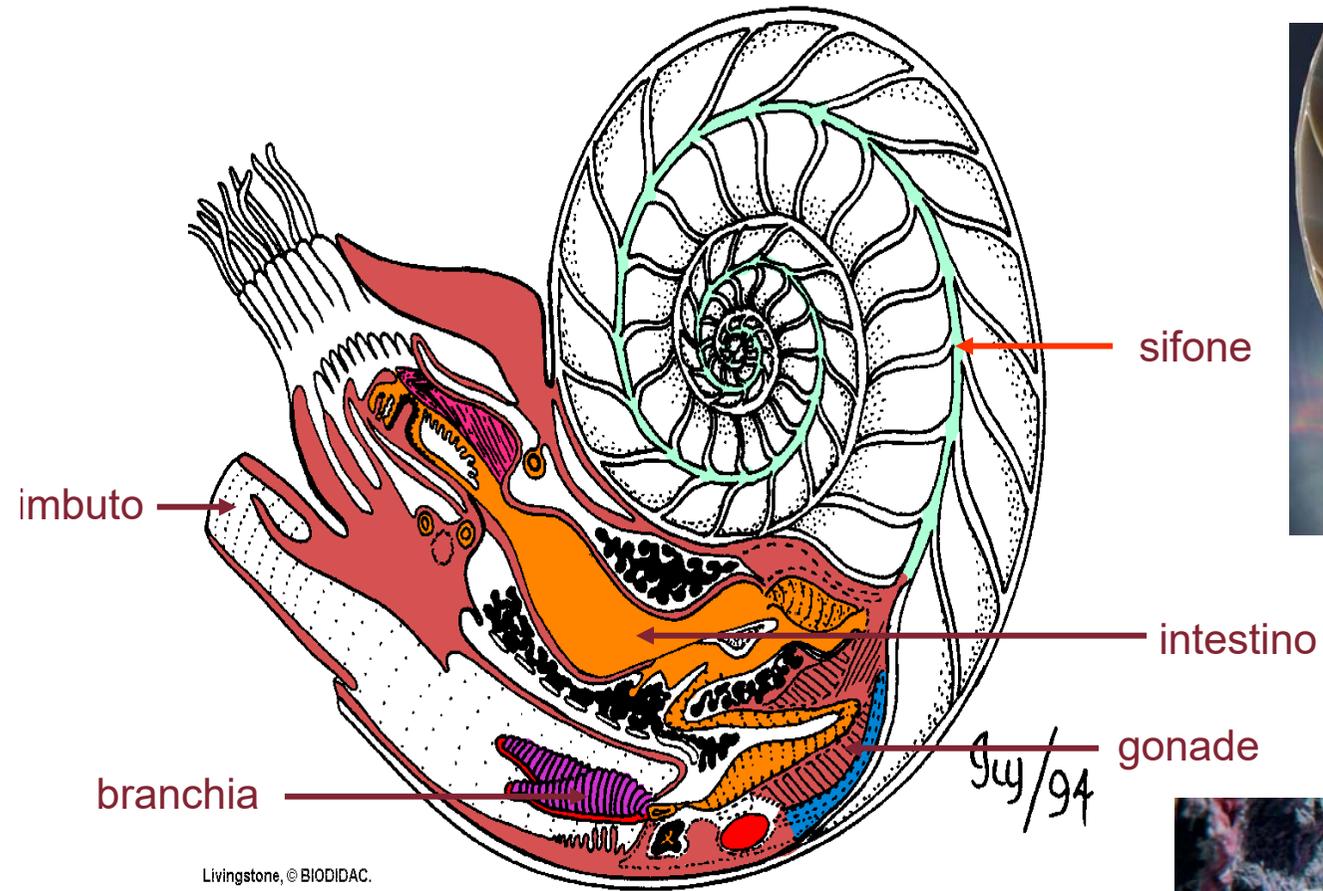
Mopalia lignosa (Gould, 1846)



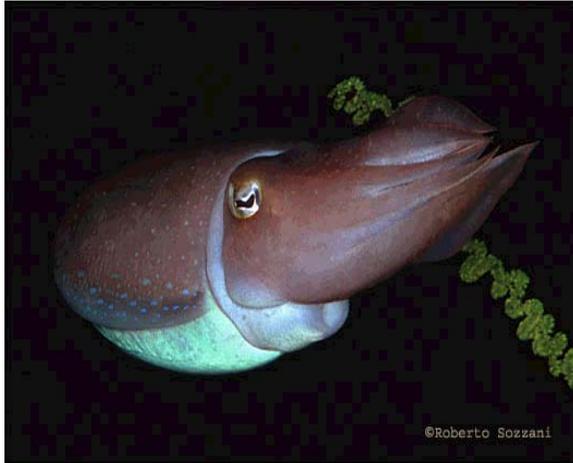
MONOPLACOFORI



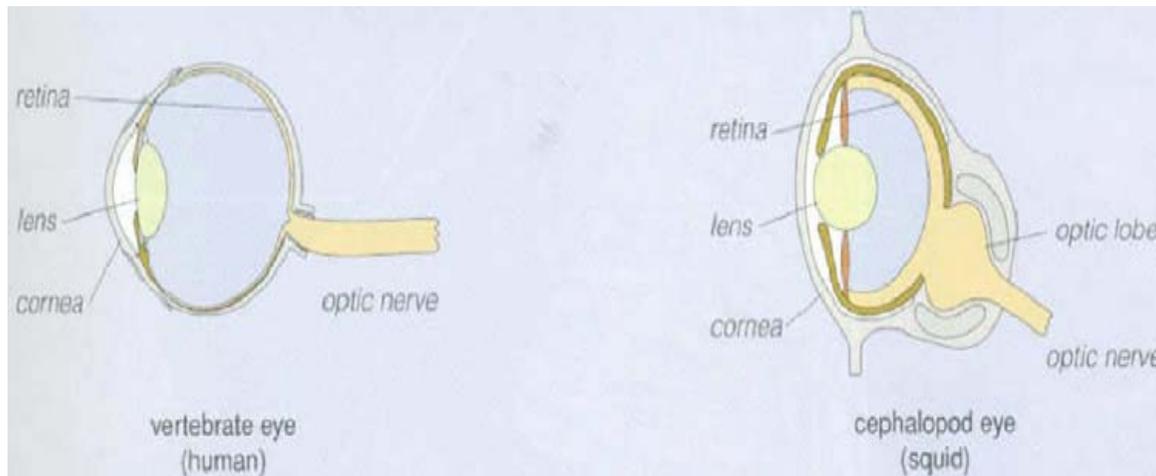
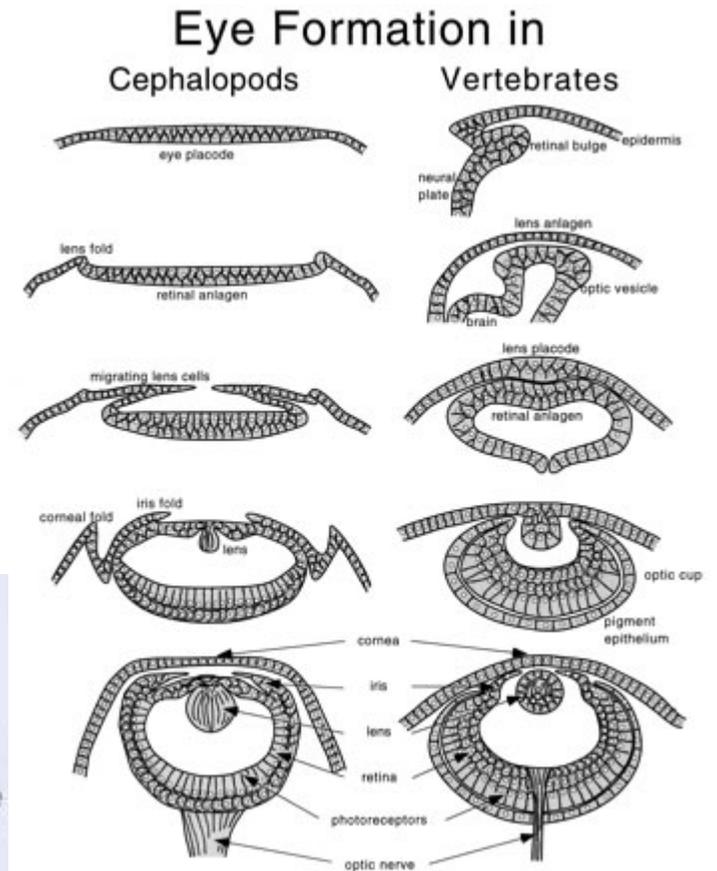
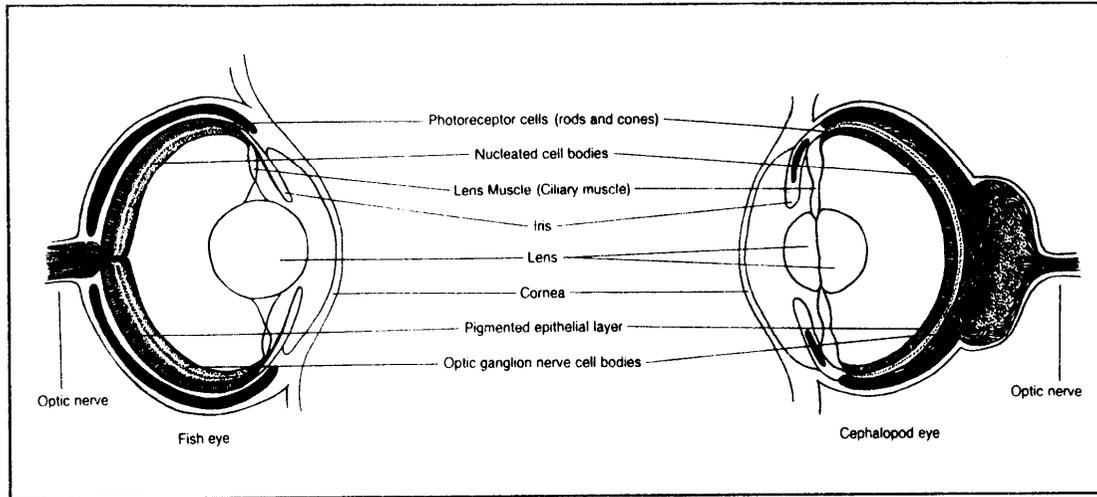
CEFALOPODI



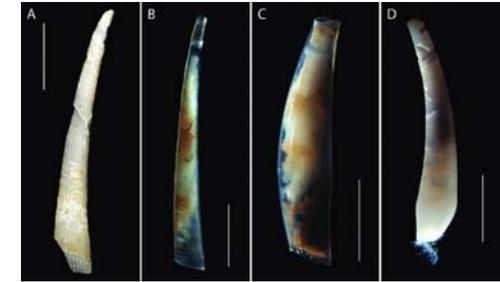
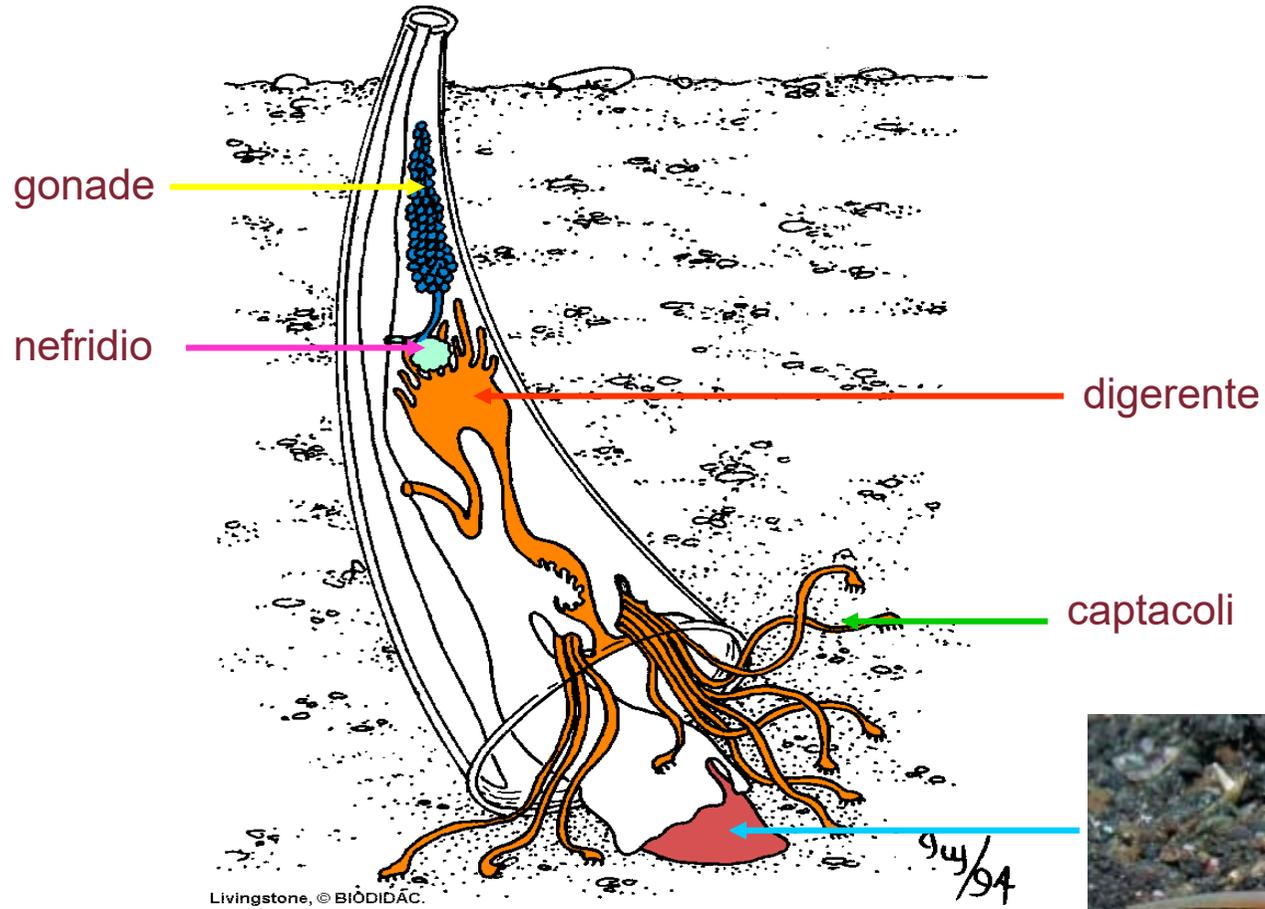
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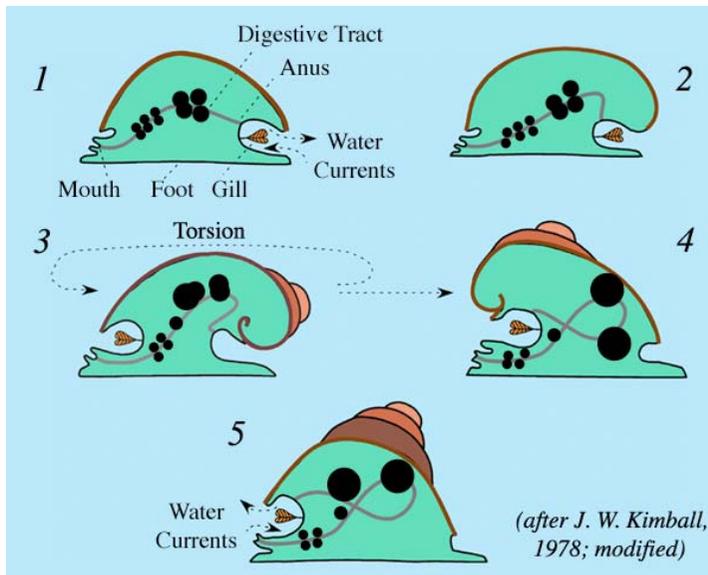
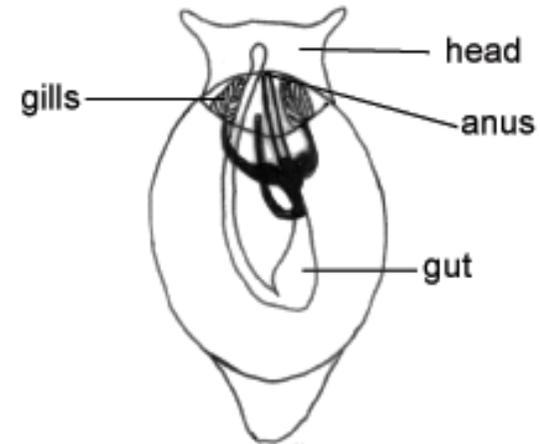
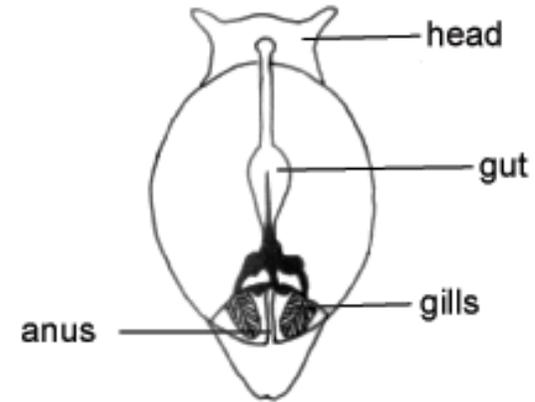
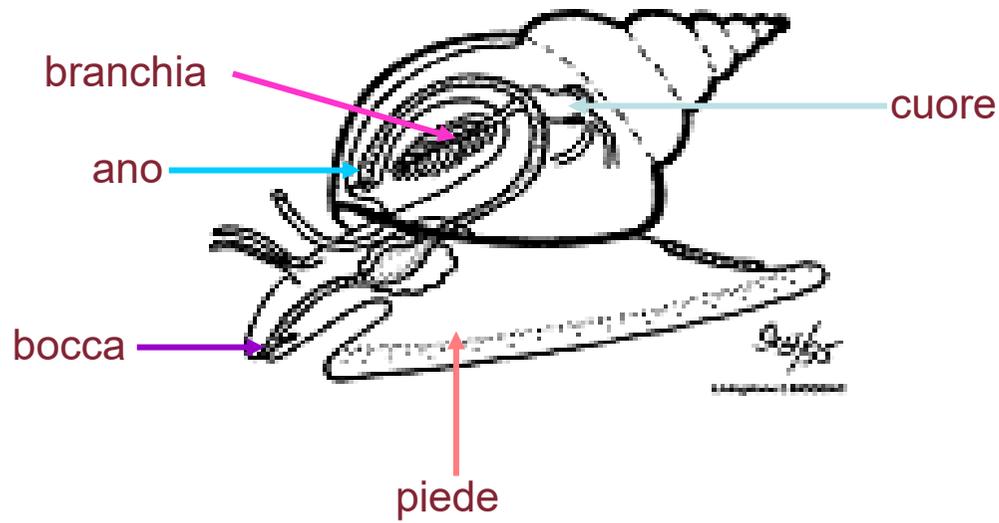
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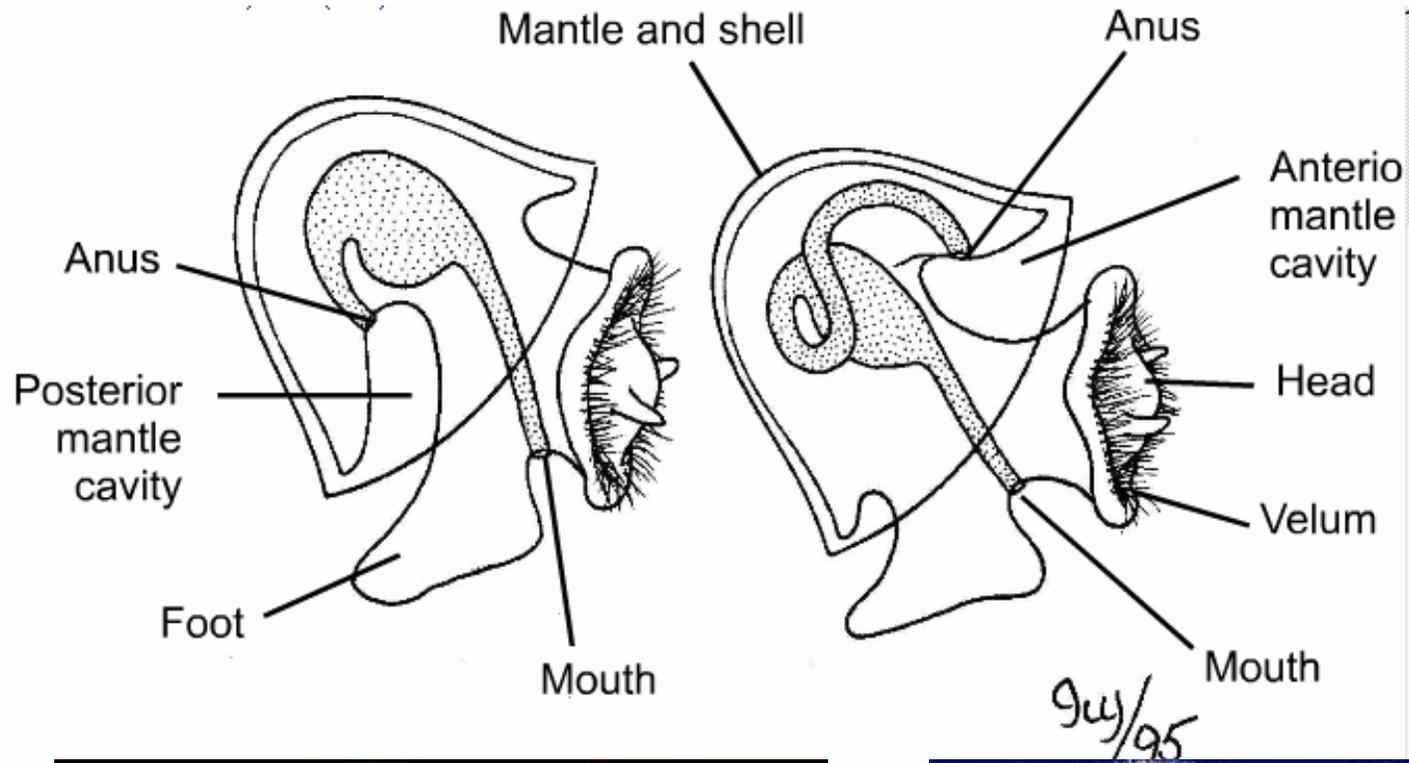
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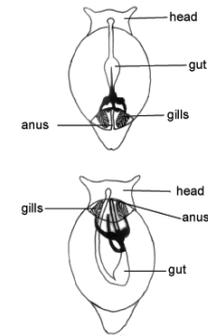
GASTEROPODI



GASTEROPODI

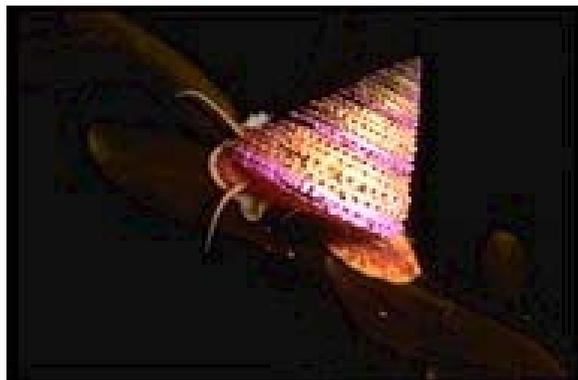


GASTEROPODI



© George Sangioulglou

Pleurotomaria gotoi H 37,5 mm. W 40,3 mm.



© In-Depth Images Kurajalein



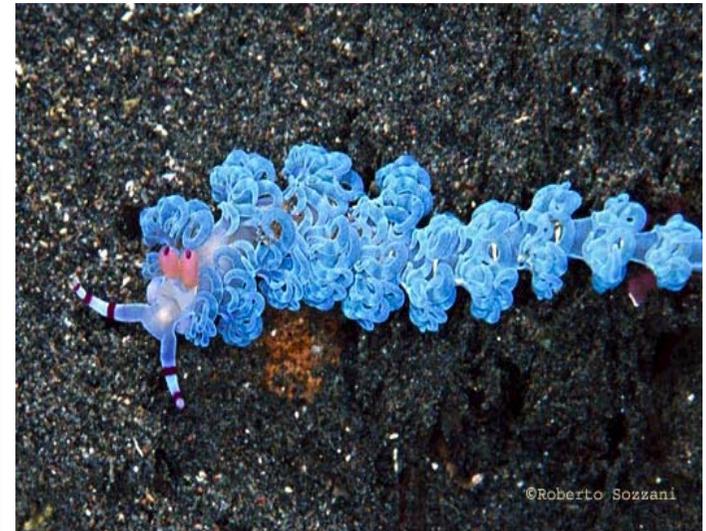
©Roberto Sozzani



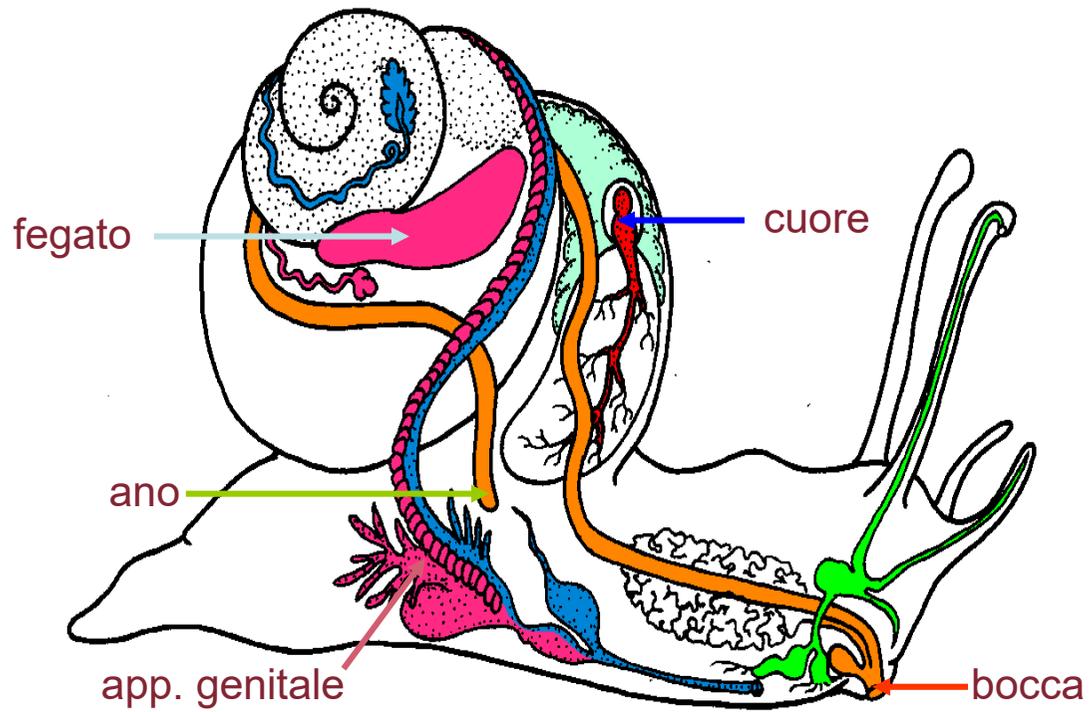
GASTEROPODI



GASTEROPODI



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9/4/95





Bauplan

Compressione laterale

Assenza di radula e
(primitivamente) di occhi

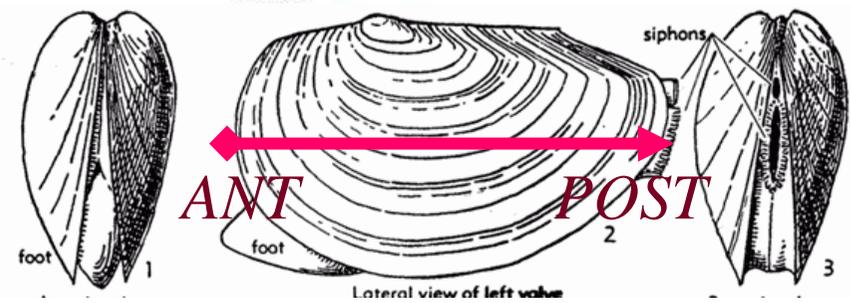
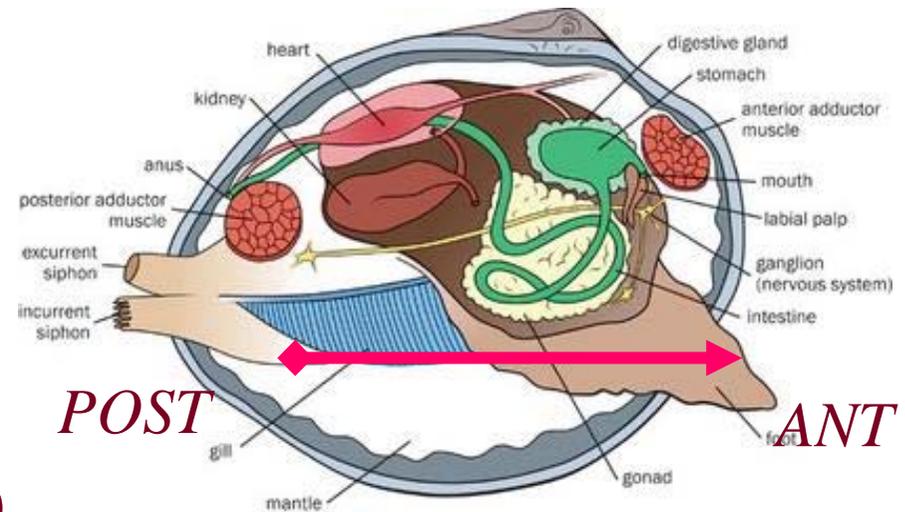
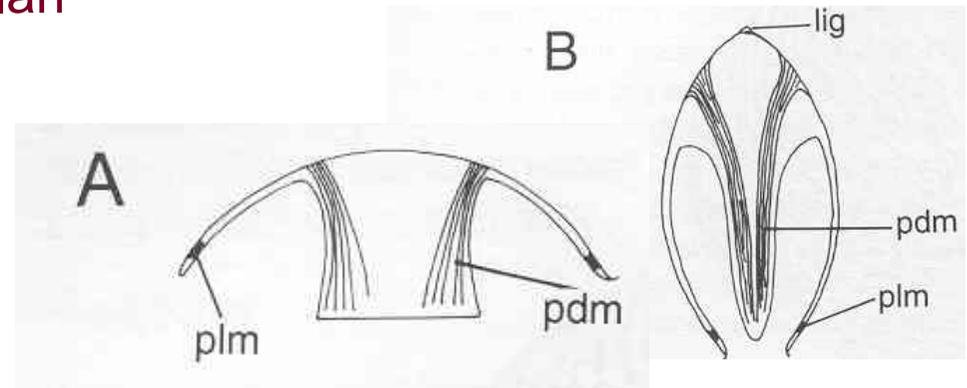
1 paio di ctenidi/branchie grandi,
primitivamente piccoli e bipettinati

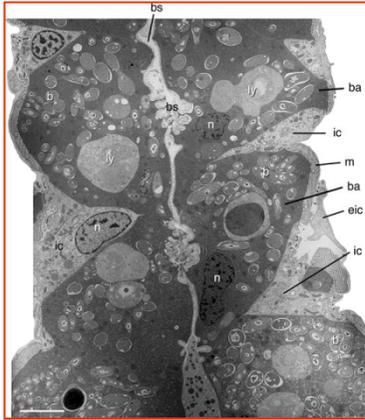
palpi labiali

margini posteriori del mantello
spesso fusi (a formare sifoni)

microfagi o depositori(primitivamente)
sospensivori/filtratori

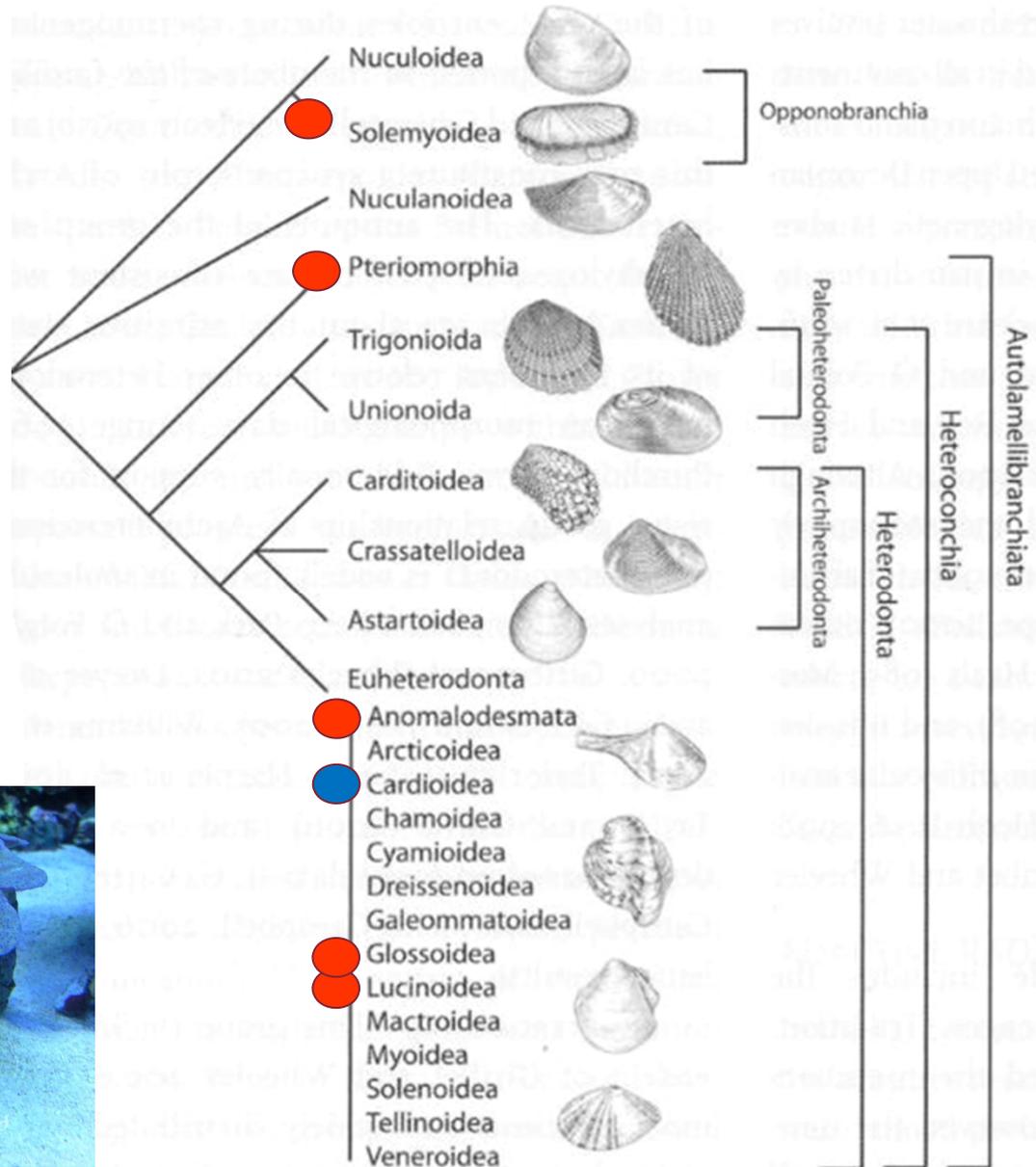
circa 20 000 specie viventi





● Symbiotic chemosynthetic bacteria

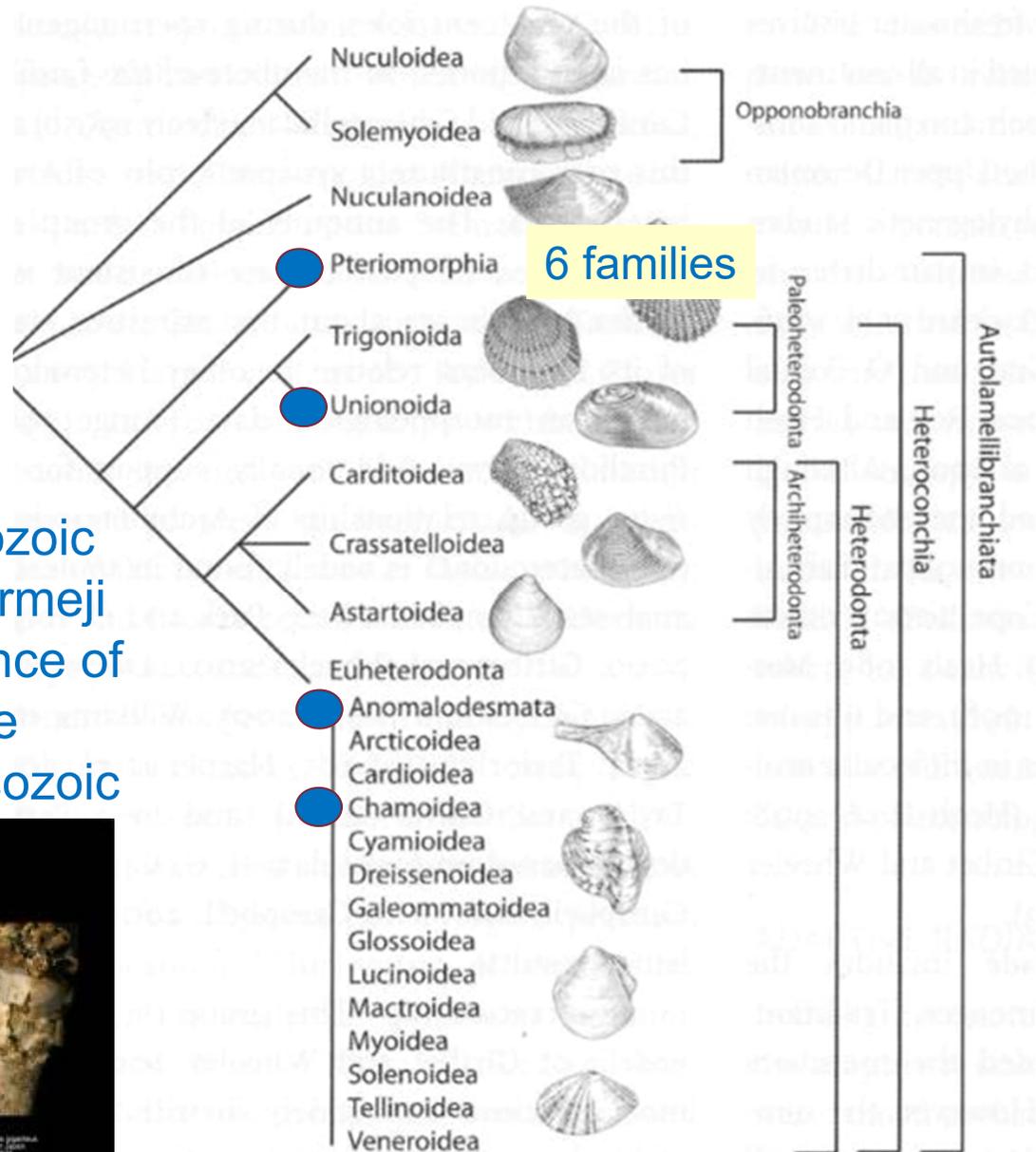
● Symbiotic zoozanthellae

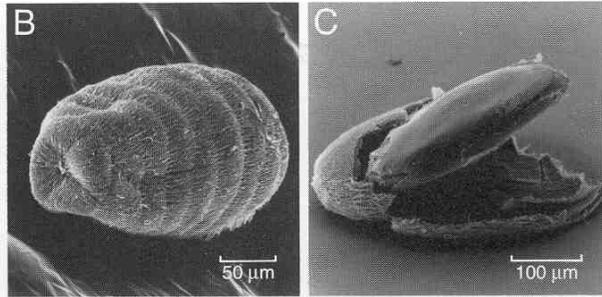




● Cementation

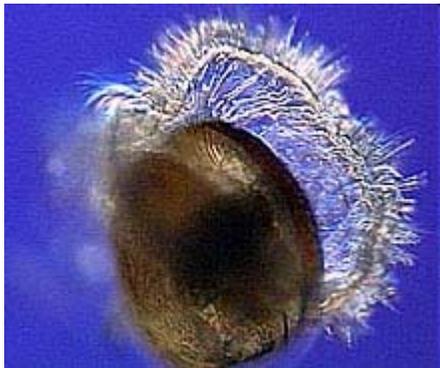
Response to the Mesozoic Marine Revolution (Vermeji 1977), or the appearance of many predatory marine groups during the Mesozoic (Harper 1991).



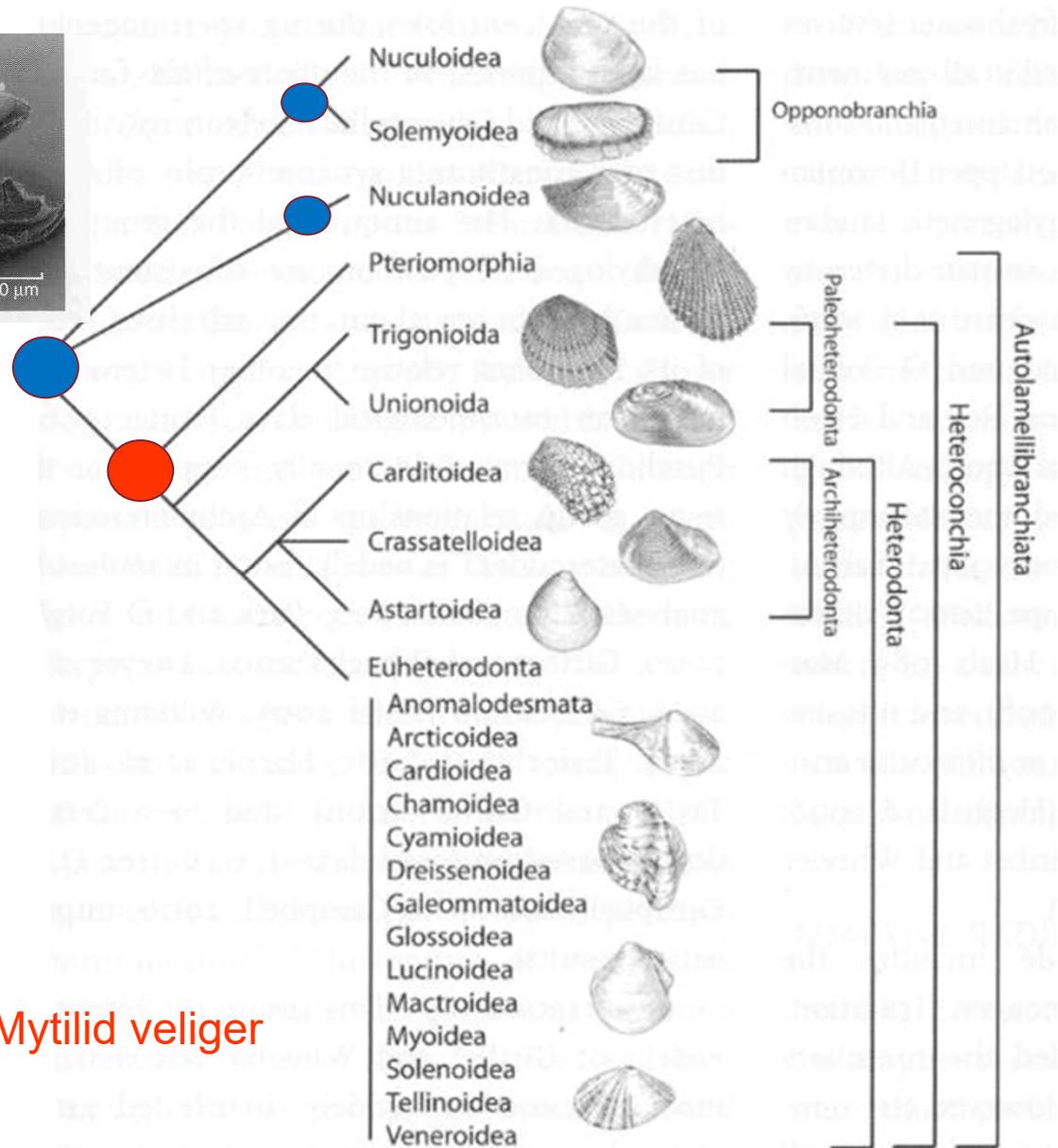


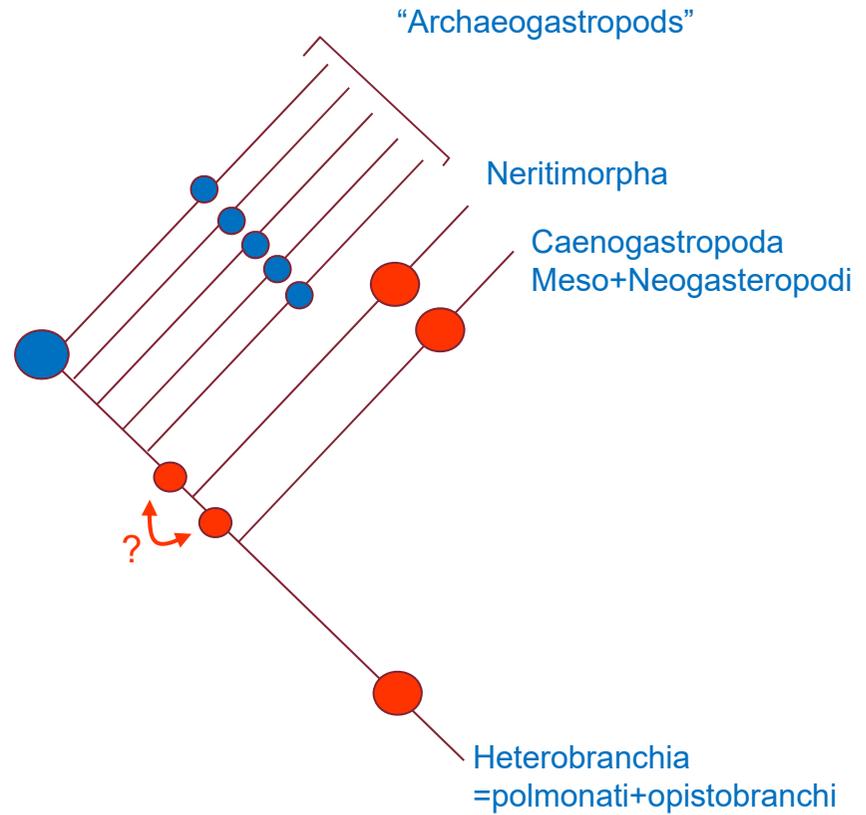
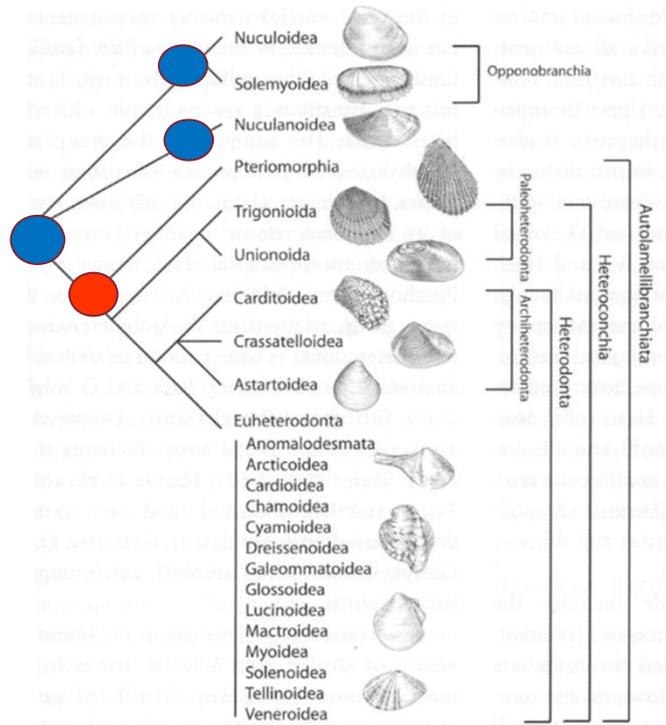
Solemyid pericalymna

- Lecithotrophic pelagic development
- Planktotrophic development



Mytilid veliger

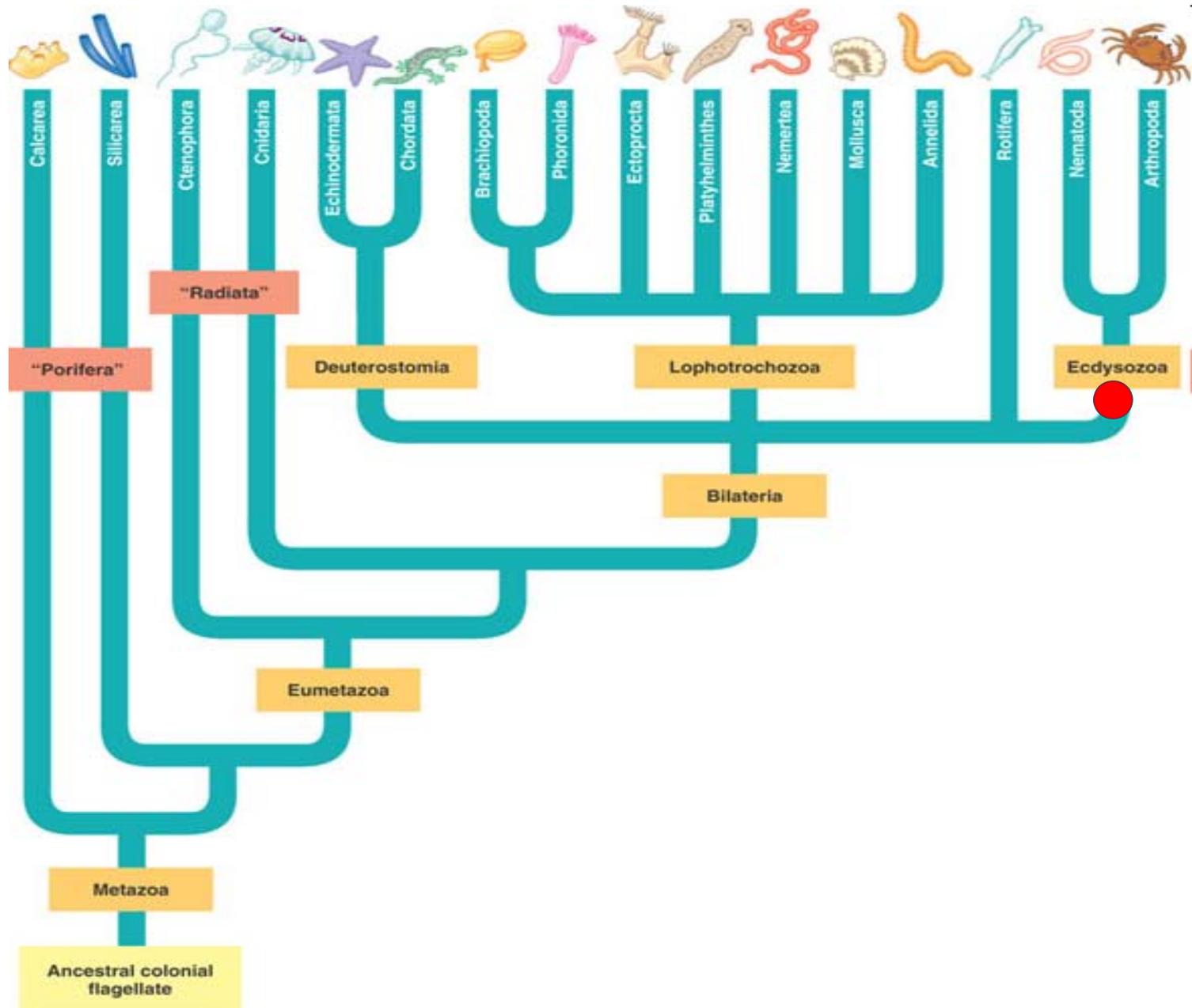




● Lecithotrophic

● Planktotrophic

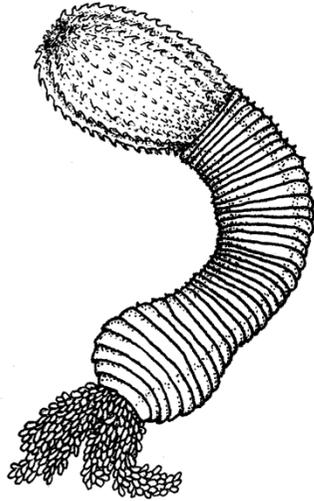




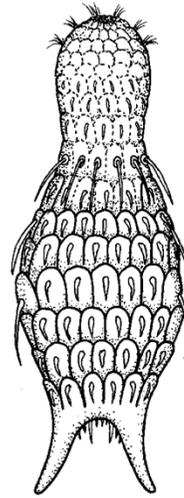
Nematodi



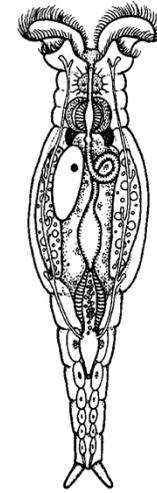
Priapulidi



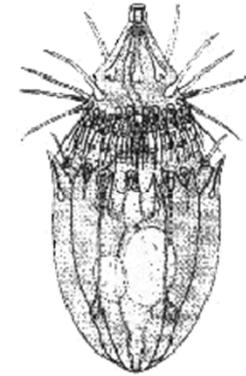
Gastrotrichi



Rotiferi



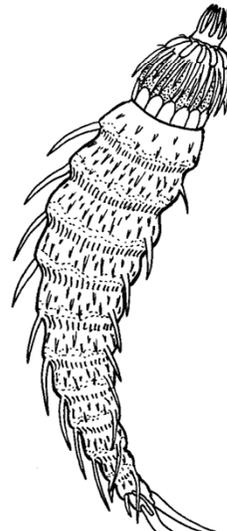
Loriciferi



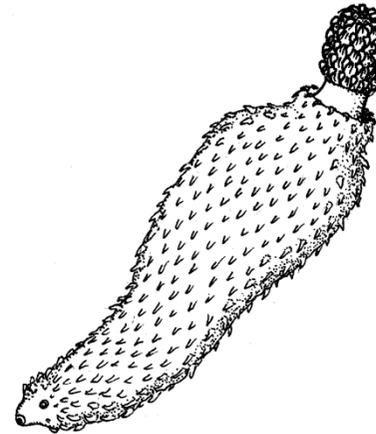
Nematomorfi



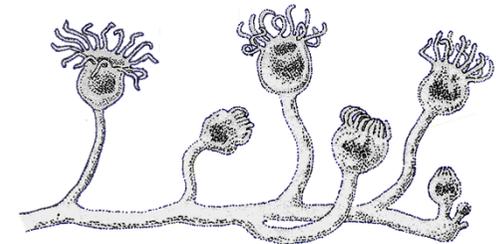
Chinorinchi

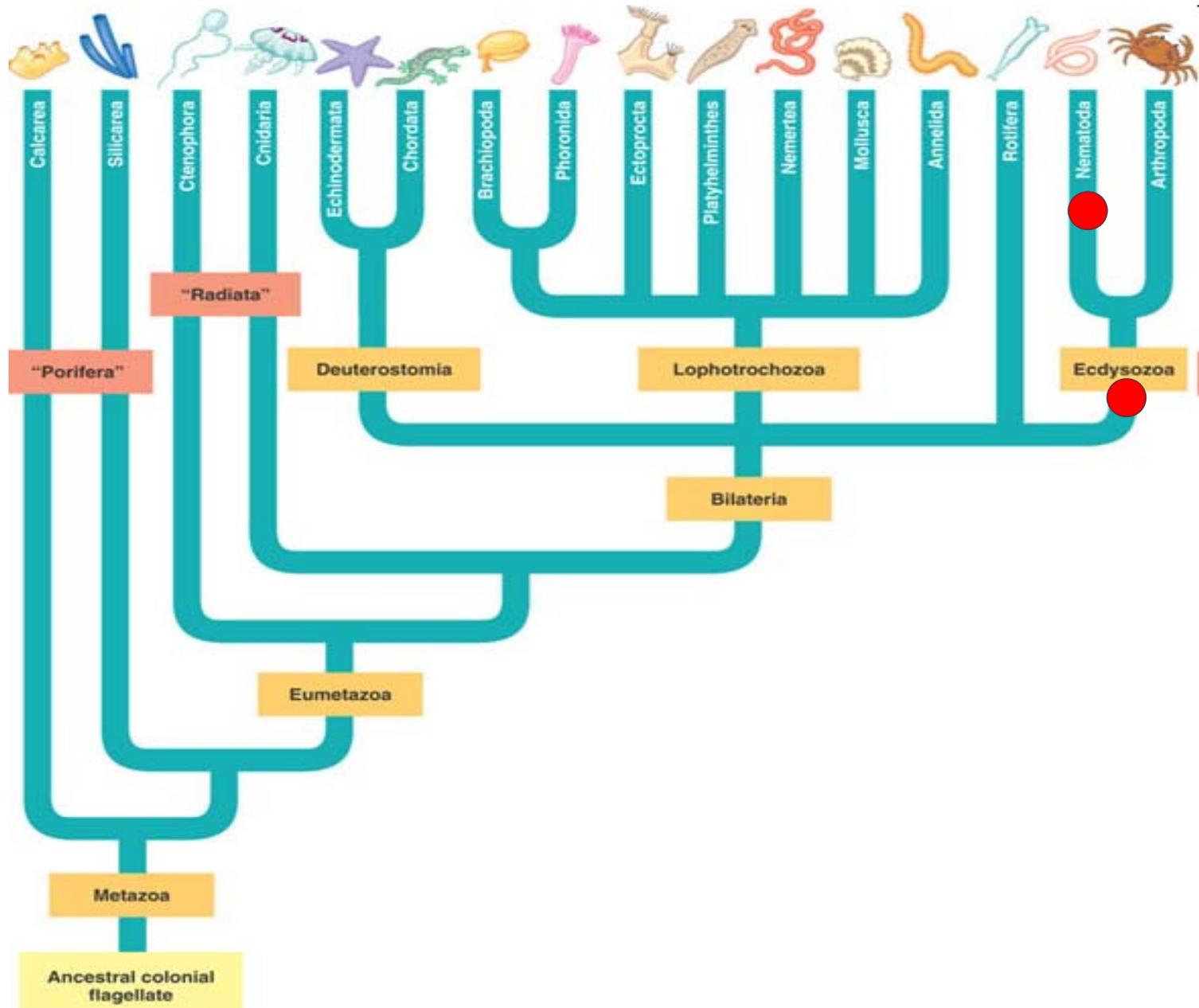


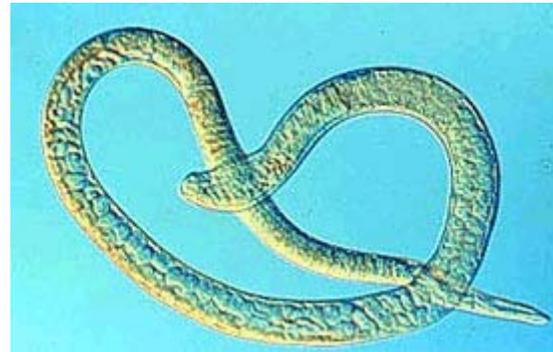
Acantocefali



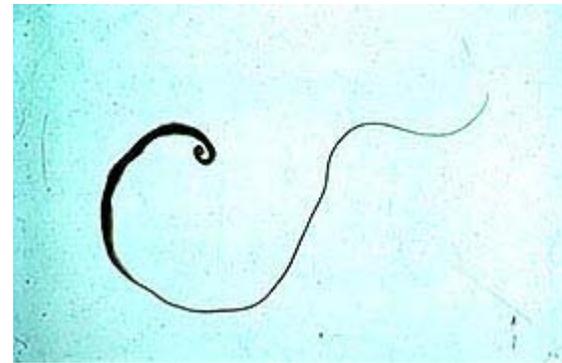
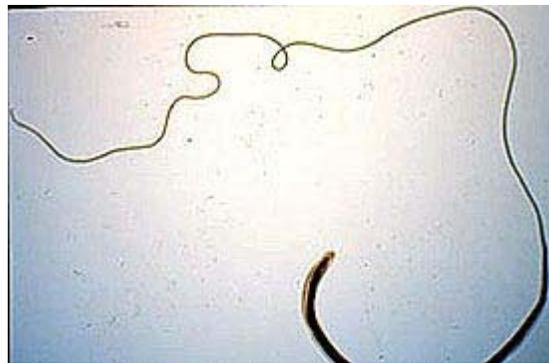
Endoprotti

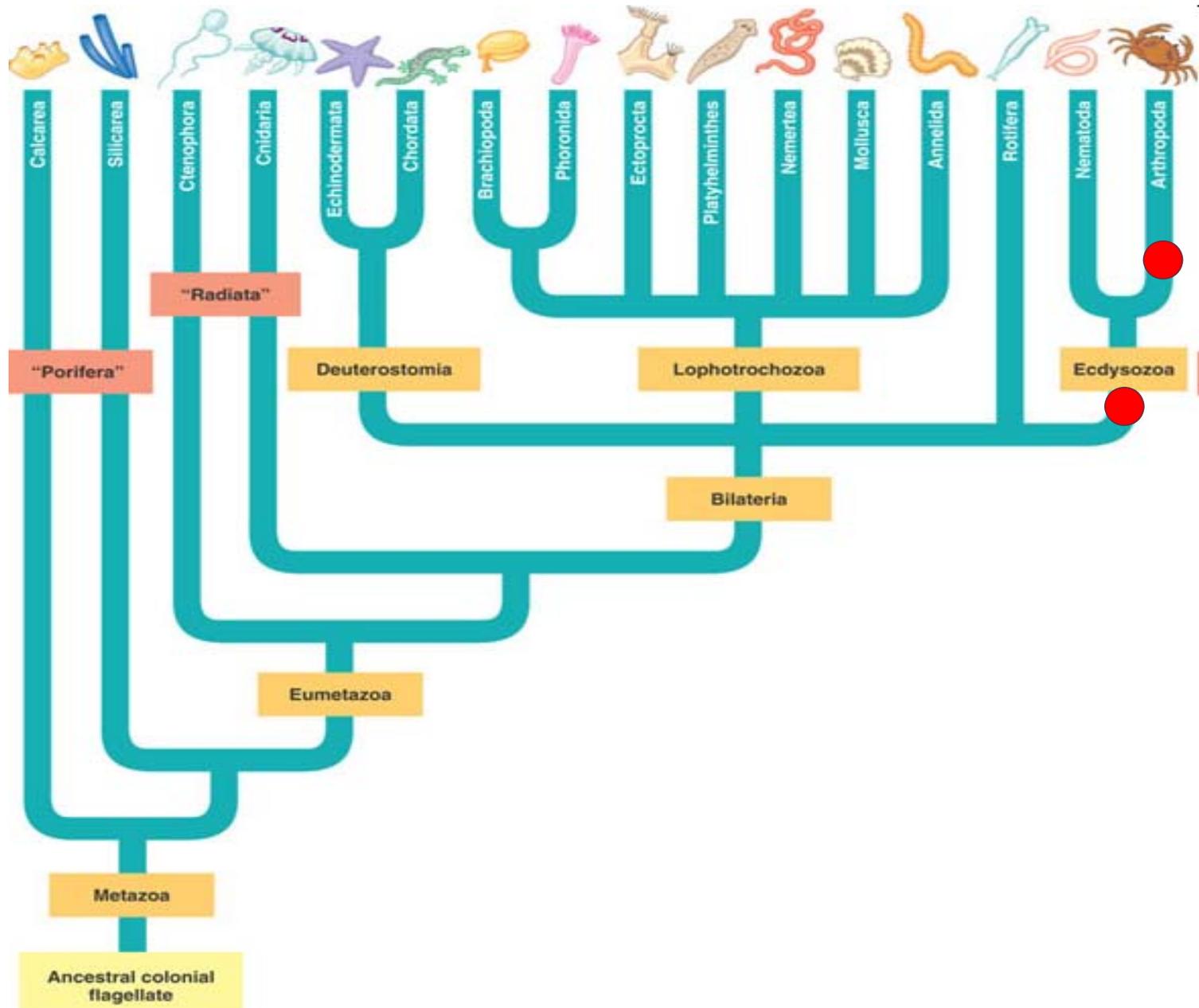






Nematodi



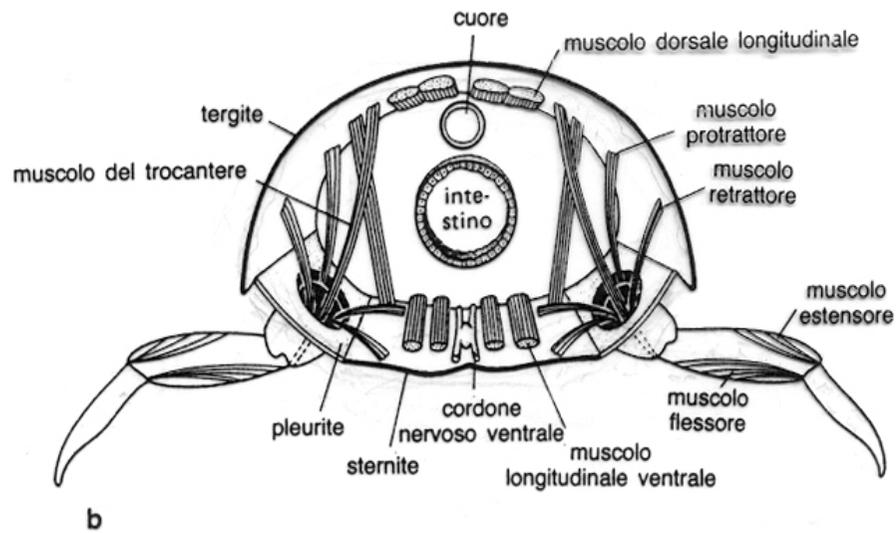
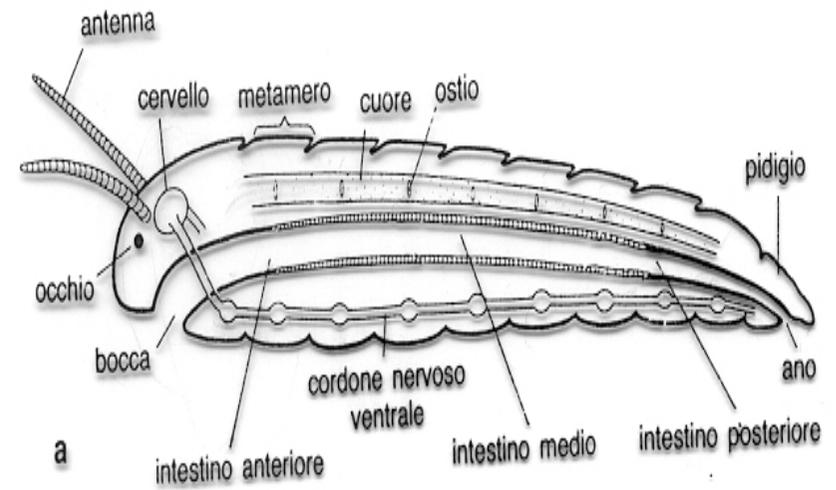


Artropodi:

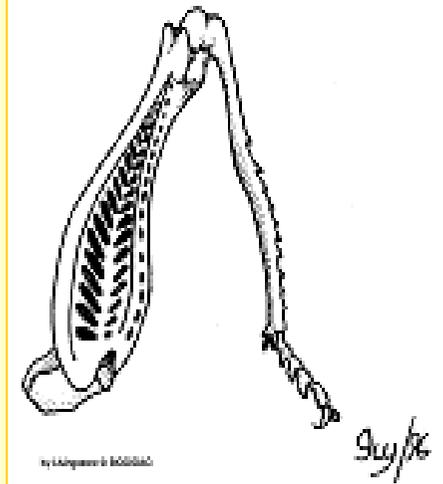
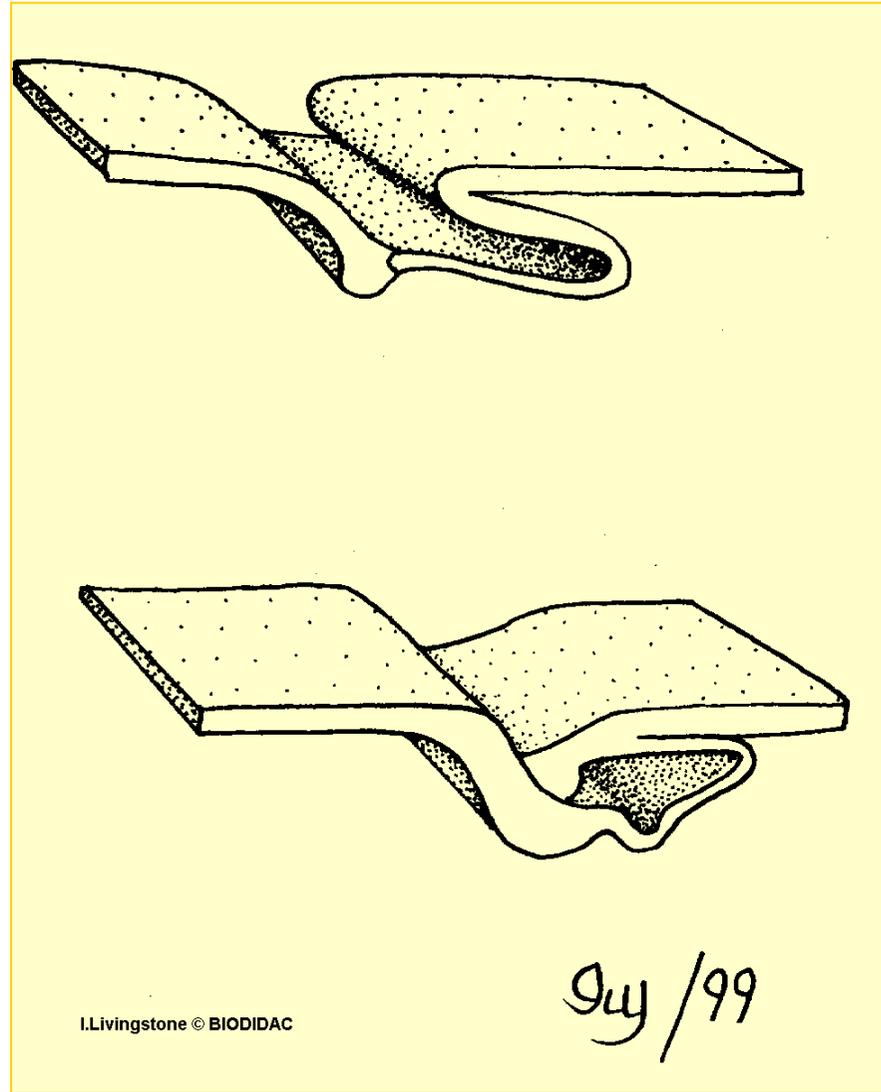
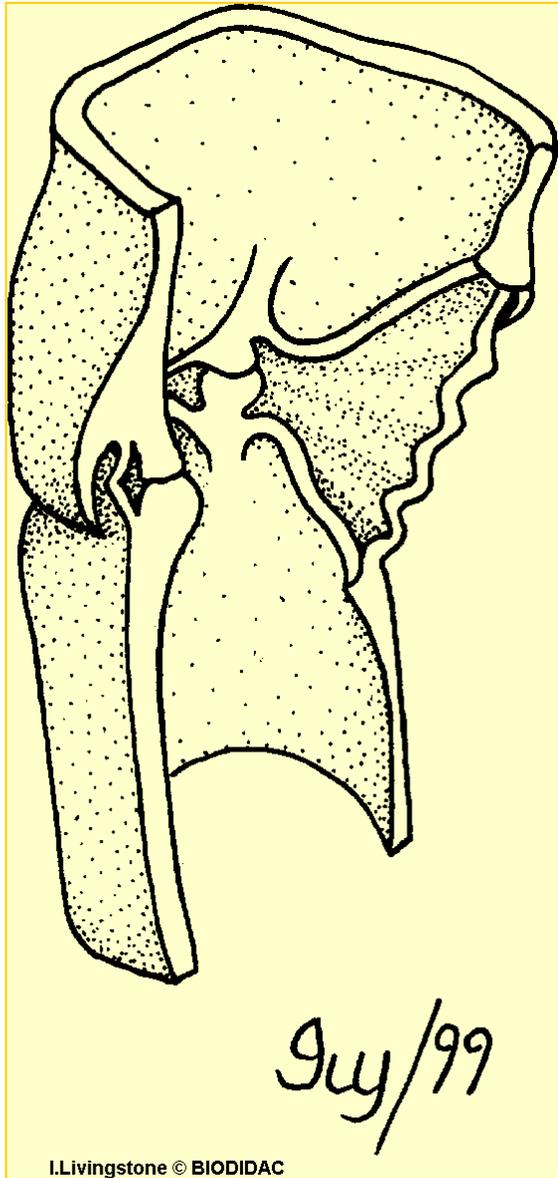
Chelicerati, Crostacei,
Insetti etc....



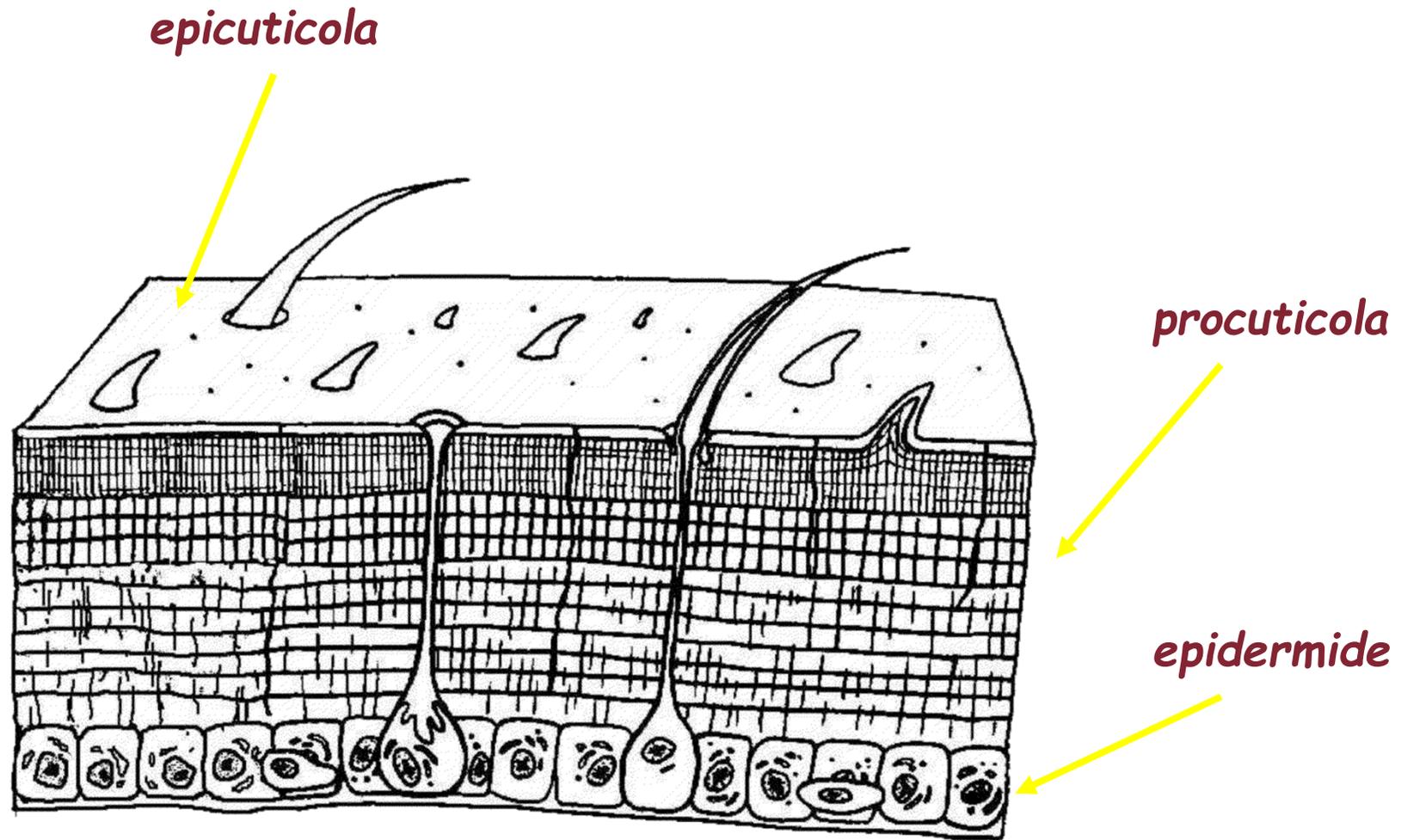
STRUTTURA



ARTICOLAZIONI



CUTICOLA



"Artropodi":

Chelicerati

Crostacei

Miriapodi

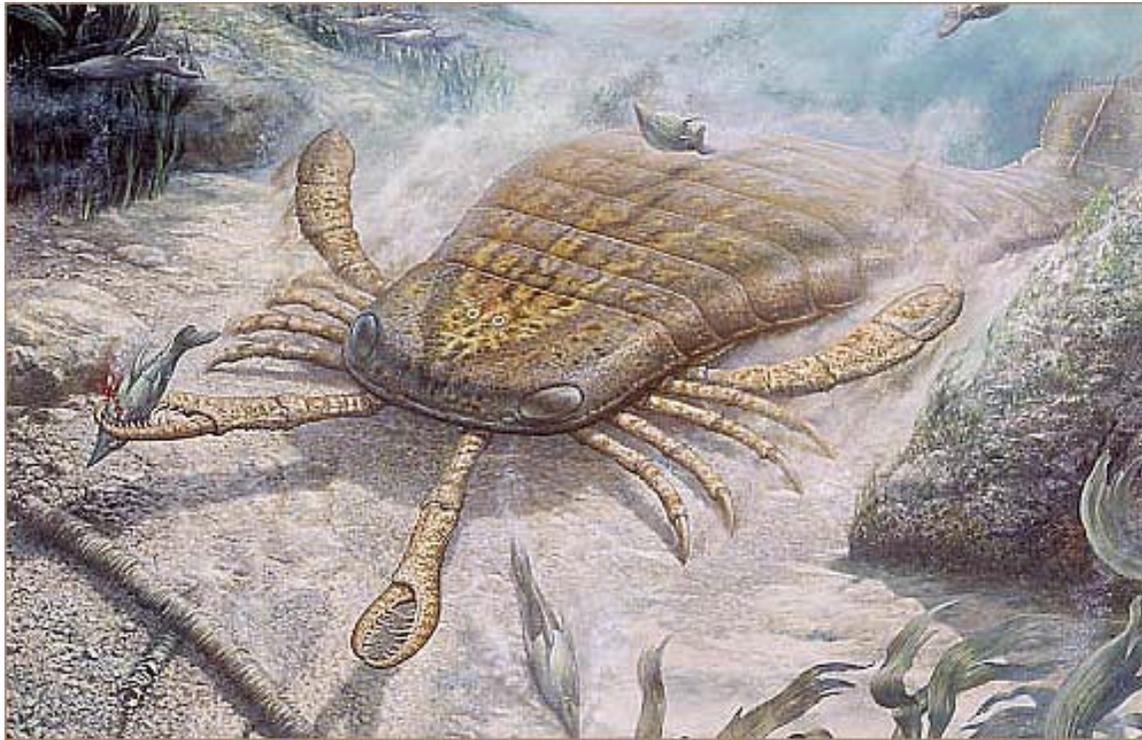
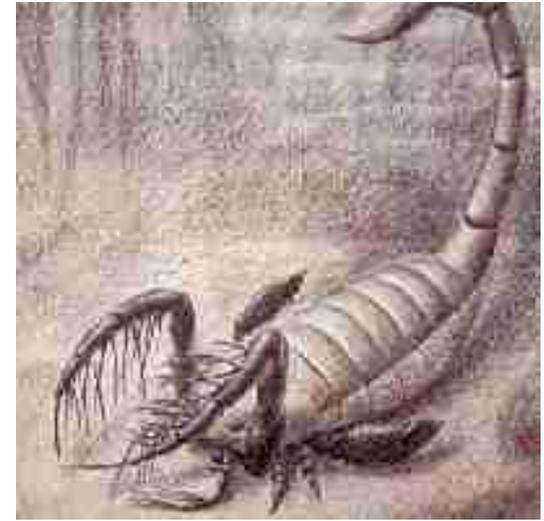
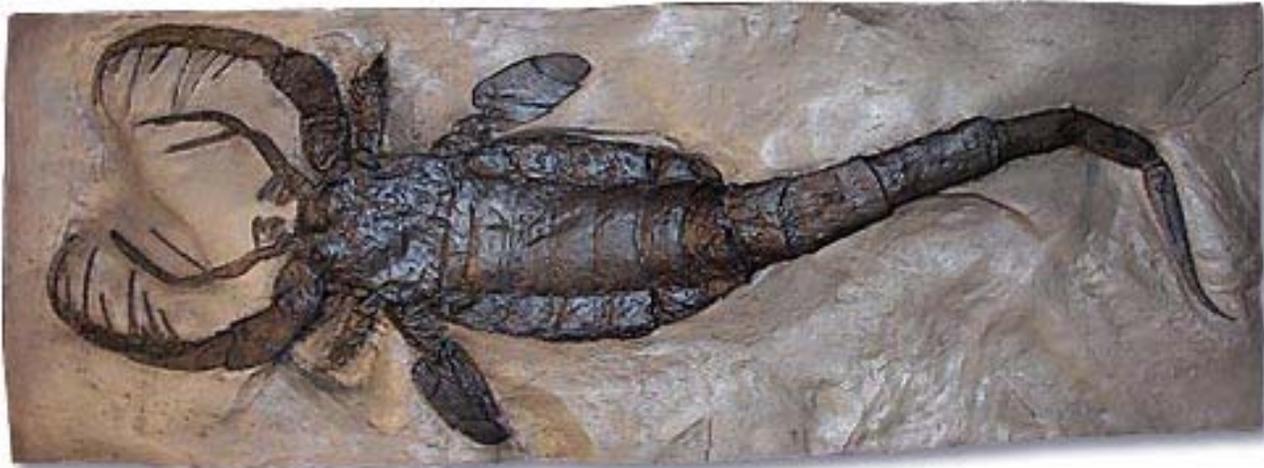
Insetti



CHELICERATI

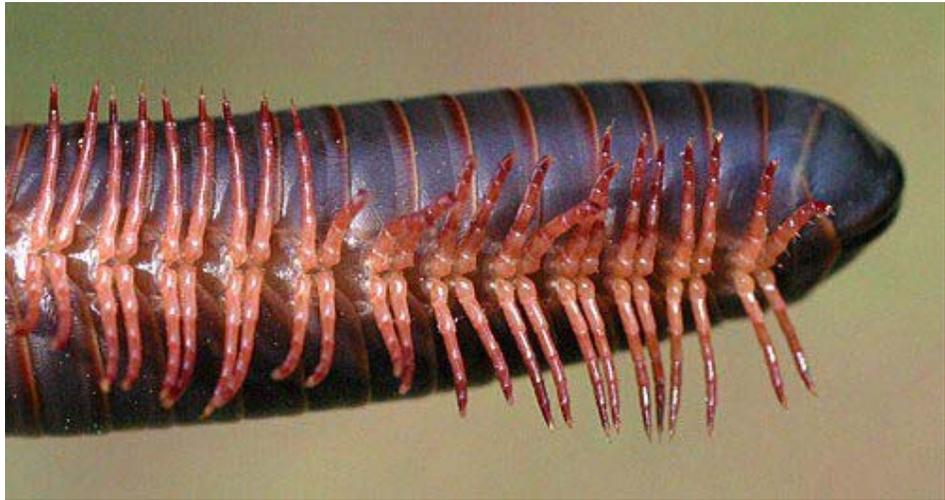
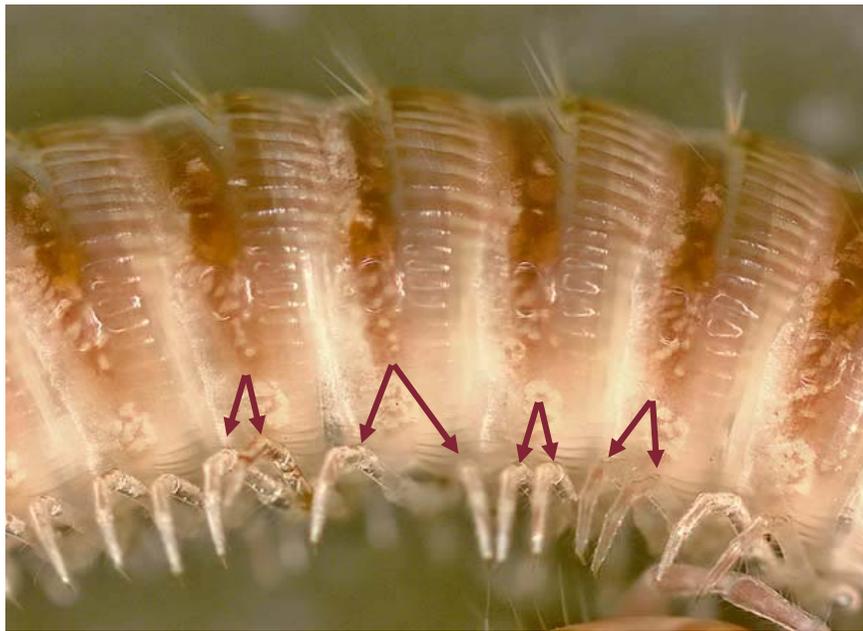


CHELICERATI

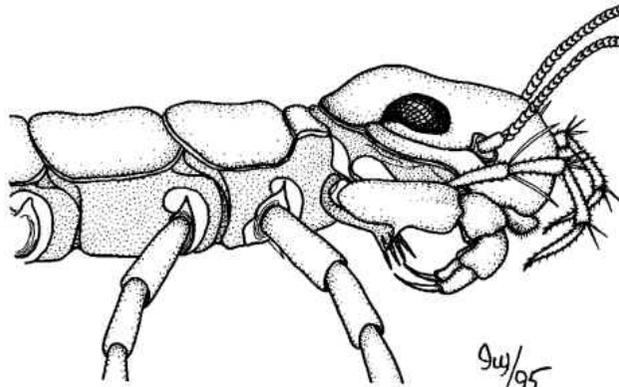


MYRIAPODA

DIPLOPODA



MYRIAPODA CHILOPODA



Livingstone, © BIODIDAC



PAUPOPODA



MYRIAPODA

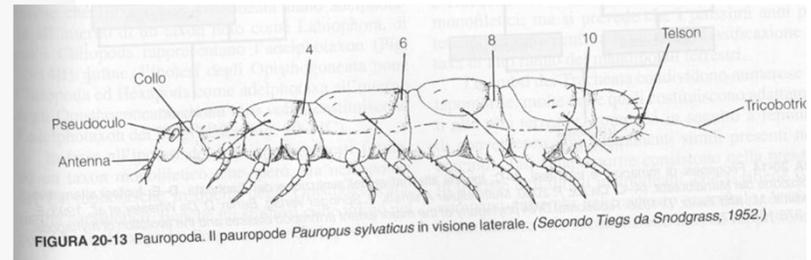
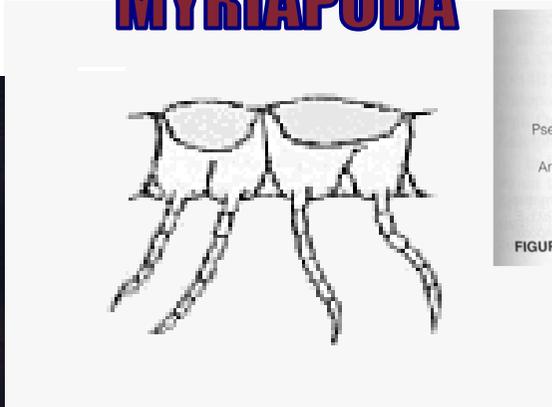
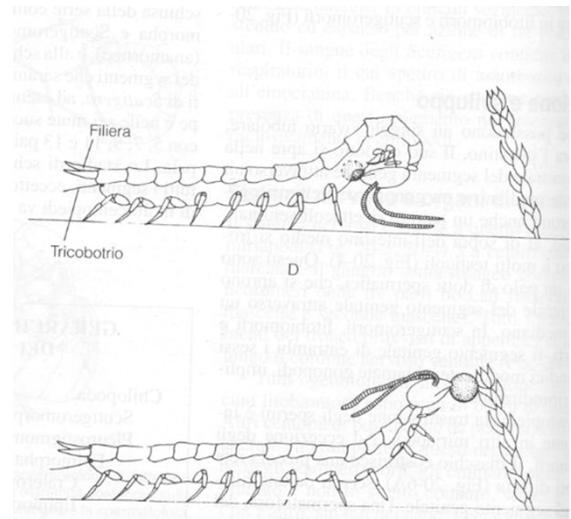
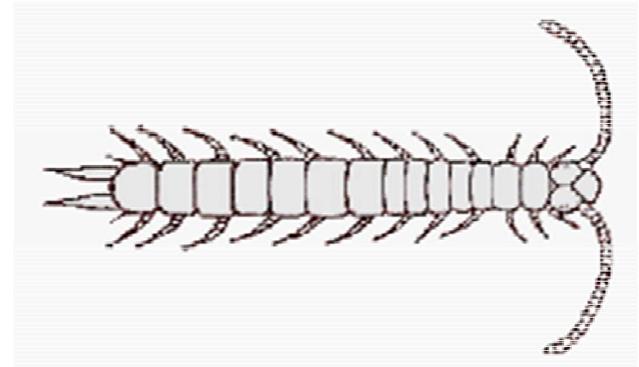


FIGURA 20-13 Pauropoda. Il pauropode *Pauropus sylvaticus* in visione laterale. (Secondo Tiegs da Snodgrass, 1952.)



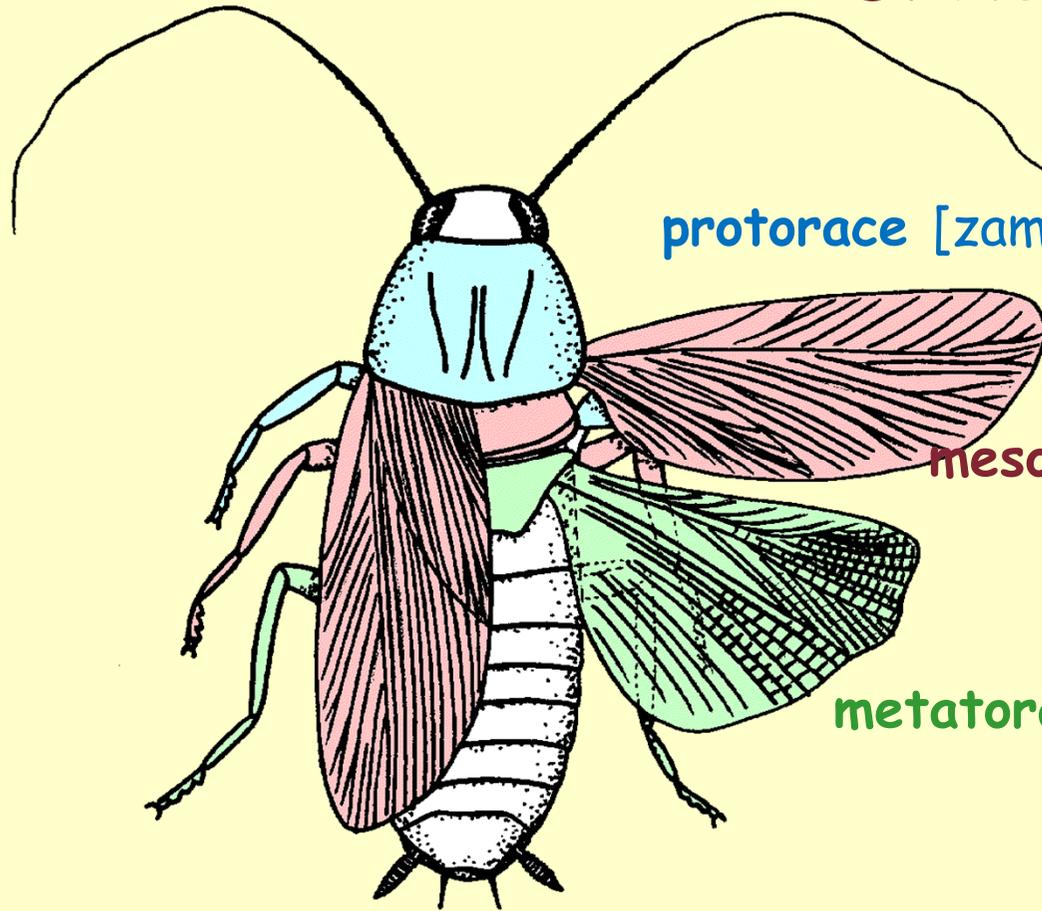
SYMPHYLA



INSETTI



TORACE



protorace [zampe anteriori]

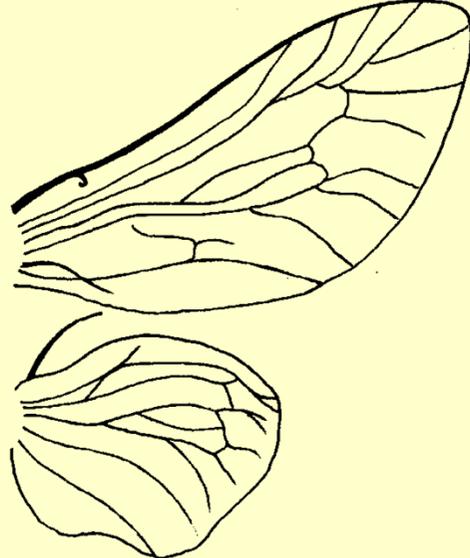
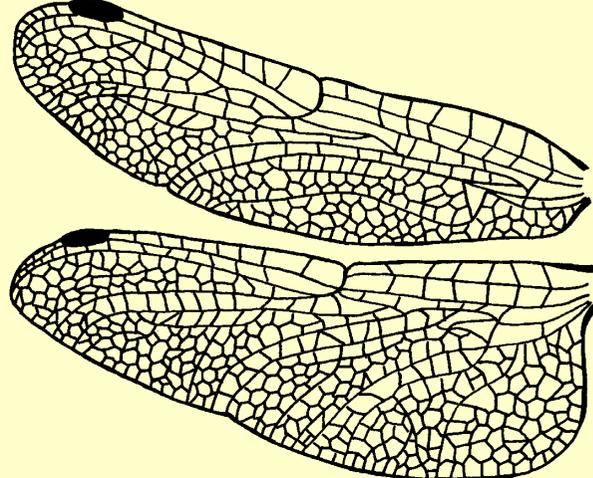
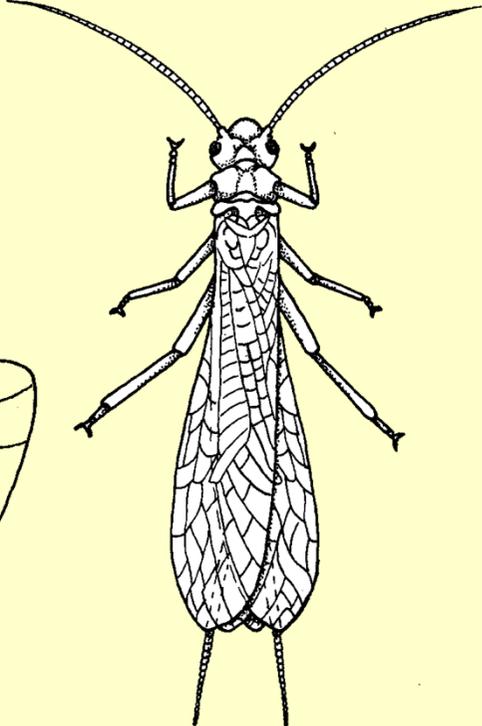
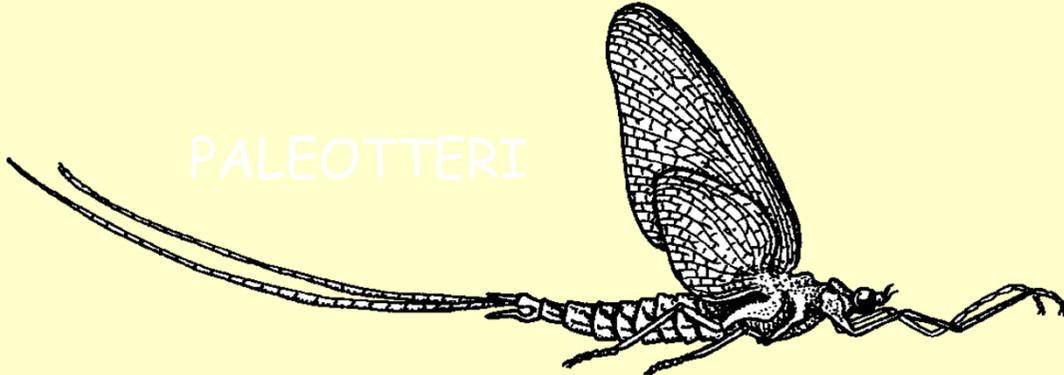
mesotorace [ali anteriori - z. medie]

metatorace [ali posteriori - z. post.]

TORACE

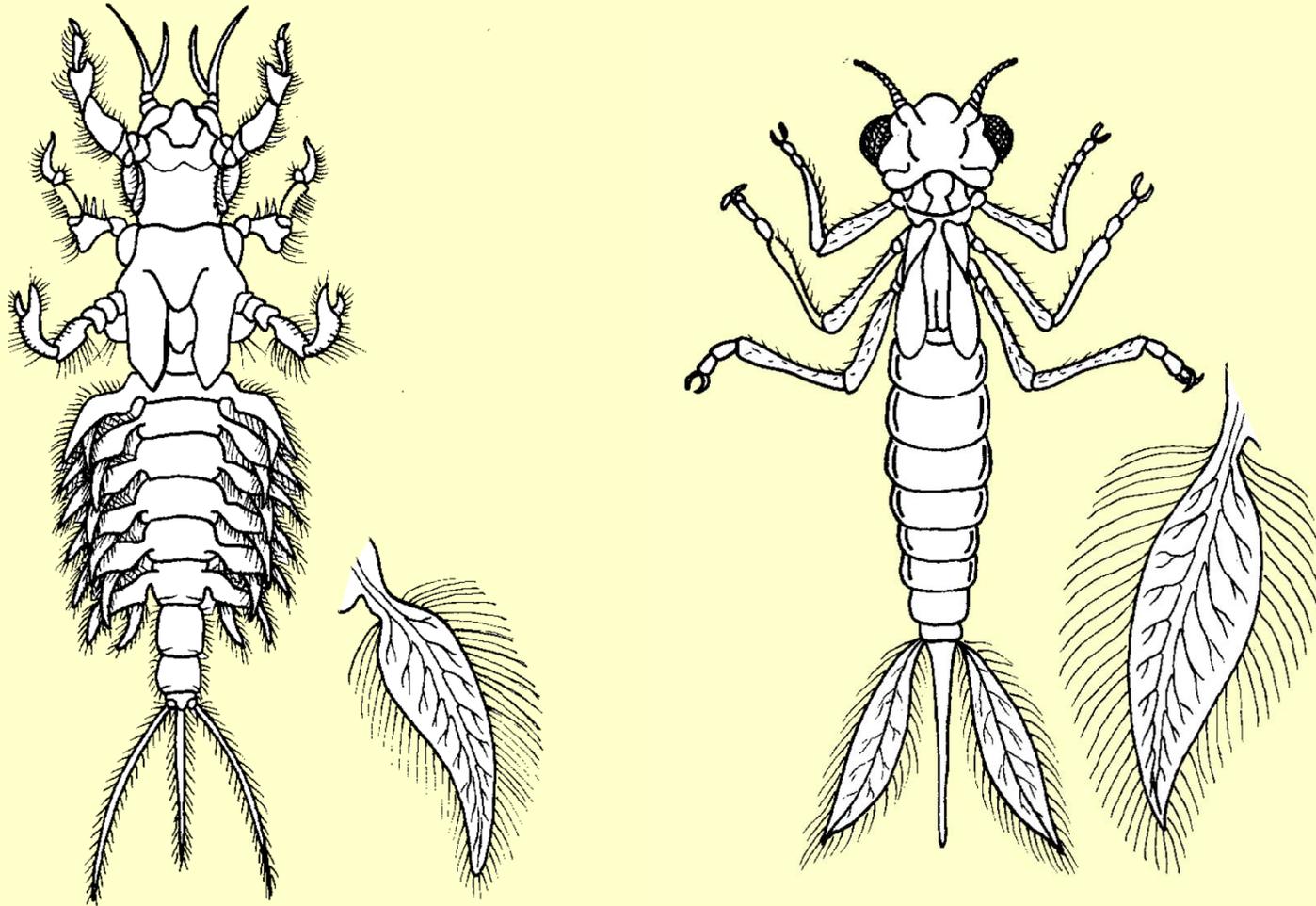
NEOTTERI

PALEOTTERI



9/4/96

ADDOME - tracheobranchie e cerci



RIPRODUZIONE



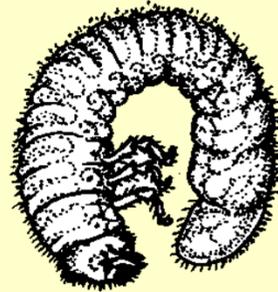
SVILUPPO



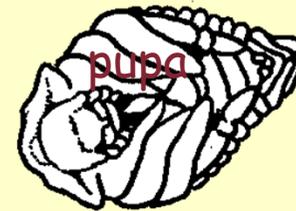
uovo



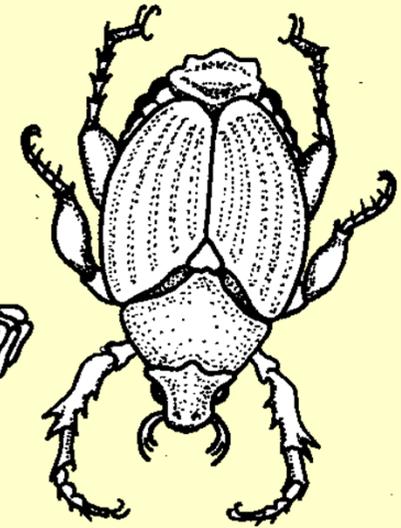
larva



larva

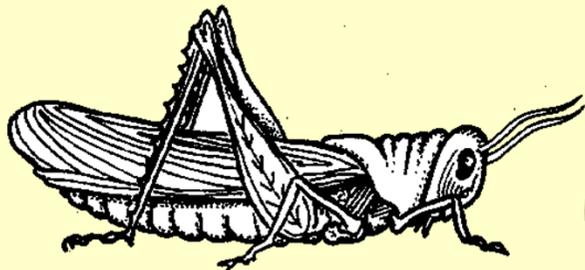


pupa



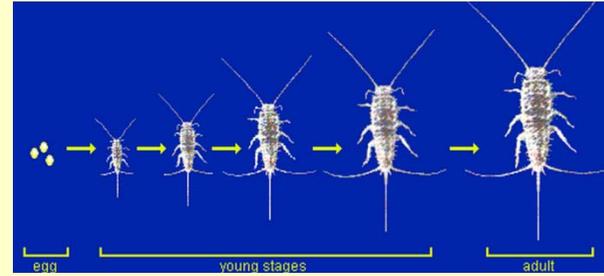
immagine

uovo

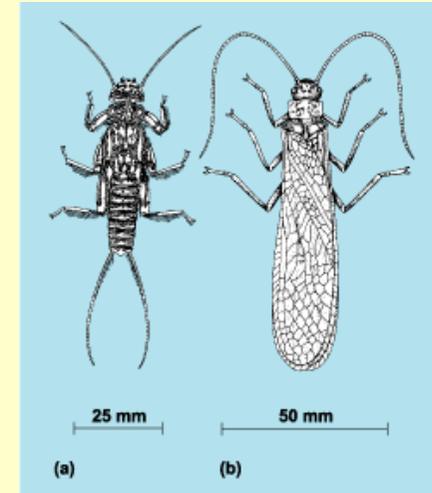


immagine

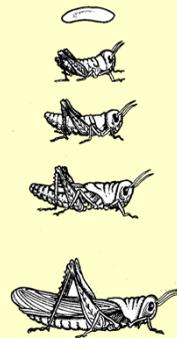
Ametaboli



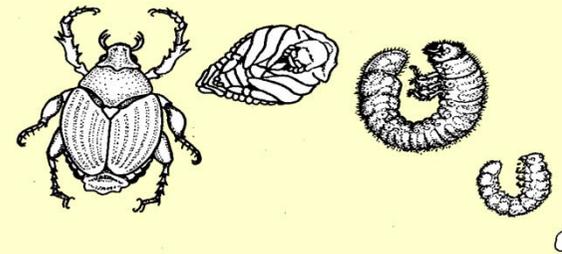
Emimetaboli



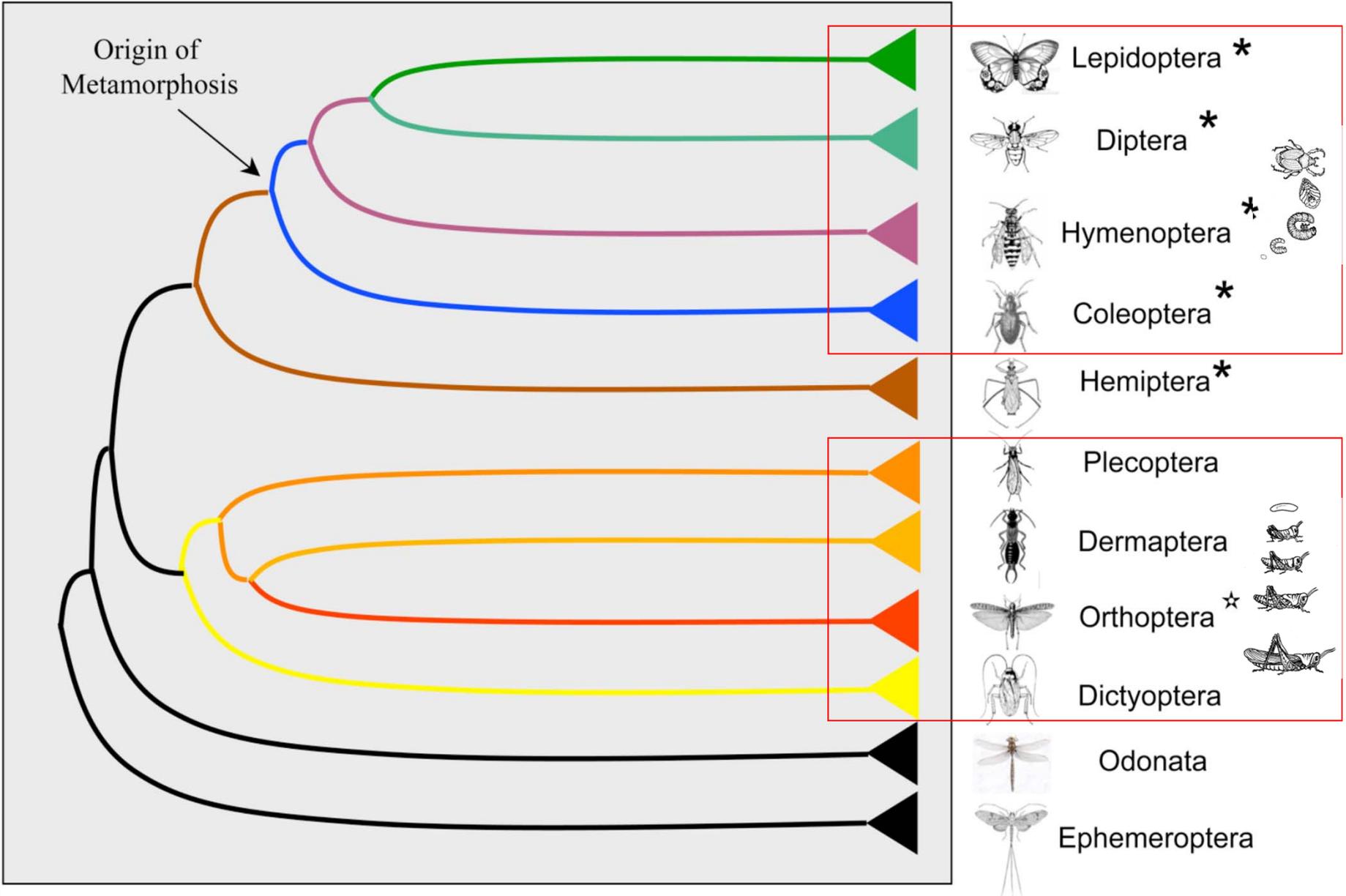
Paurometaboli



Olometaboli



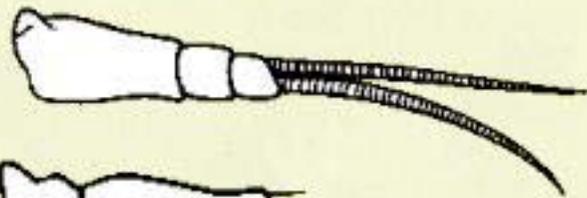
← PALEOZOIC		MESOZOIC				CENOZOIC
Devonian	Carboniferous	Permian	Triassic	Jurassic	Cretaceous	



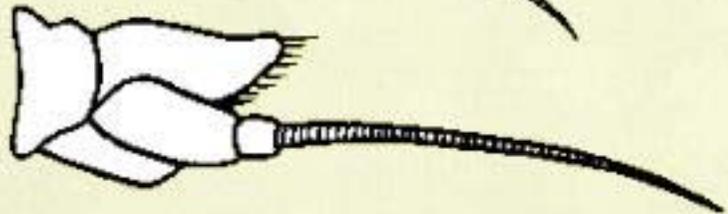
CROSTACEI



REGIONE CEFALICA



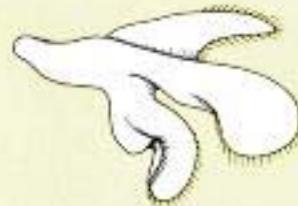
I antenna (antennula)



II antenna



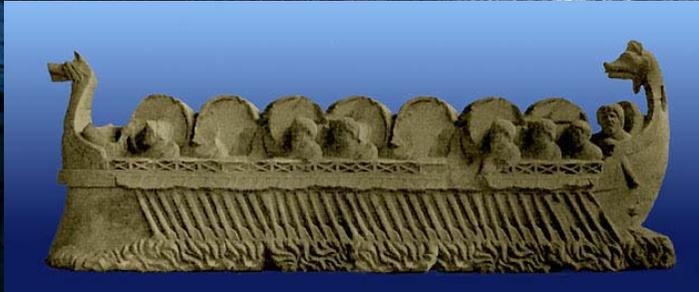
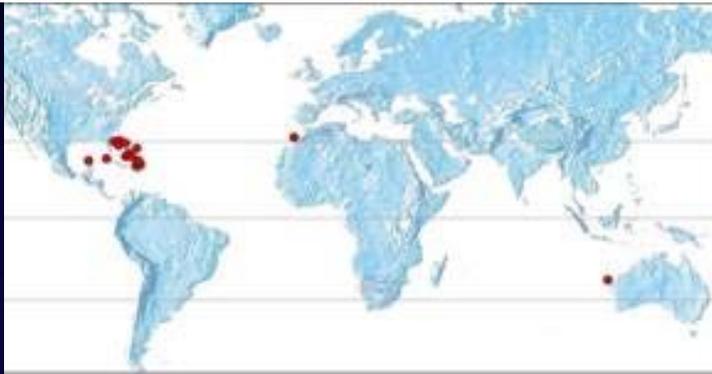
mandibola



I mascella

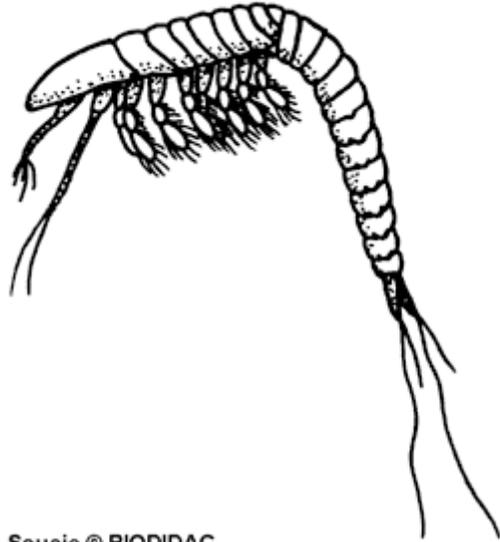


II mascella



REMIPEDI

CEPHALOCARIDA



J. Soucie © BIODIDAC



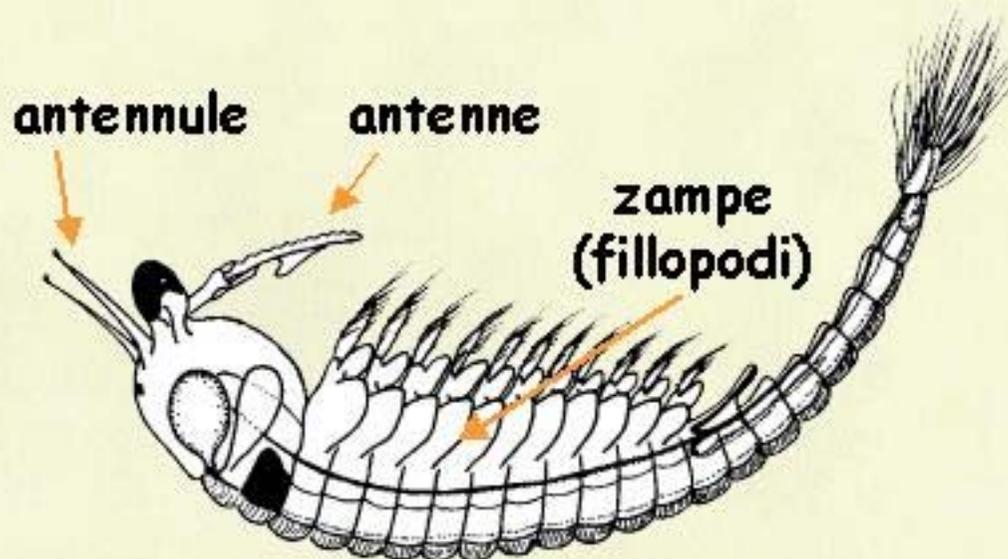
Telson con rami caudali, carapace assente, scudo cefalico



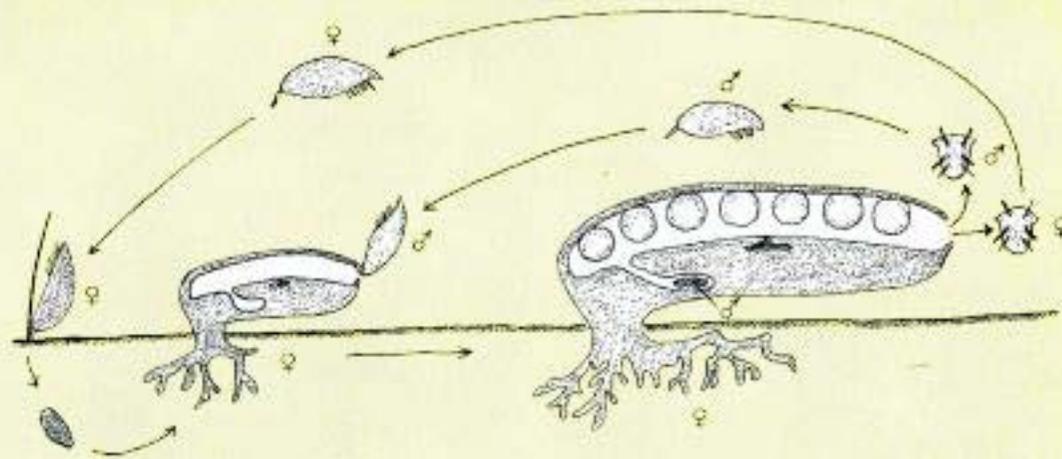
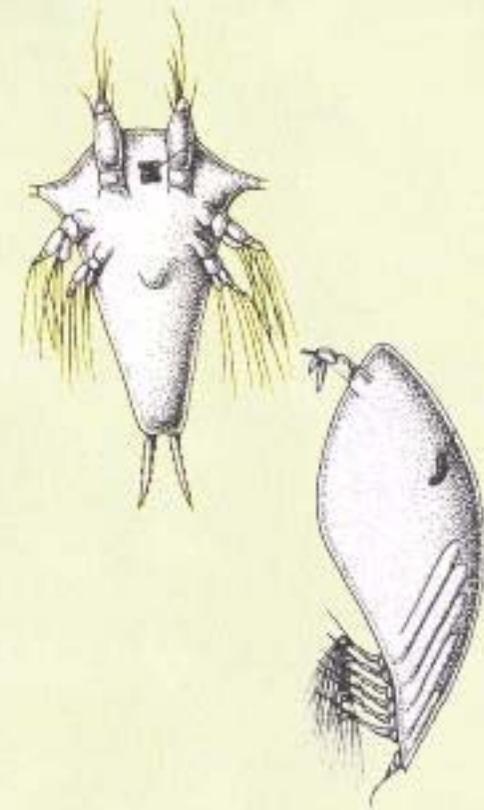
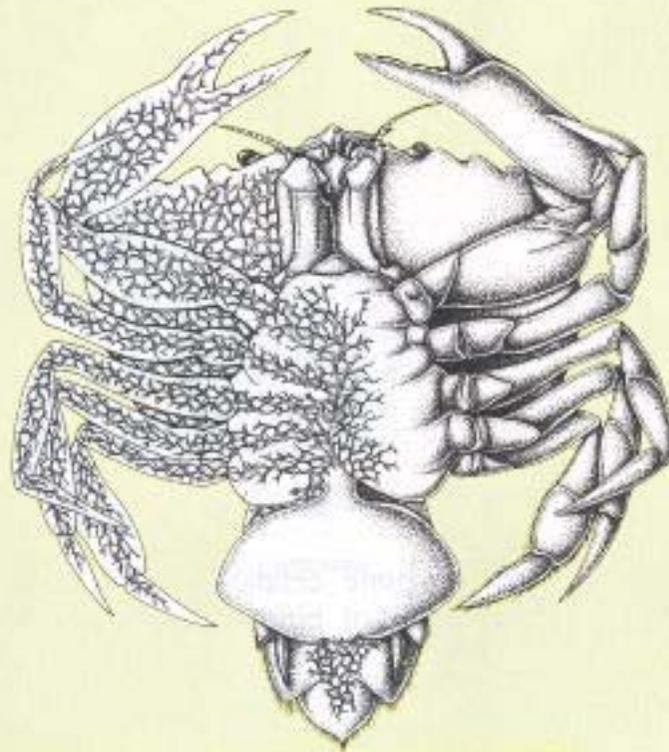


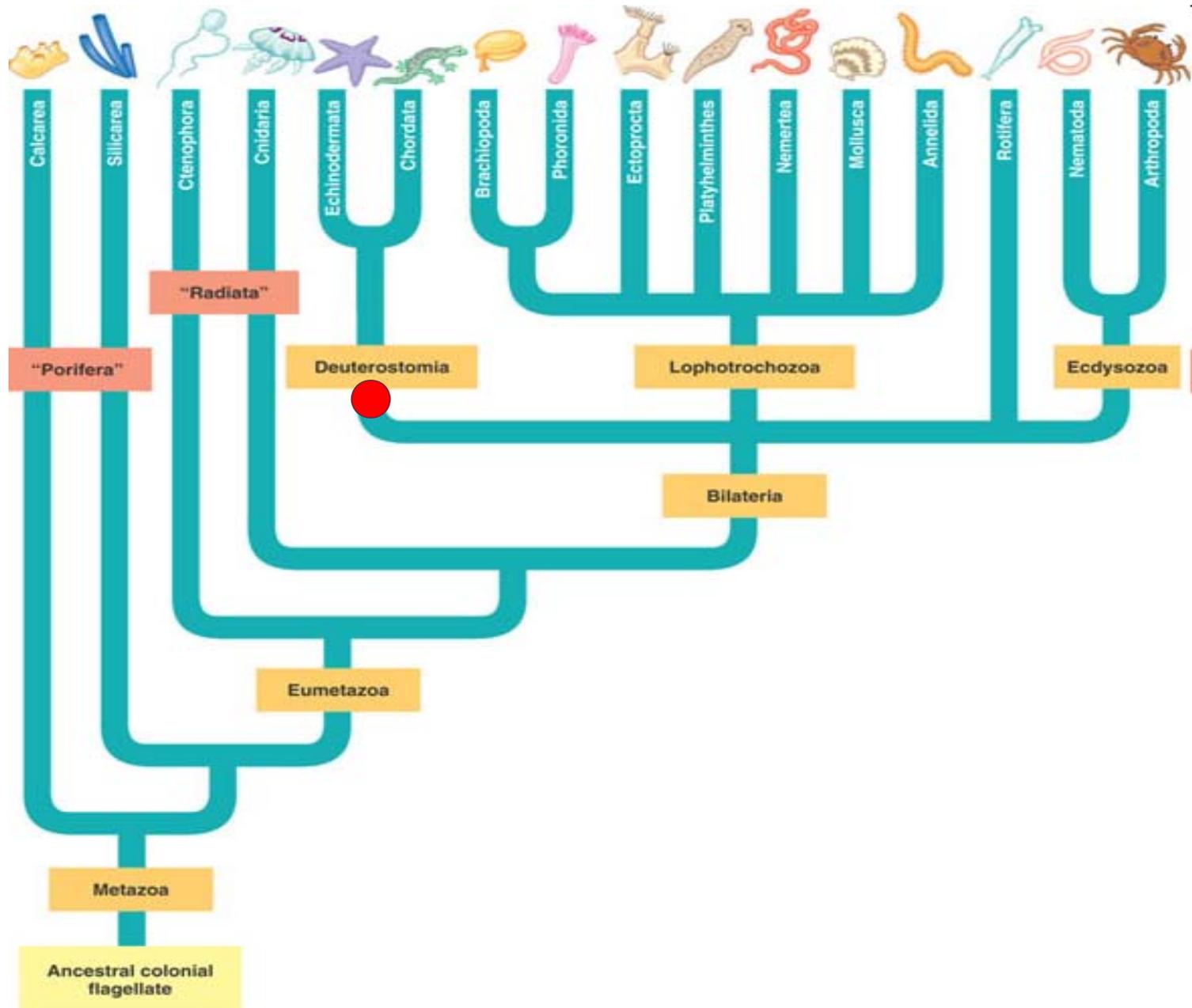
BRANCHIOPODI

ANOSTRACI

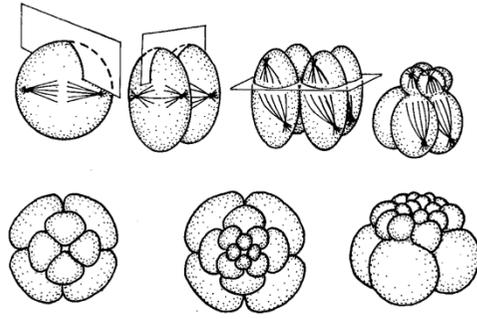


CIRRIPIEDI

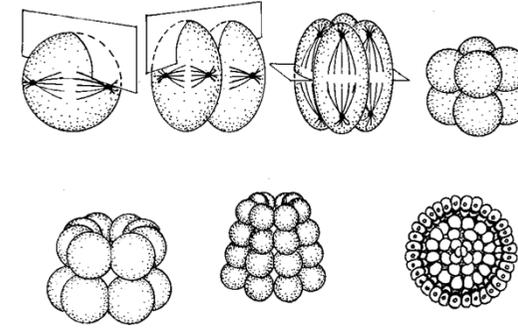




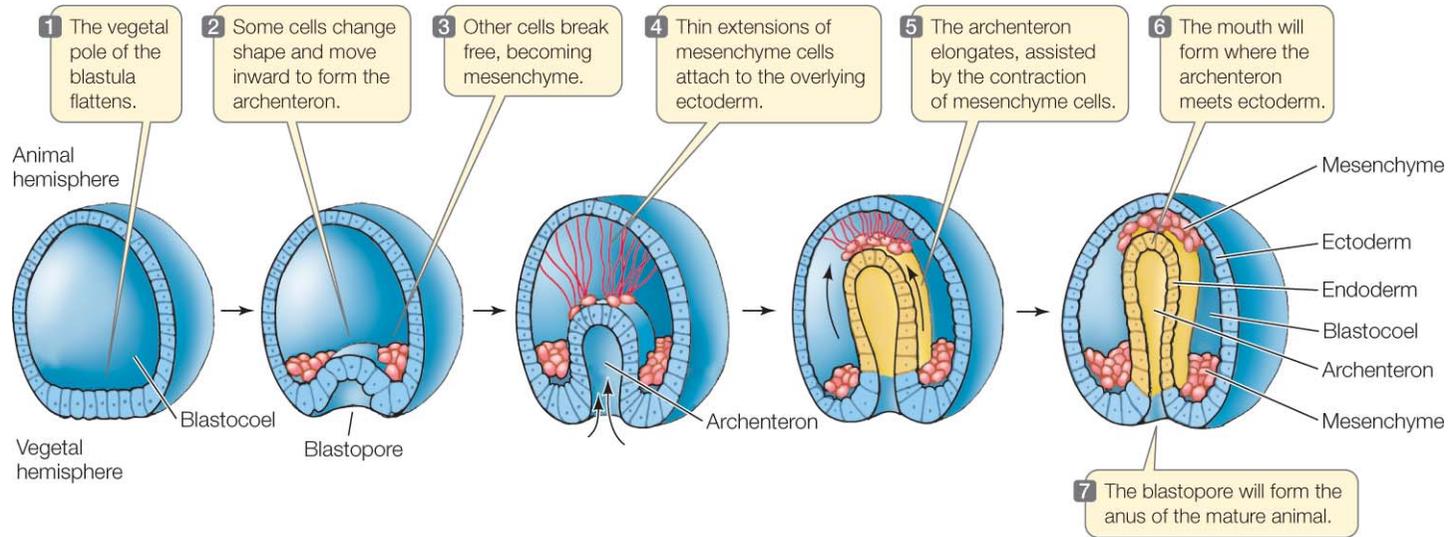
DEUTEROSTOMI

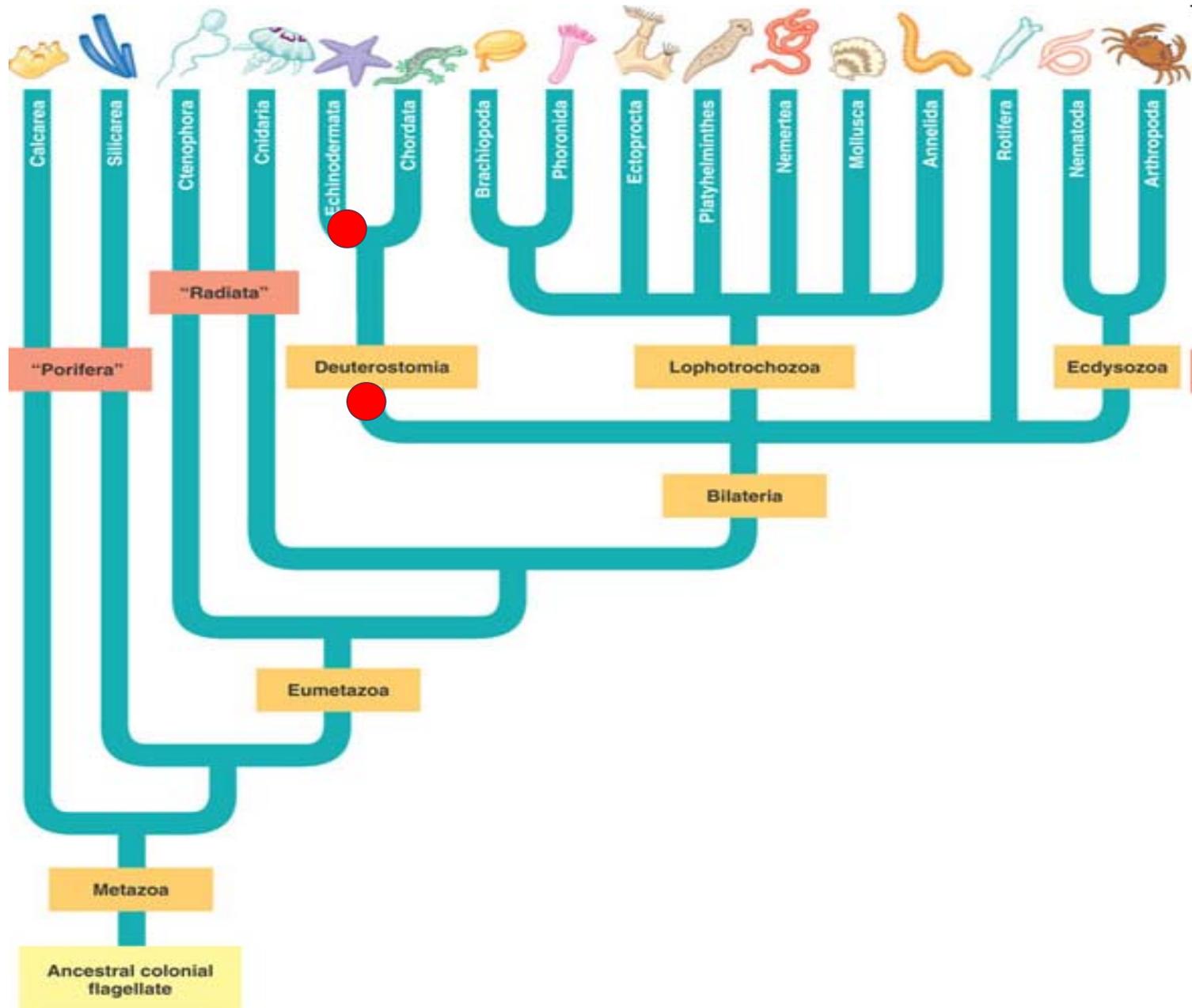


spirale



radiale

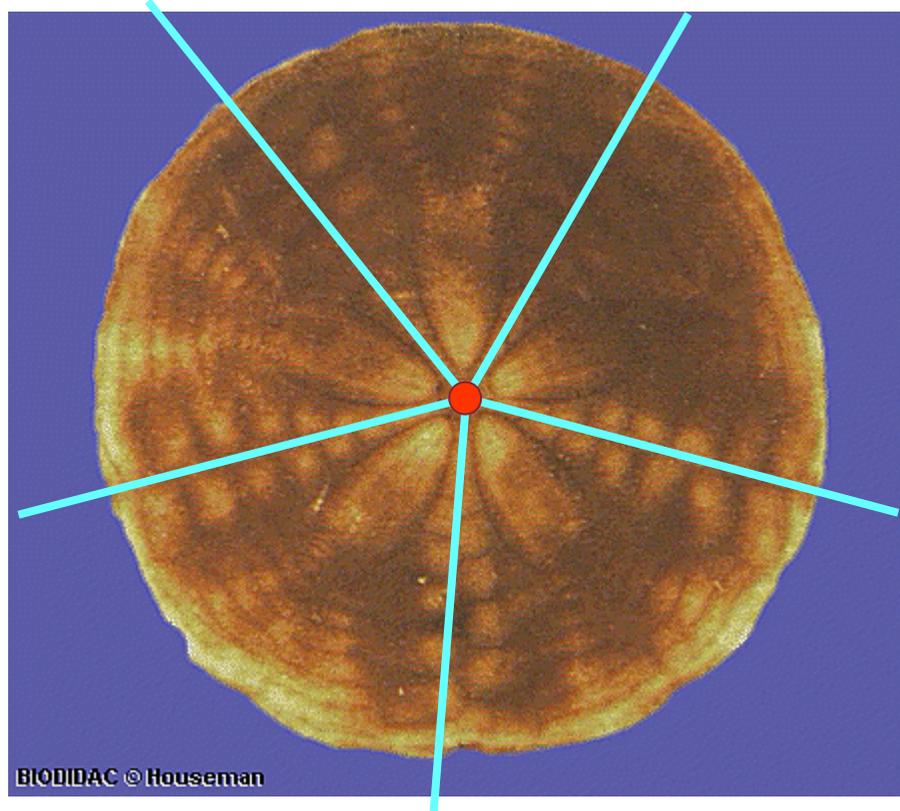
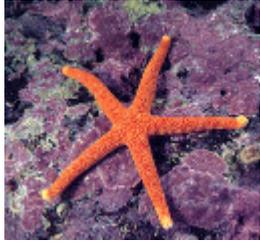






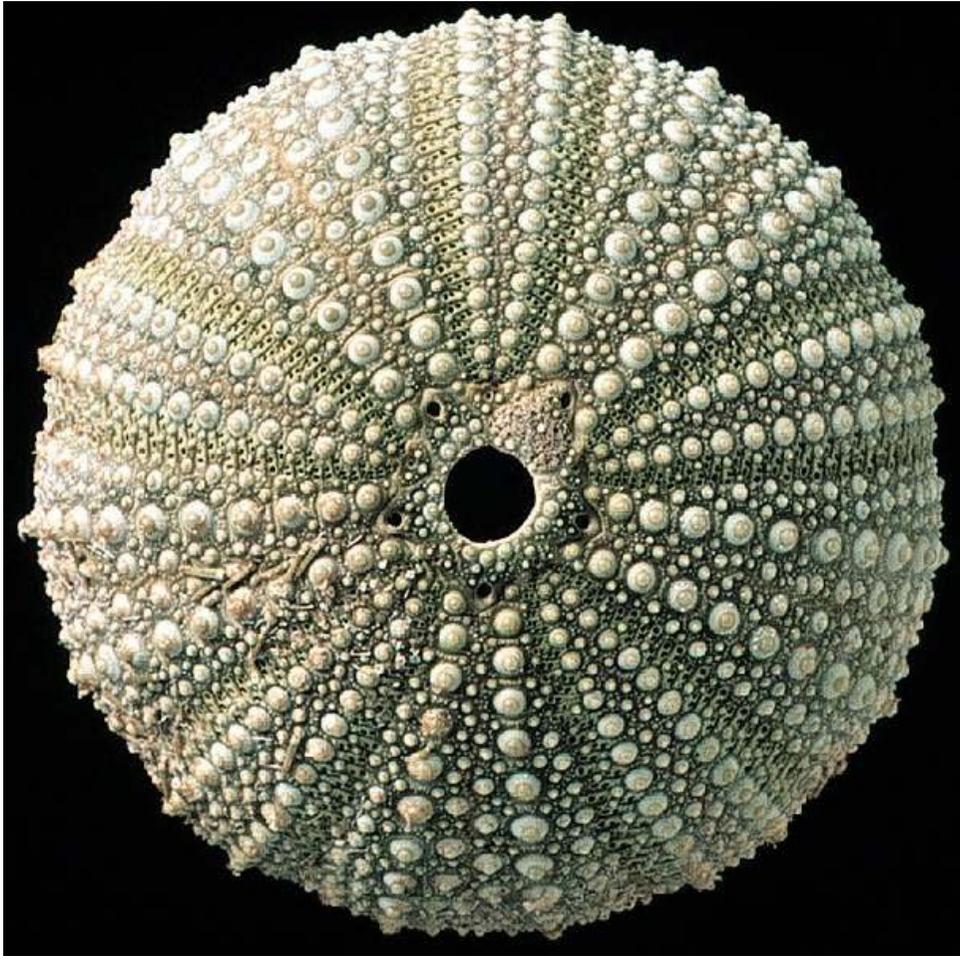
ECHINODERMI



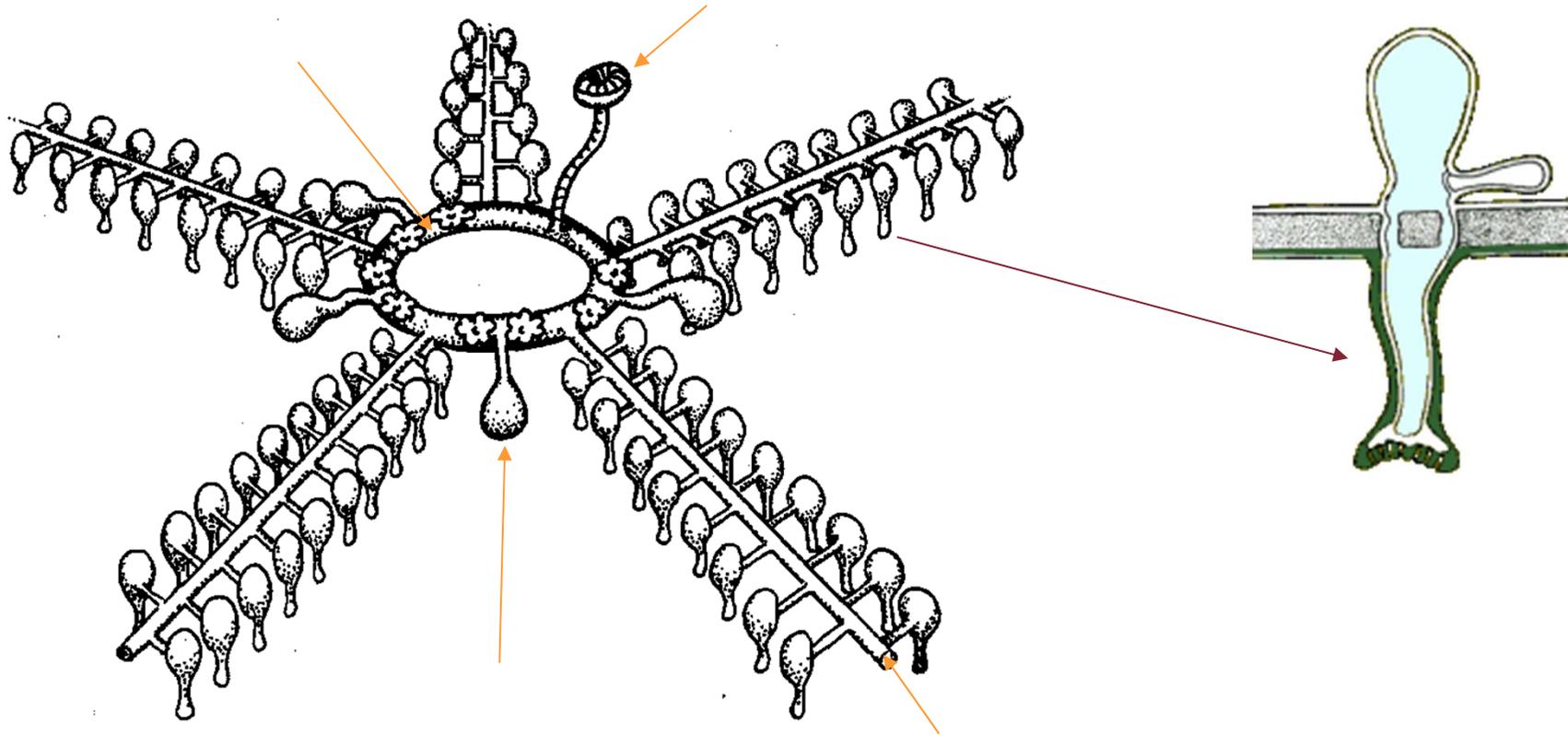


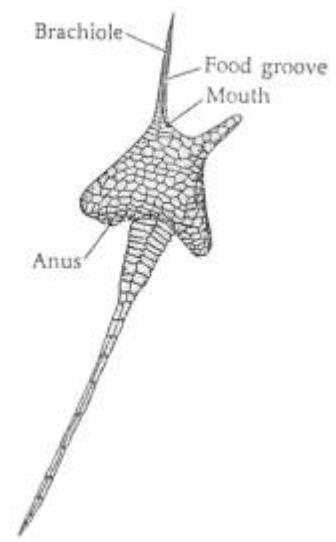
BIODIDAC © Houseman

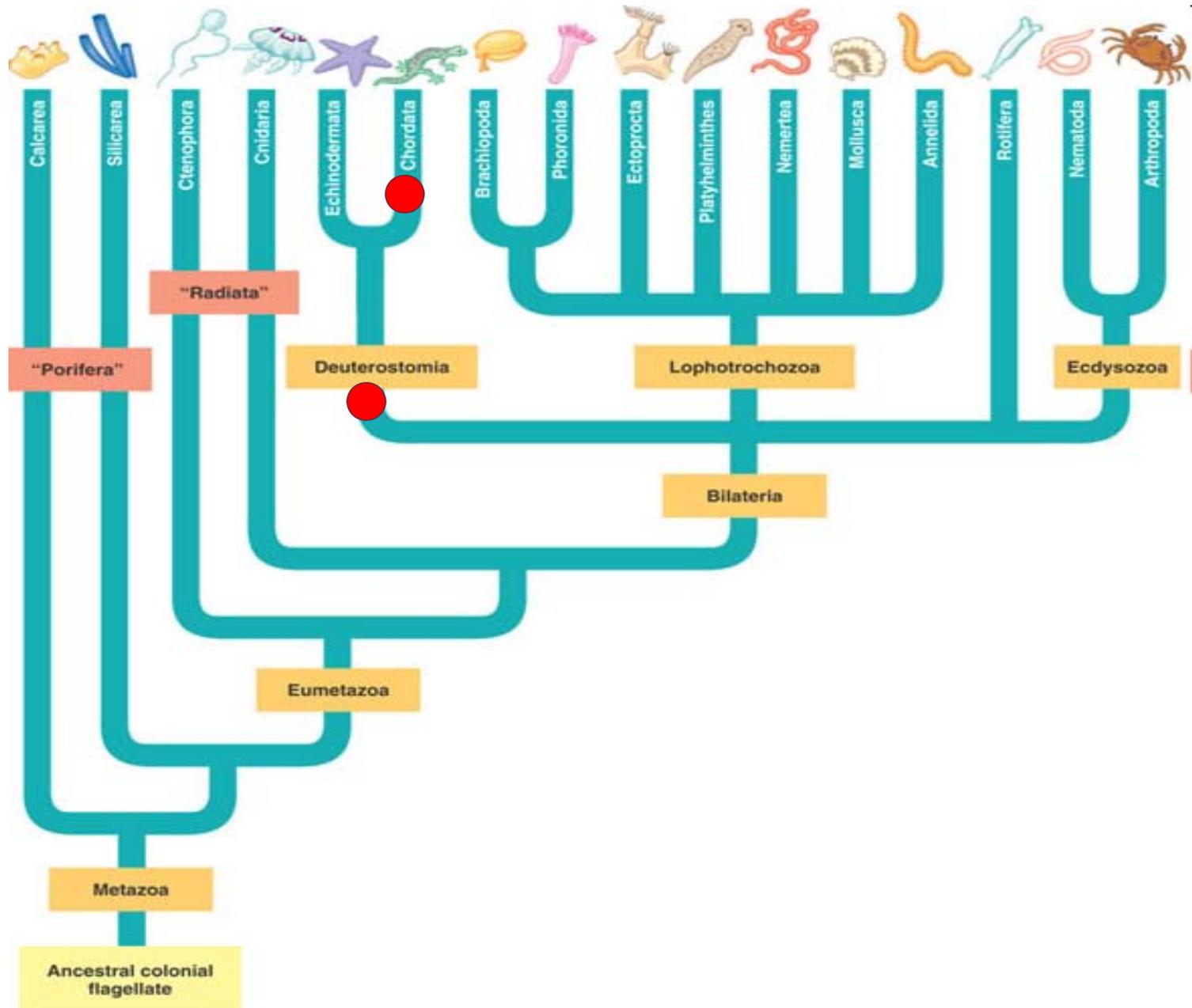




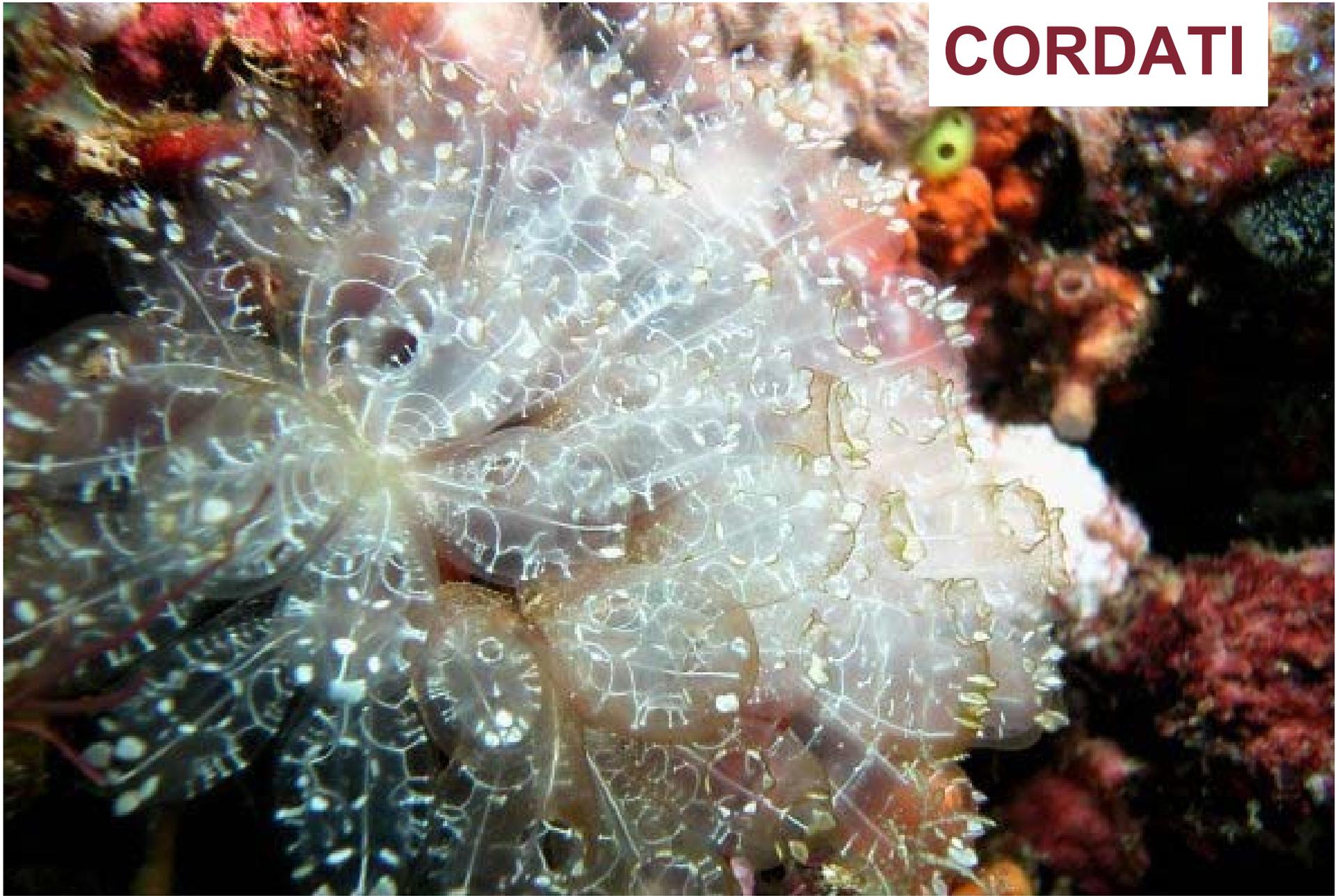
SISTEMA ACQUIFERO



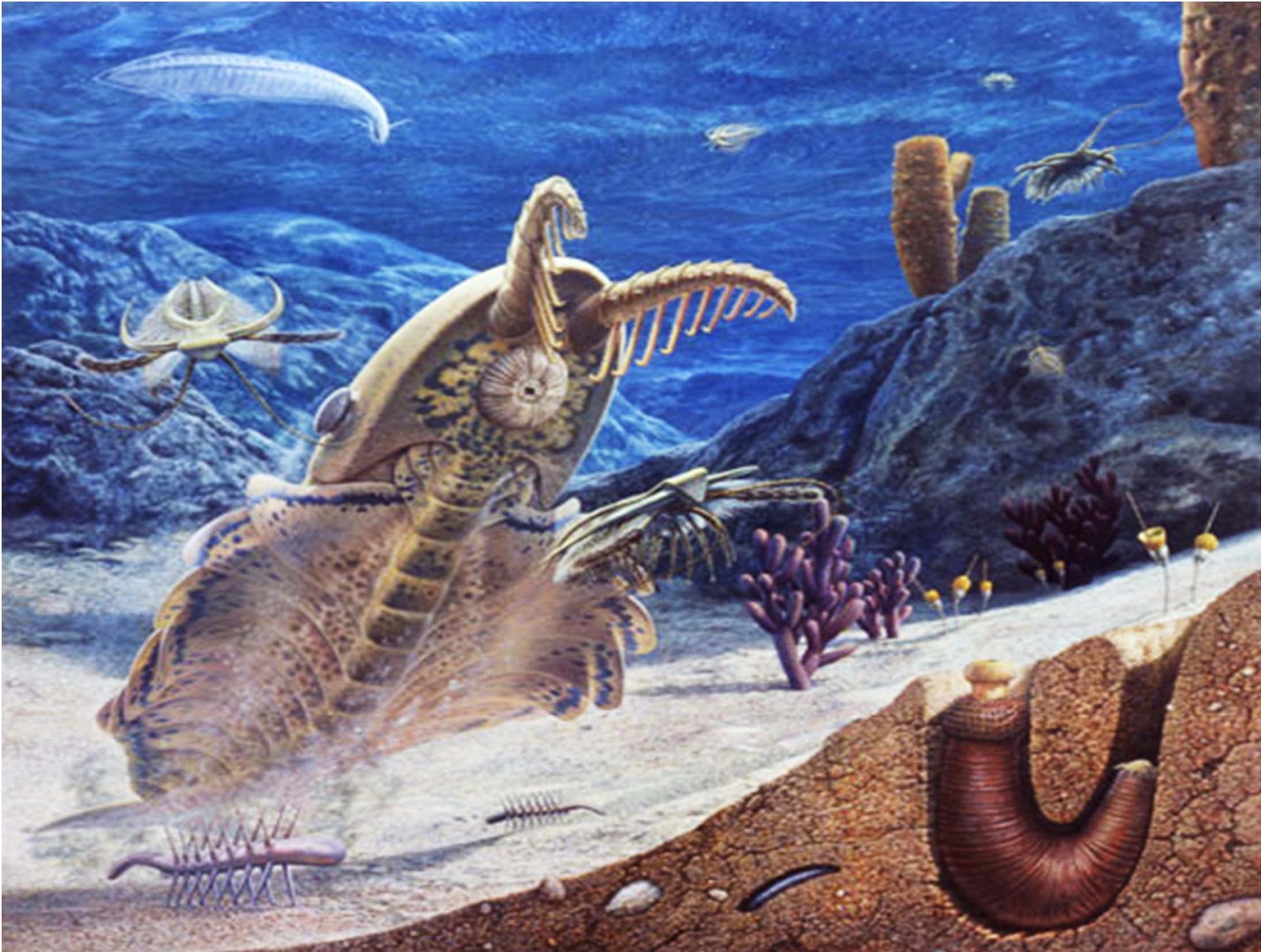


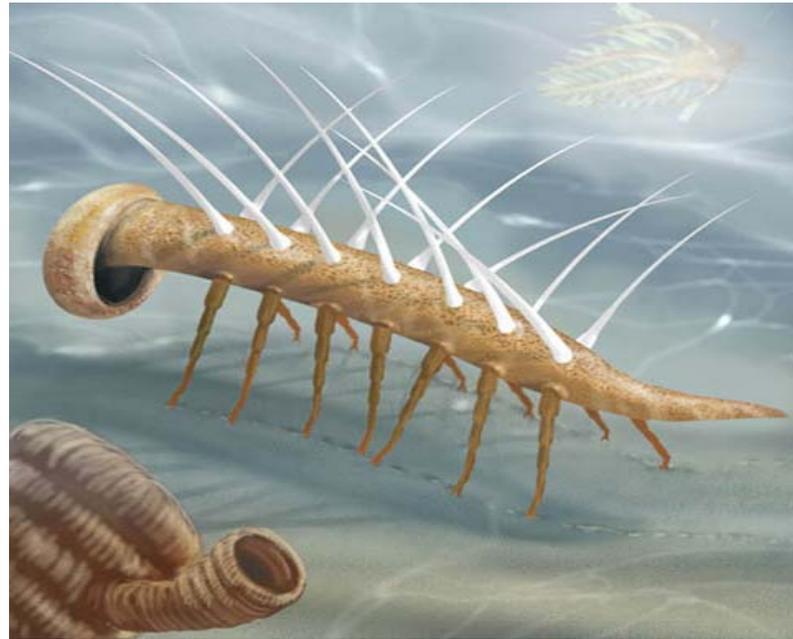
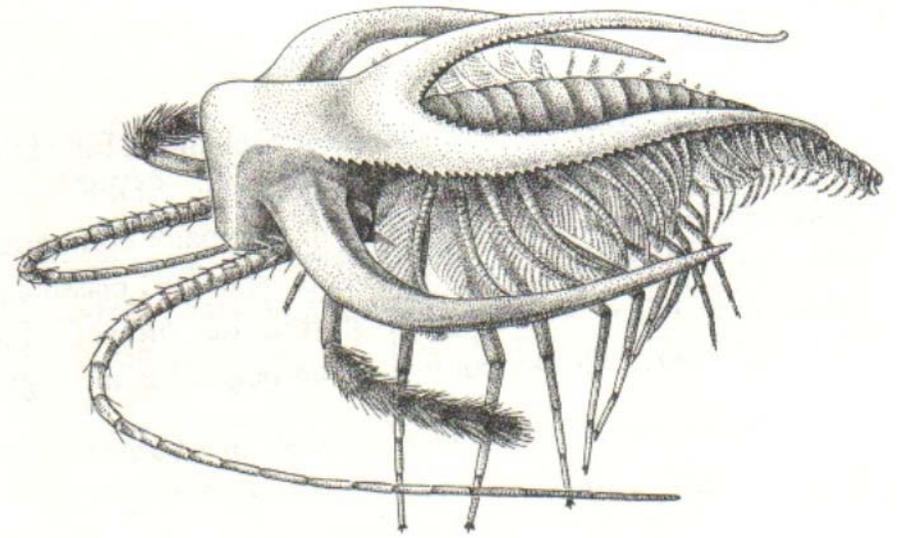
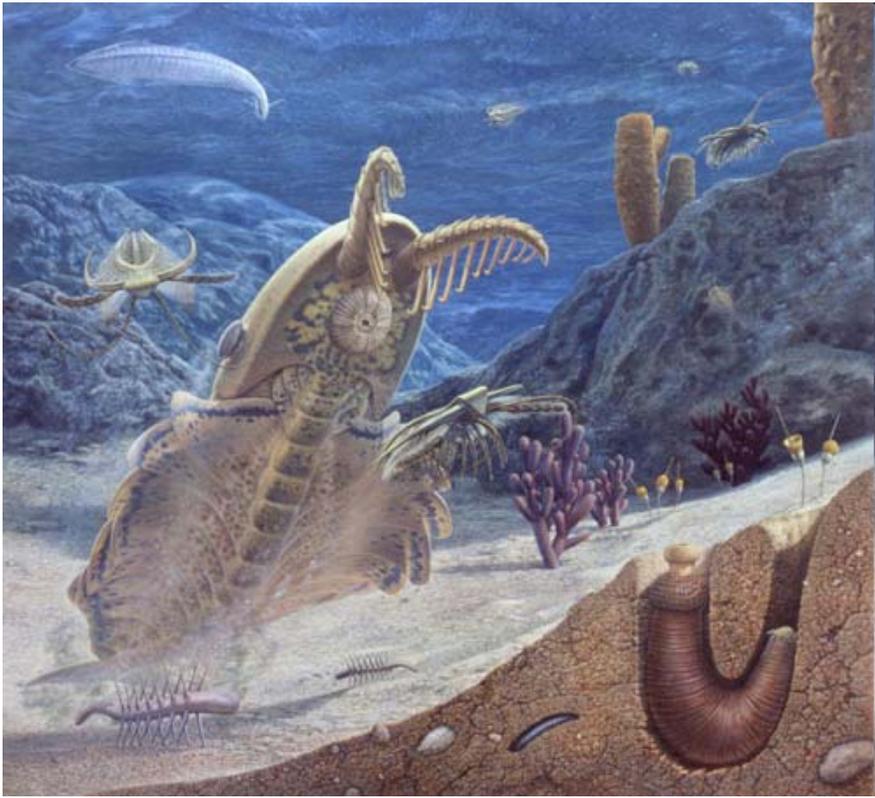


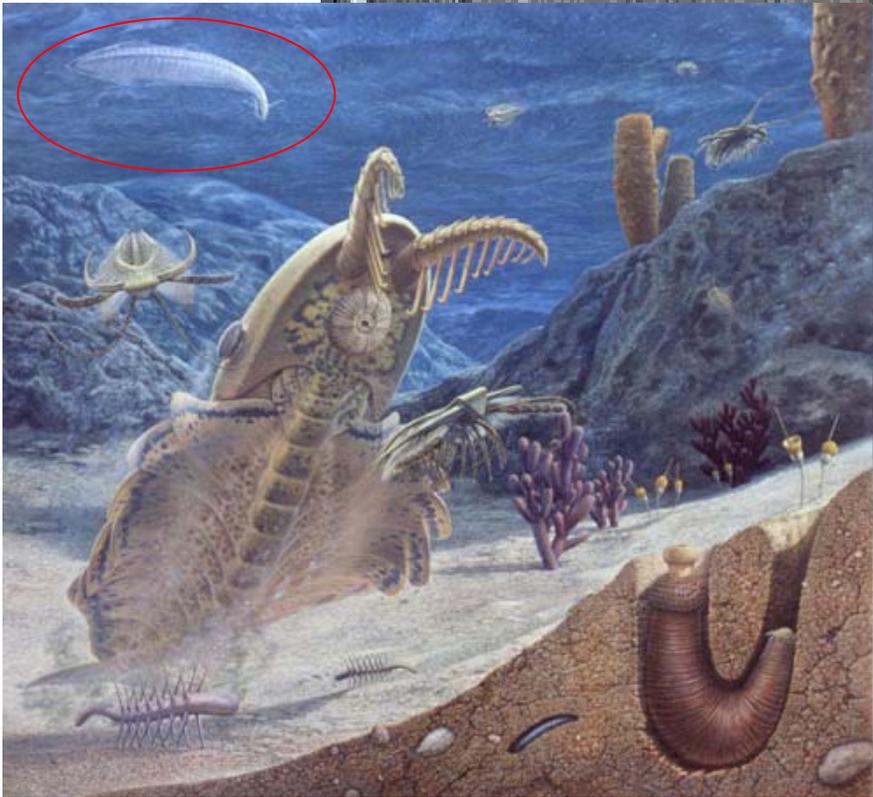
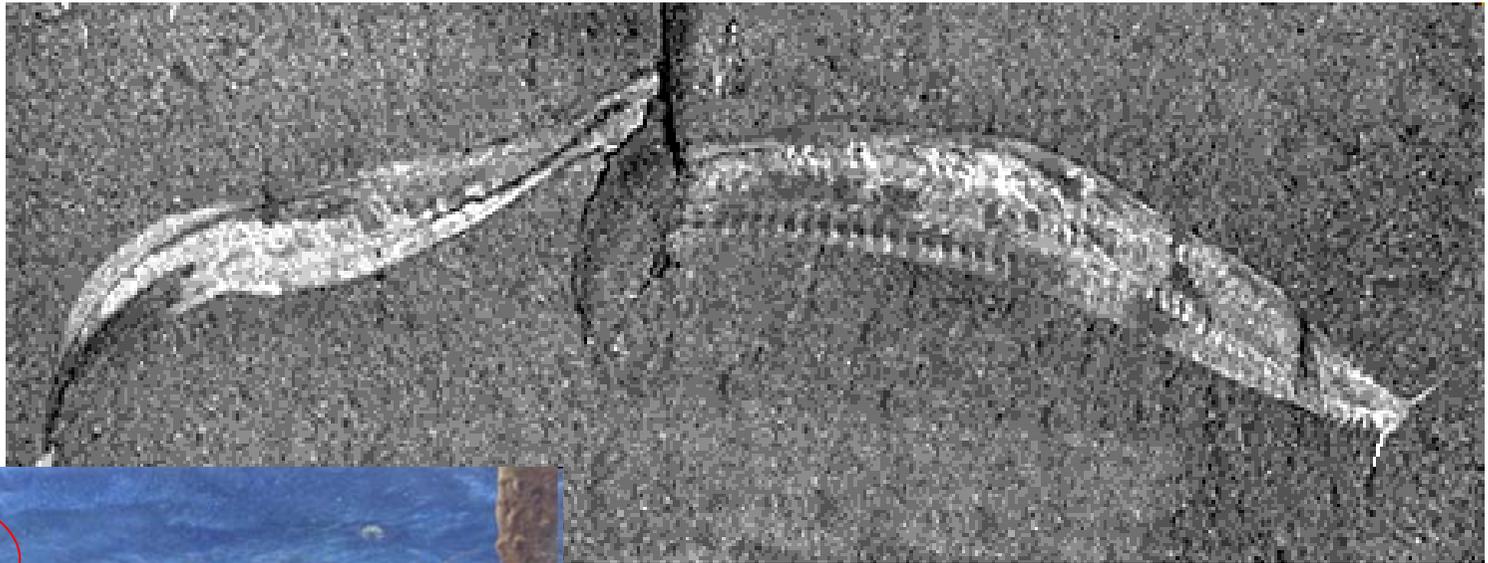
CORDATI

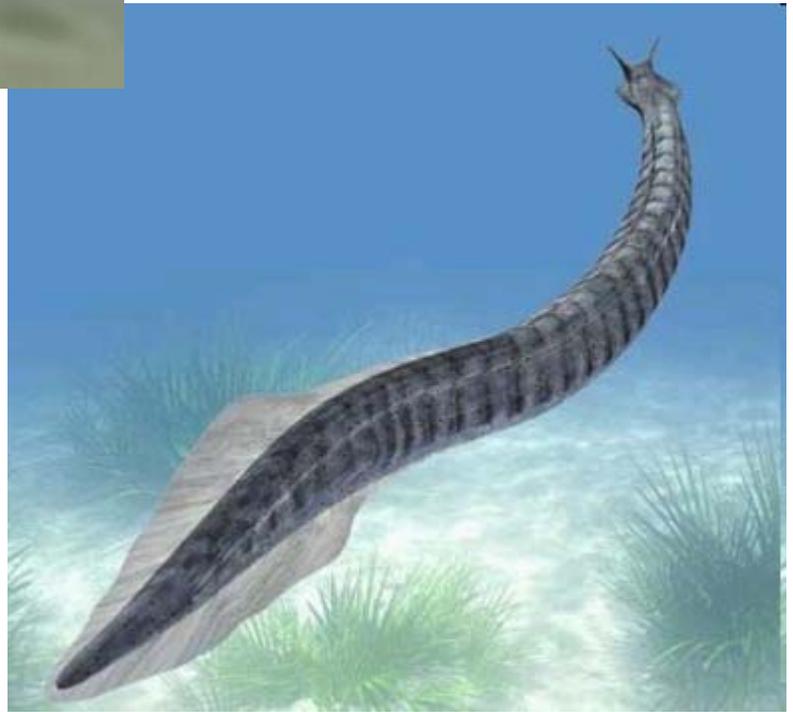
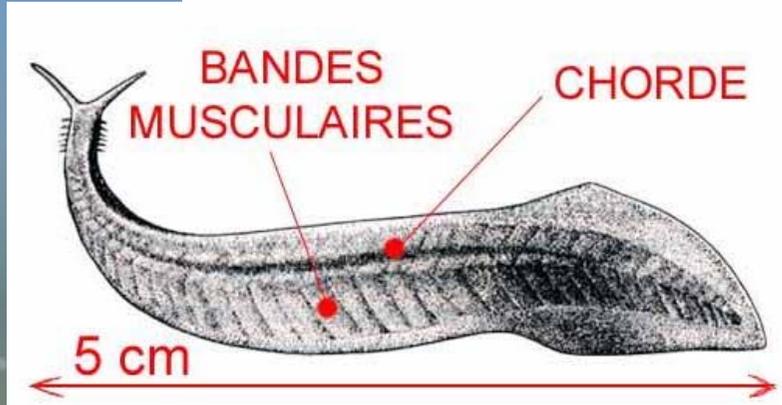
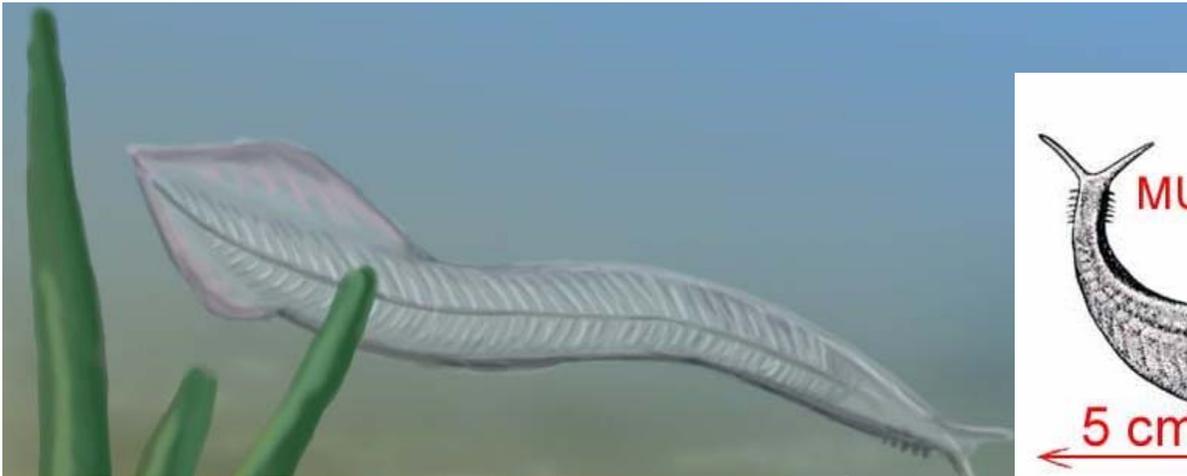


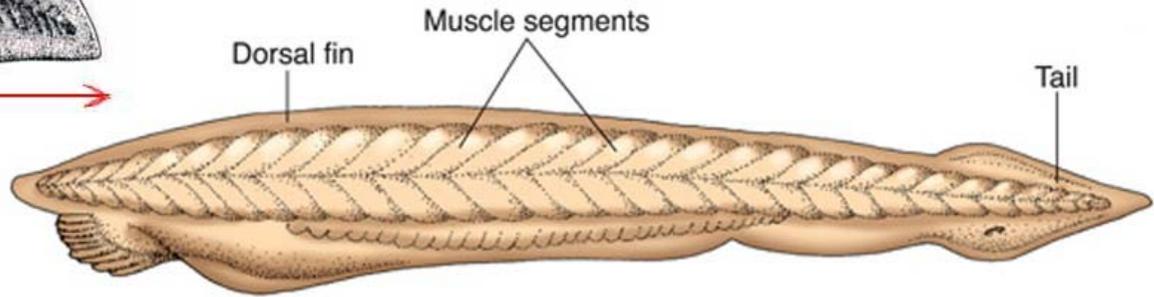
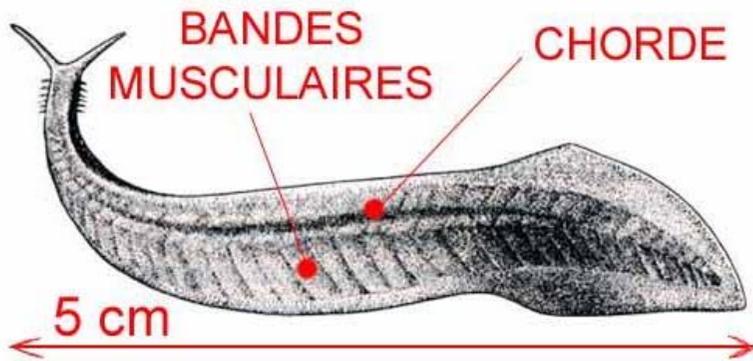




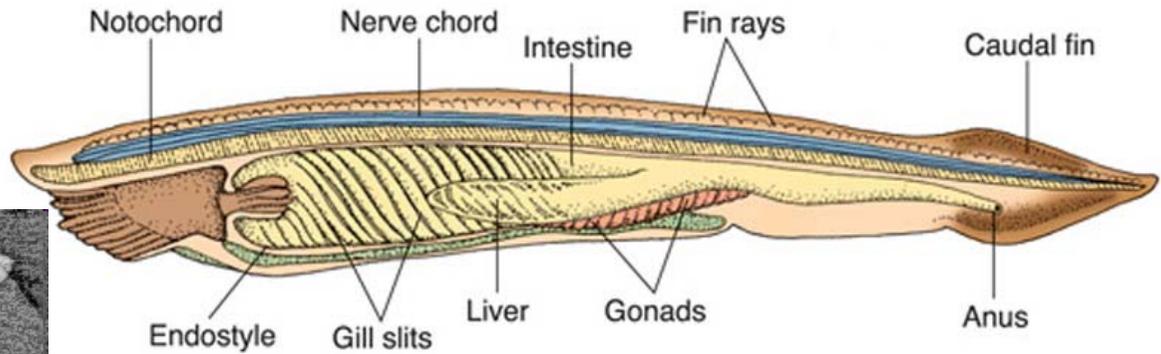


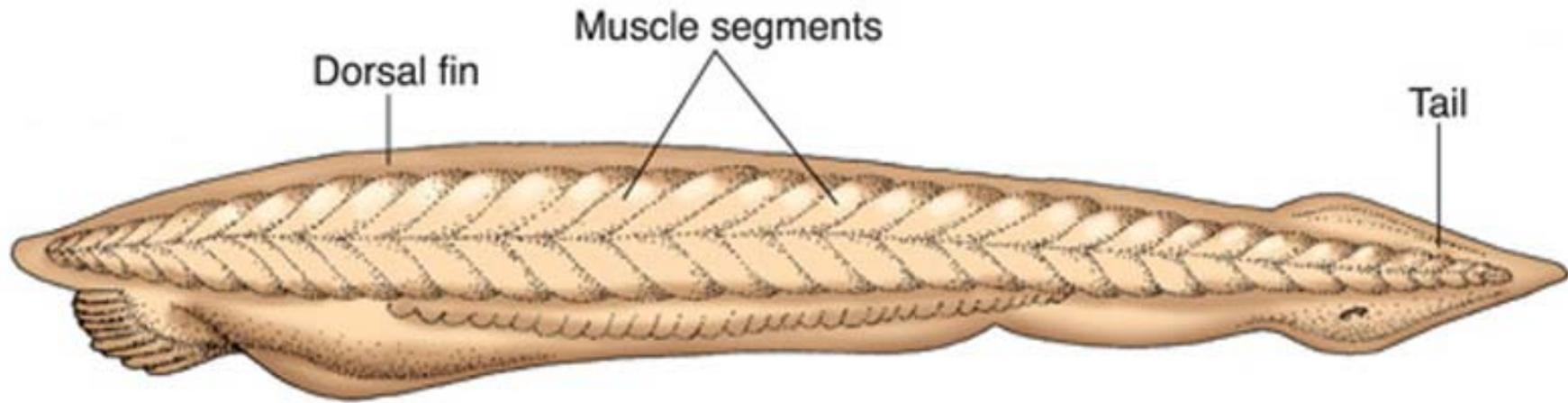




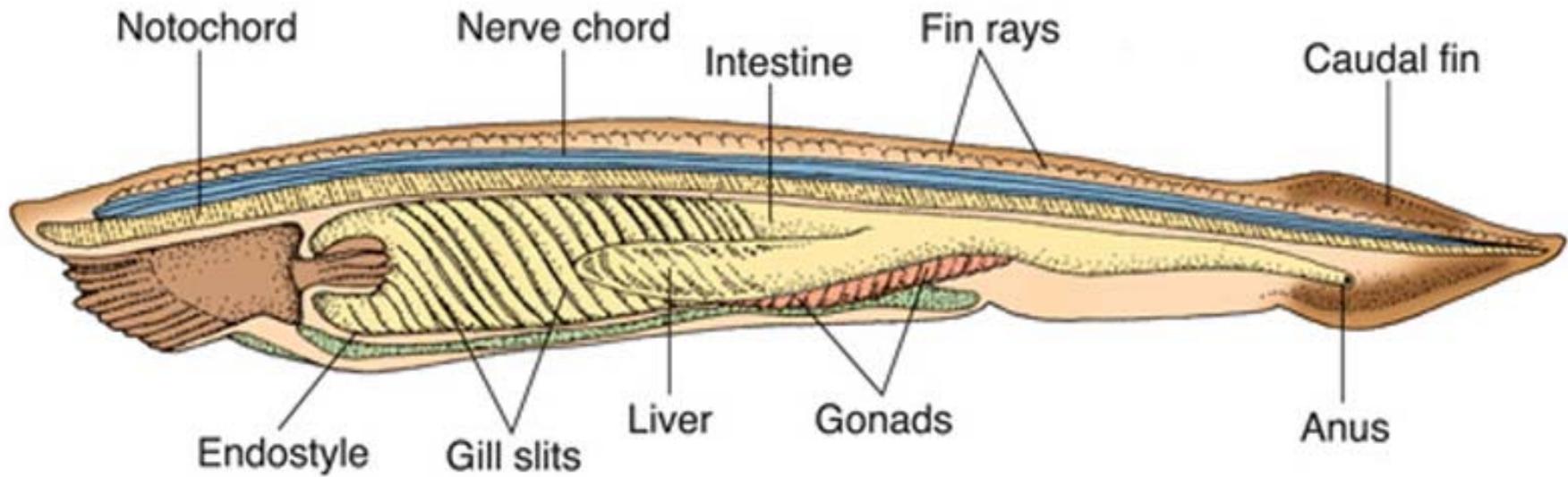


A





A



B

CLASSIFICAZIONE

phylum CORDATI

subphylum CEFALOCORDATI

subphylum UROCORDATI

classe ASCIDIACEI

classe TALIACEI

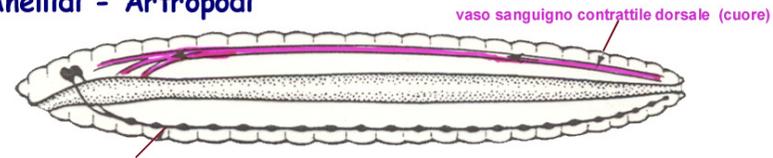
classe LARVACEI

subphylum VERTEBRATI

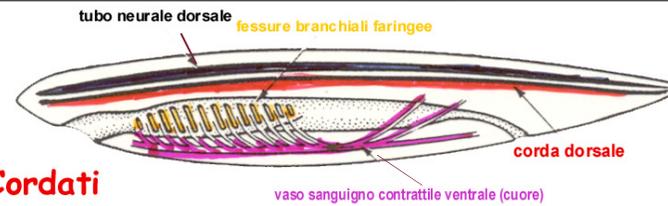
classi: CONDROITTI, OSTEITTI, ANFIBI
RETTILI, UCCELLI, MAMMIFERI

Caratteristiche principali dei Cordati

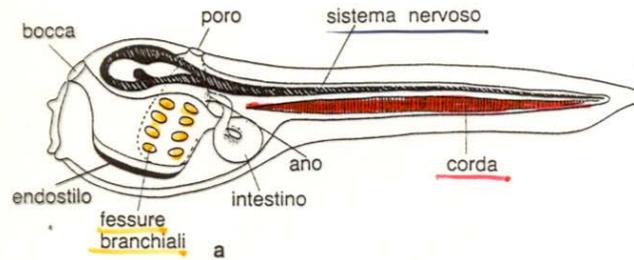
Anellidi - Artropodi



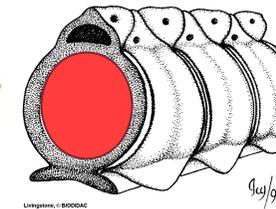
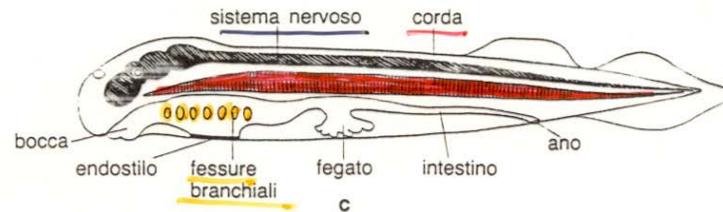
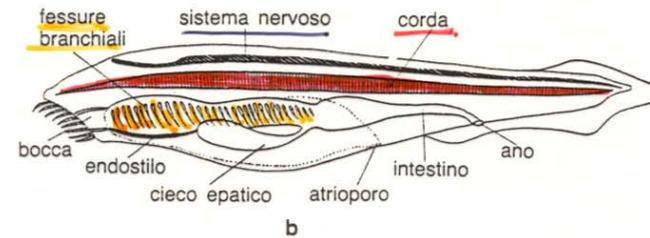
Cordati



Tunicati



Cefalocordati



Vertebrati



New taxa

Media nuove specie per anno

Land and freshwater vertebrates	560
Insects	7000
Other land animals	2500
Plants	2300
Other land organisms	1800
Marine fishes	140
Marine Crustacea	440
Other marine organisms	1000
Marine algae	90

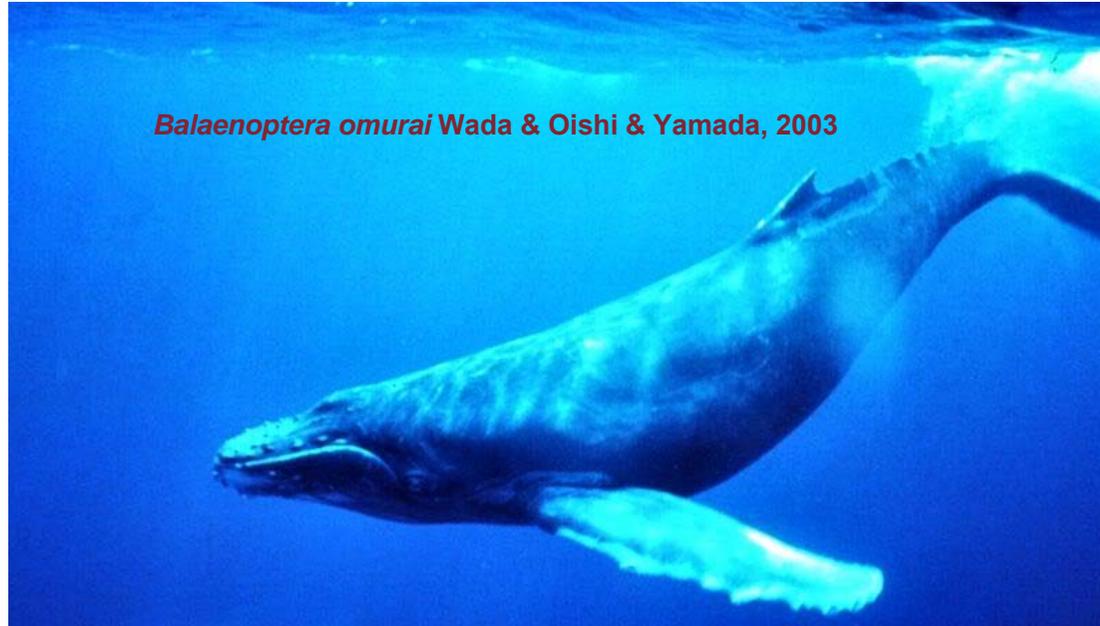
New taxa

anfibi da 4003 (1985) a 5282 (2001)

Paedophryne amauensis
Rittmeyer, Allison, Gründler,
Thompson & Austin, 2012



New taxa



Mammiferi

Orcaella heinsohni

Beasley, Robertson and Arnold, 2005



Snubfin dolphin



New taxa

Nuovi mammiferi scoperti recentissimamente:

Muntiacus putaoensis
1999 – N. Myanmar



Copyright Mark Kostich

Megamuntiacus vuquangensis
1996 – Laos



© Alon Rabinowitz

Pseudoryx nghetinhensis
1993 - Laos/Vietnam

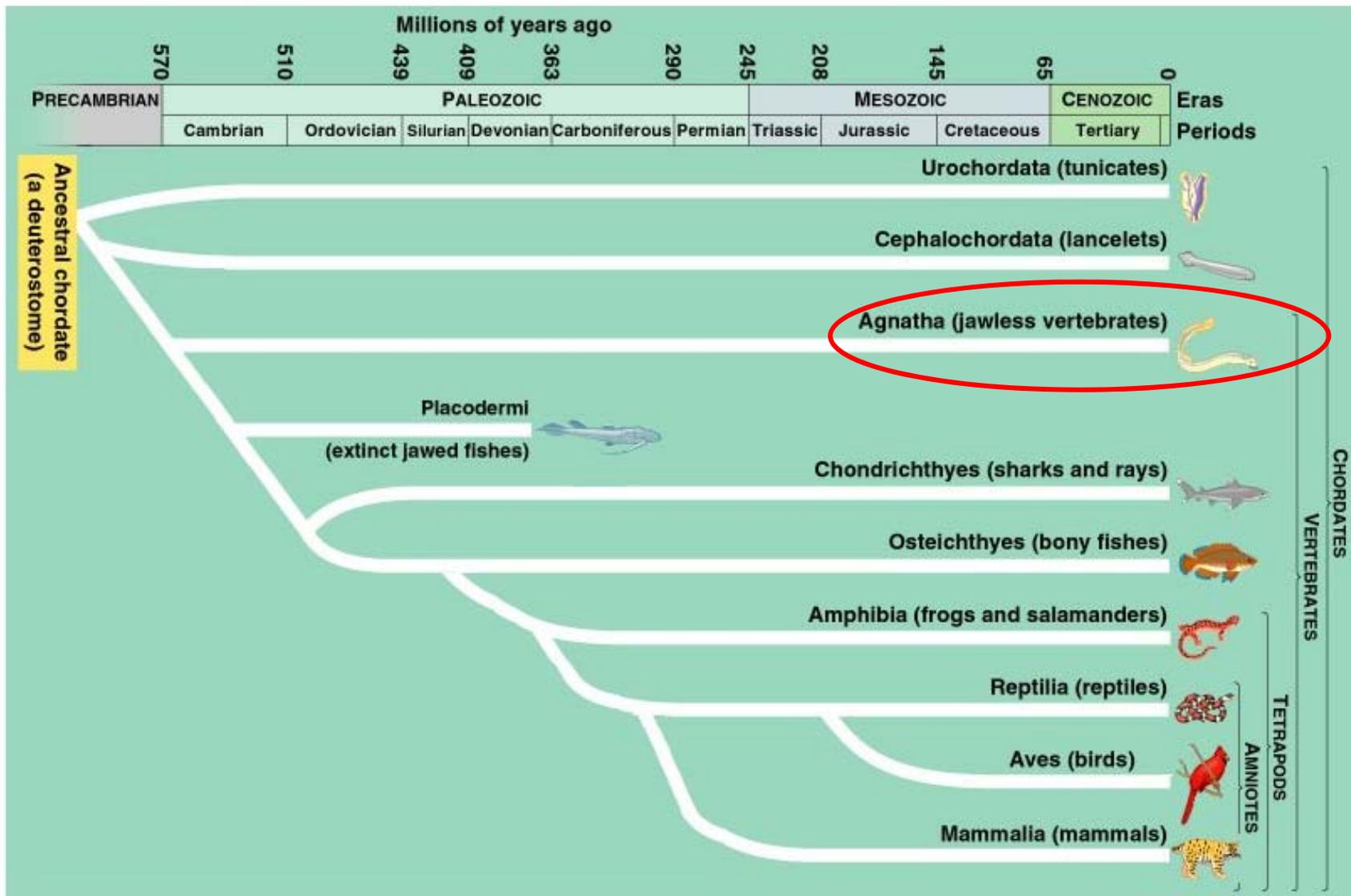


Loxodonta africana
elefante di savana

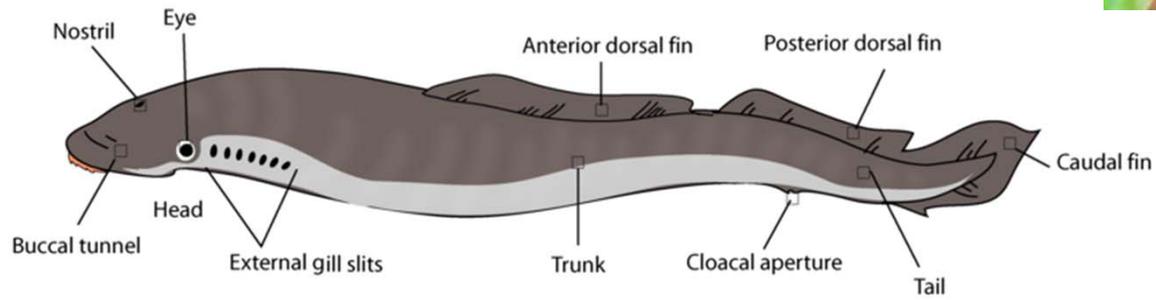
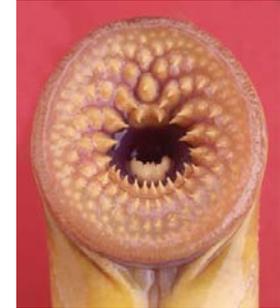
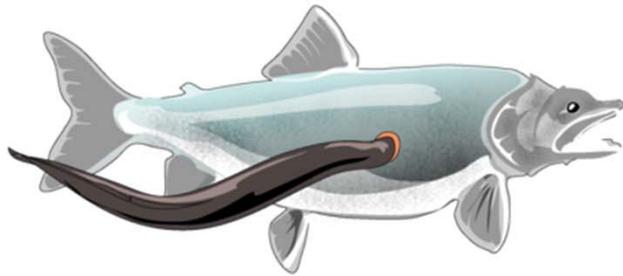


Loxodonta cyclotis
elefante di foresta

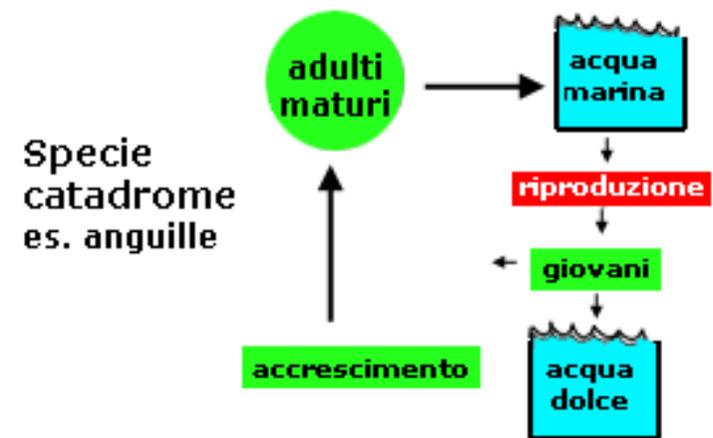
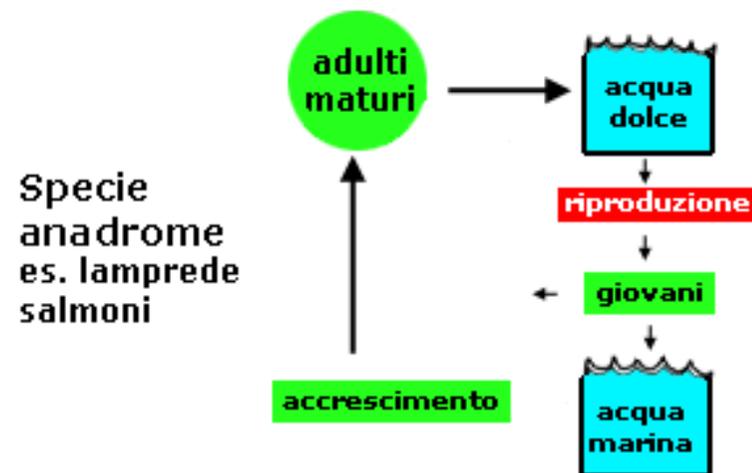
© Martyn Colbeck / gettyimages.com

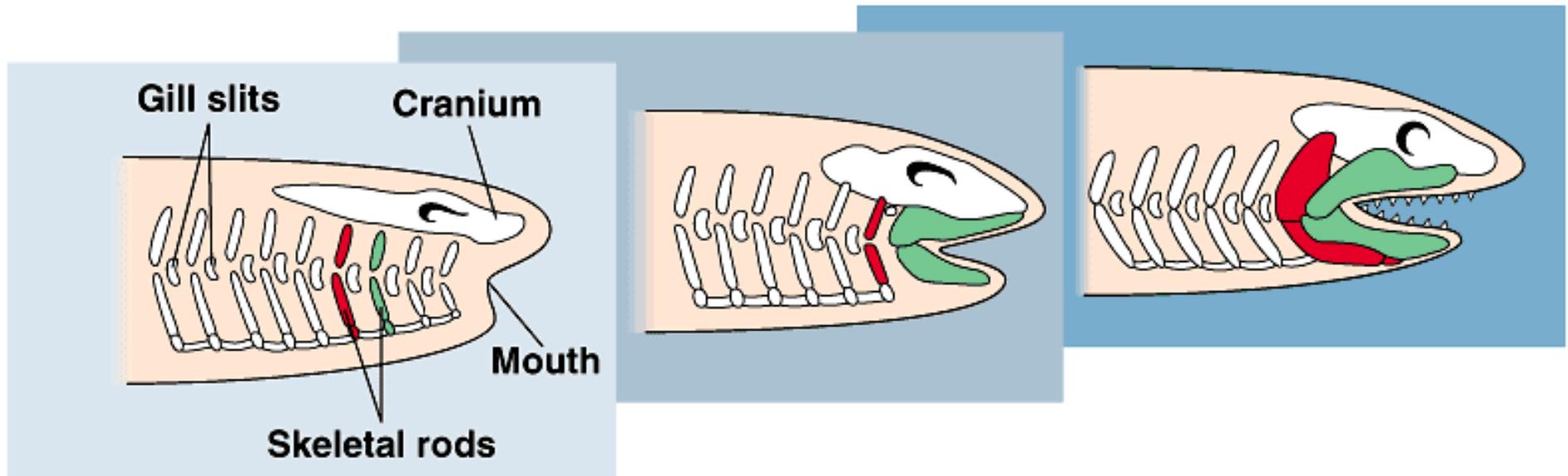


Agnata

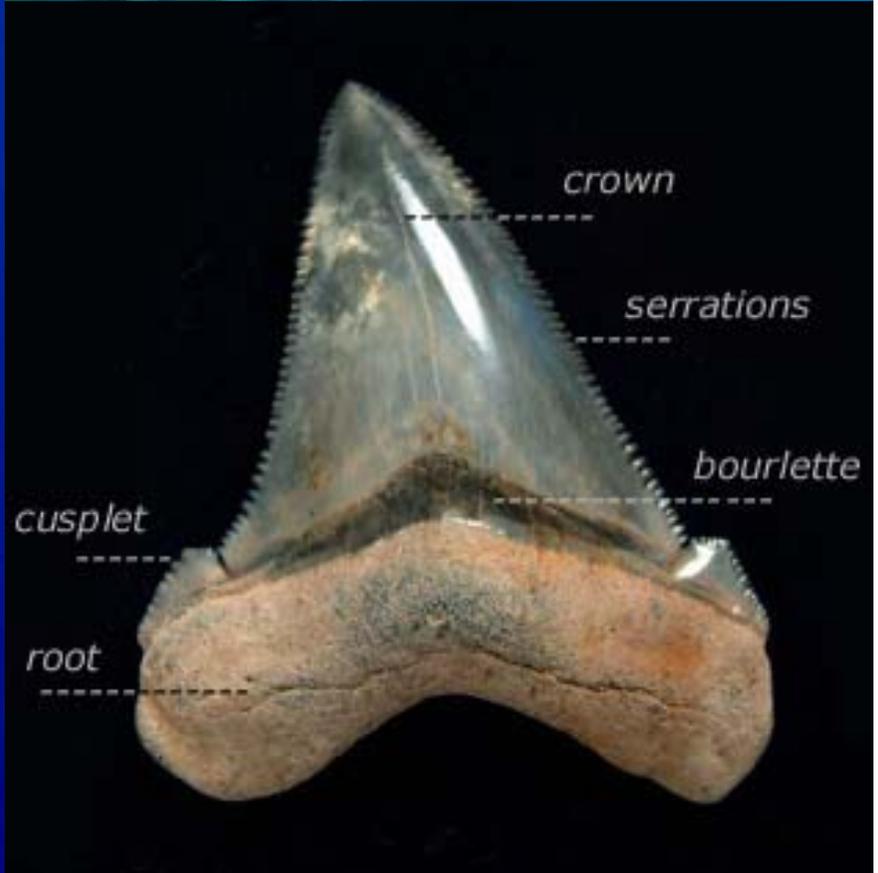


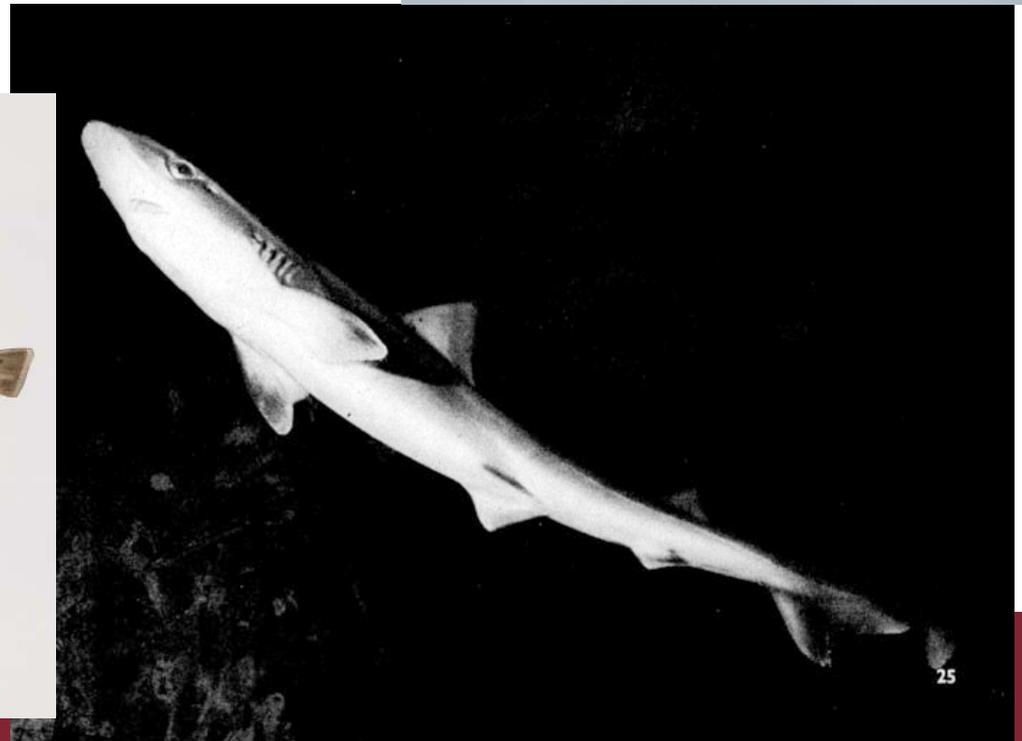
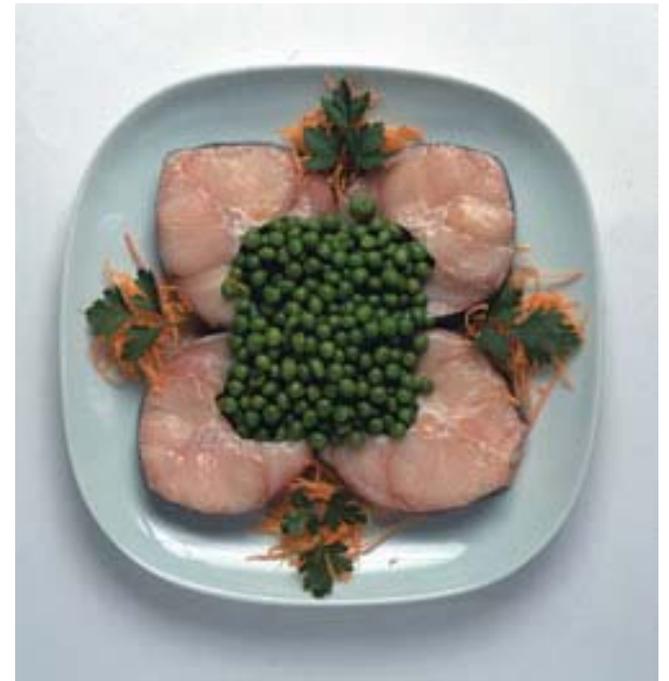
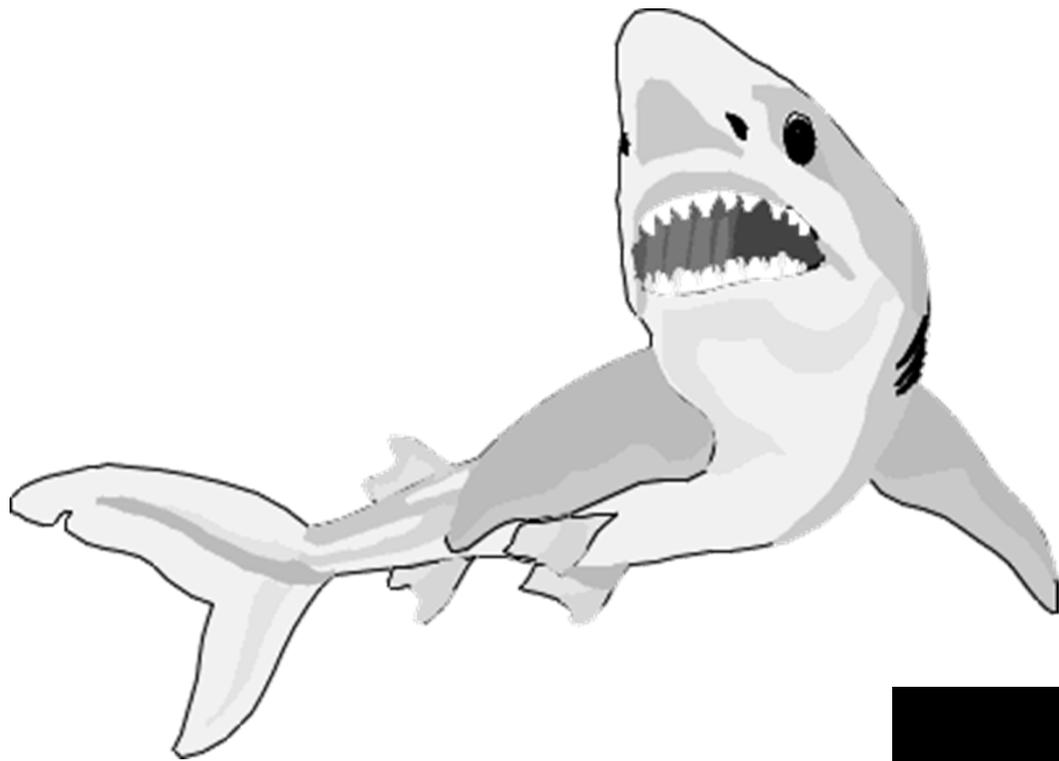
Schemi relativi ai cicli biologici delle specie ittiche anadrome e catadrome



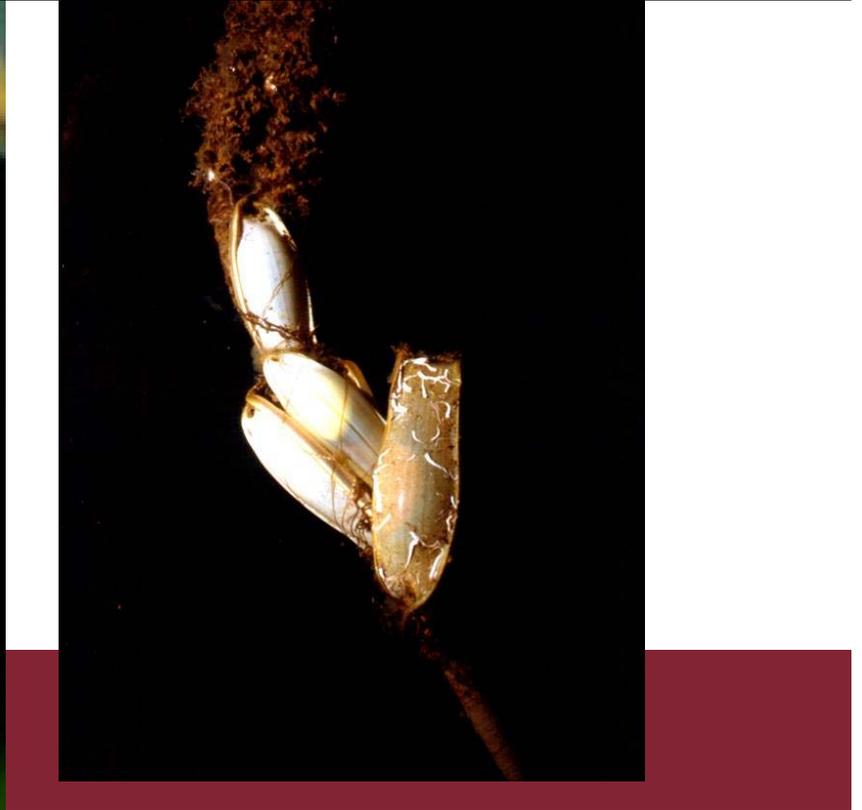


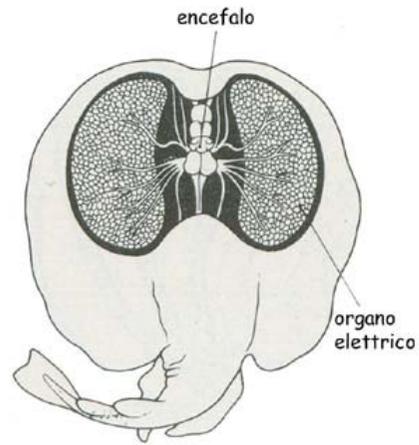
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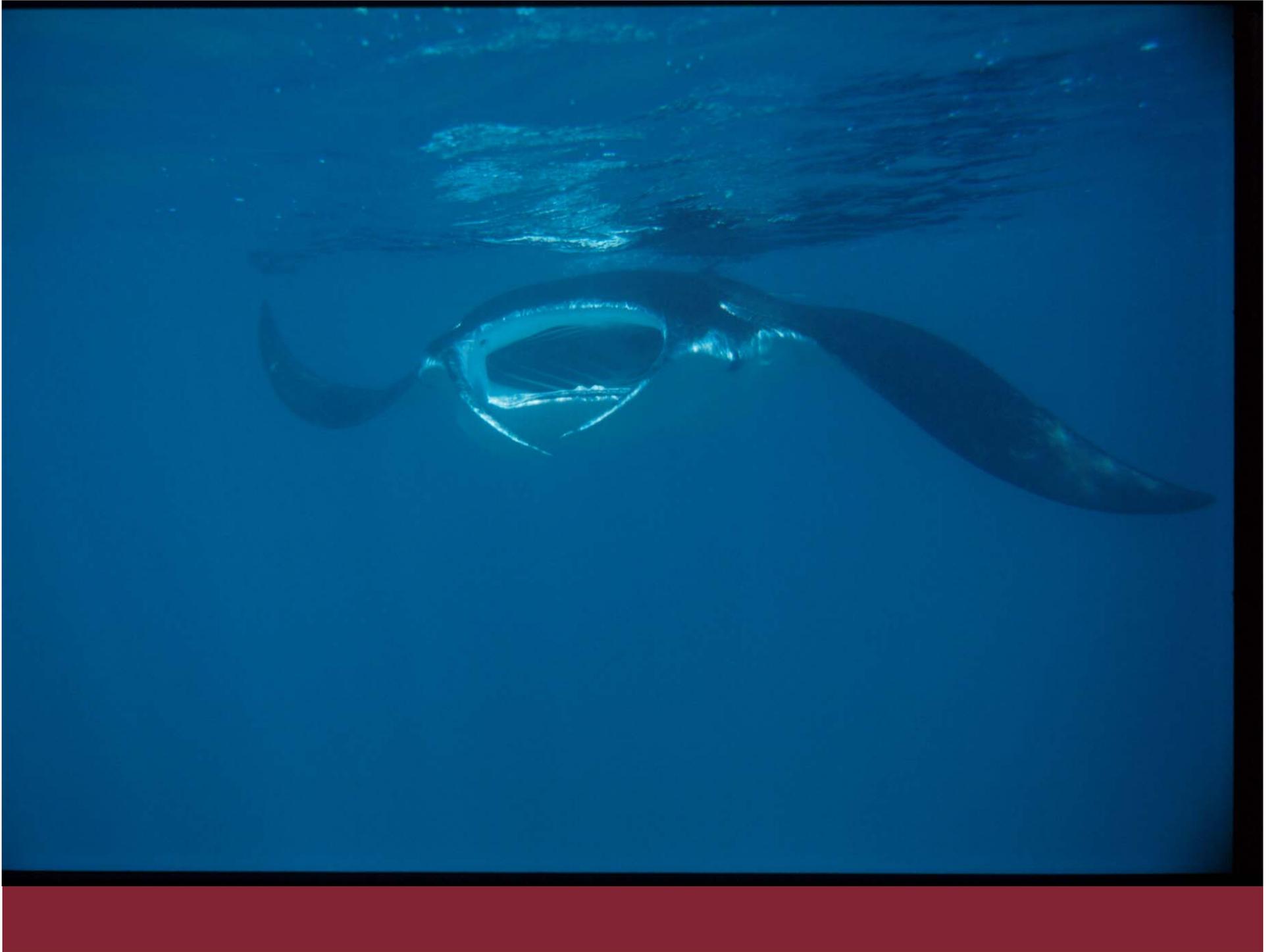


La Torpedine batideo. A lo organi elettri è munito.

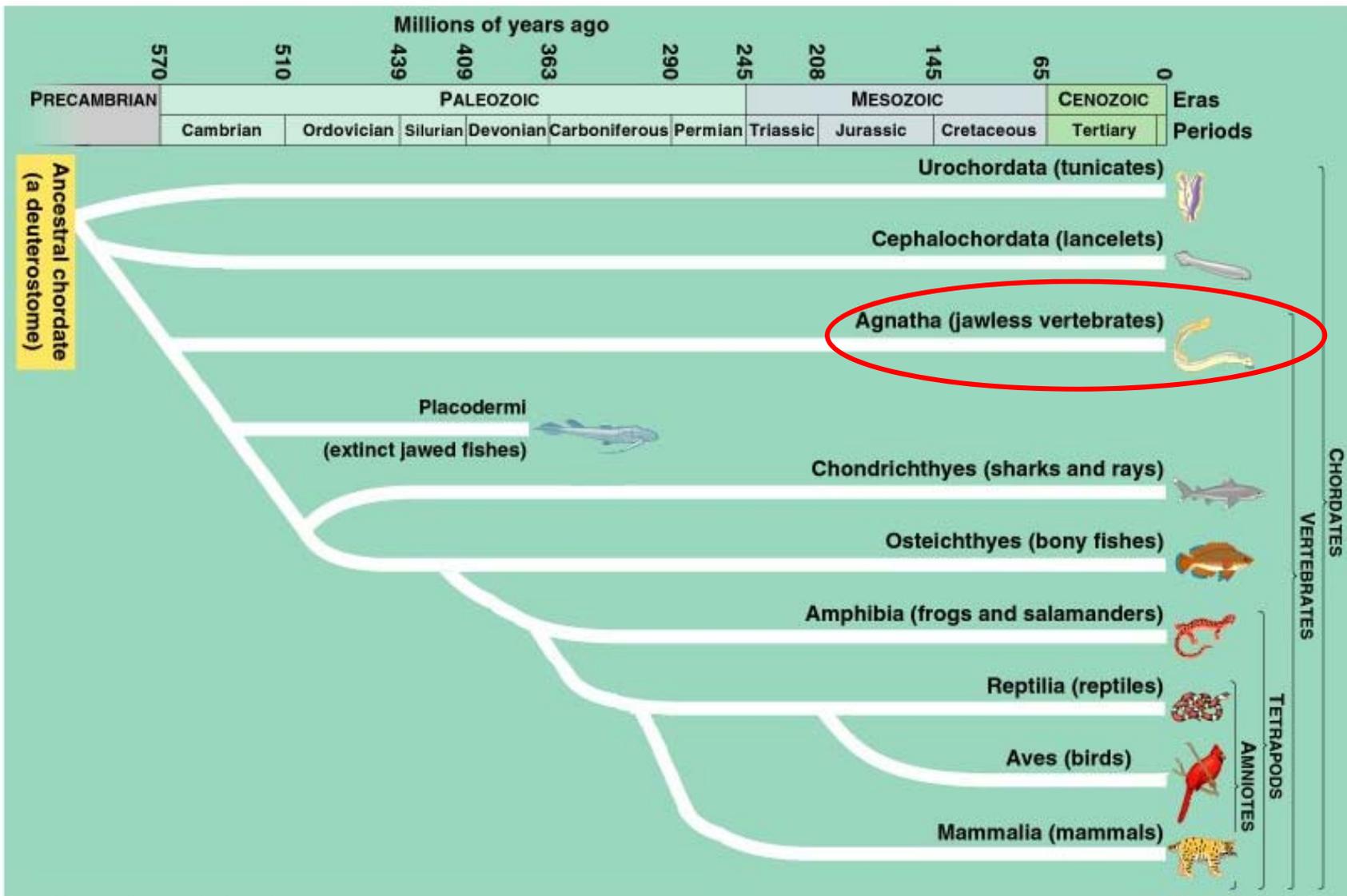


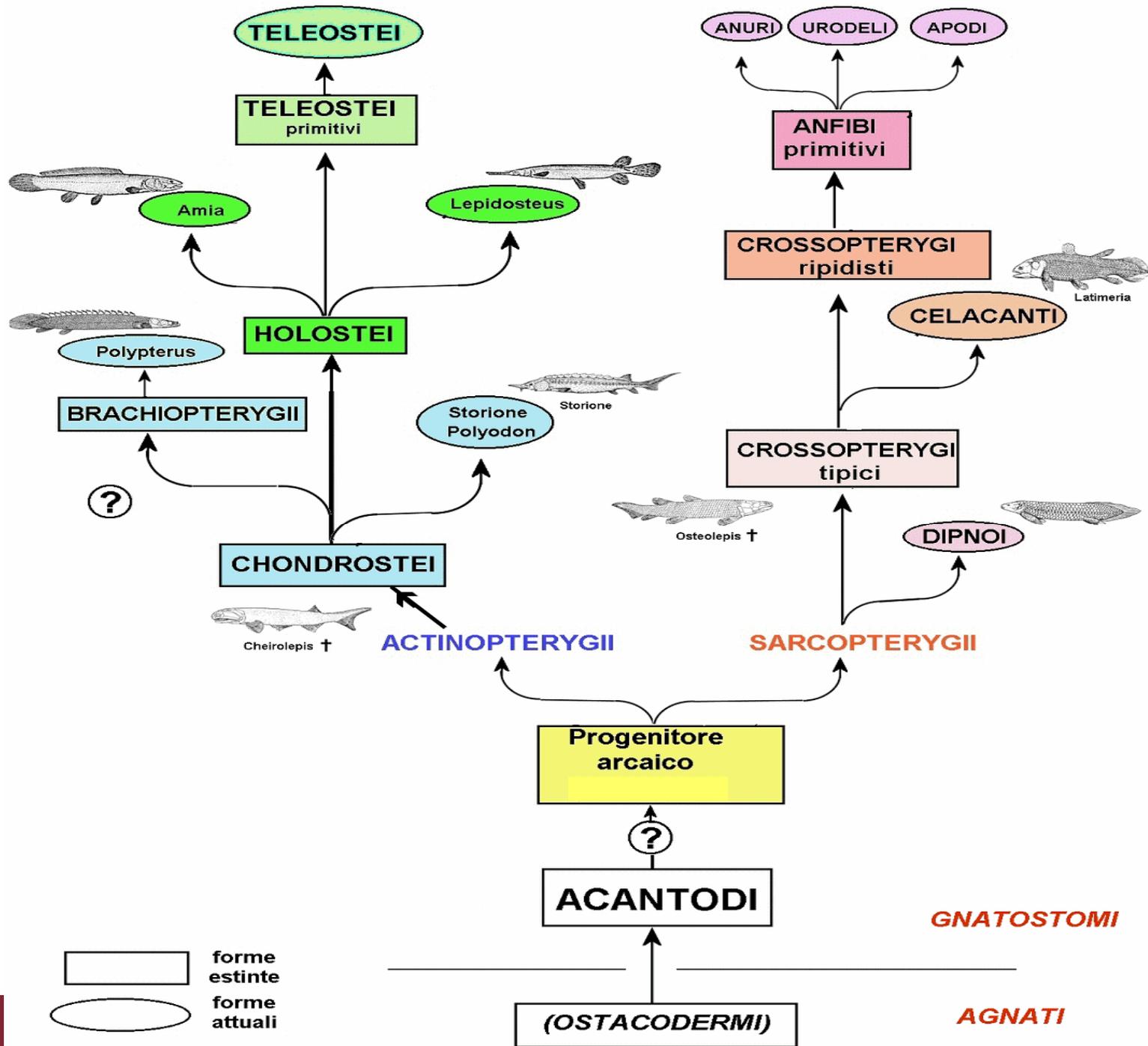
RAZZA PORCOSPINO
Urogymnus asperrimus
Porcupine ray







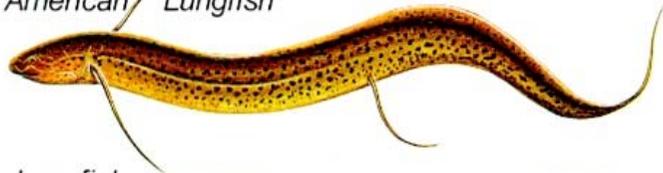




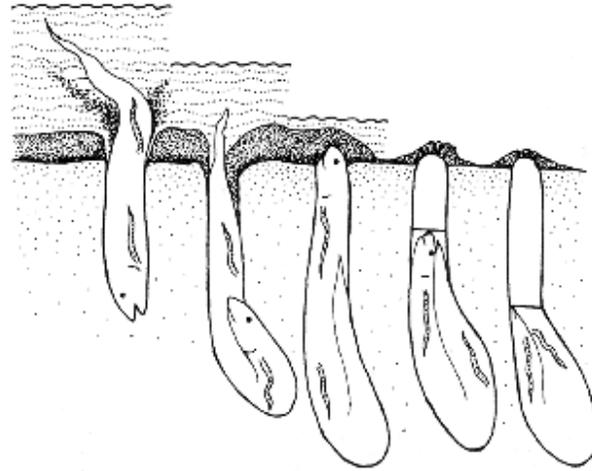
Australian Lungfish



South American Lungfish



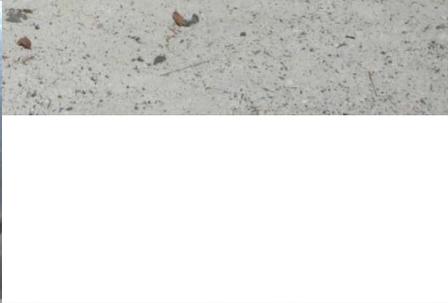
African Lungfish

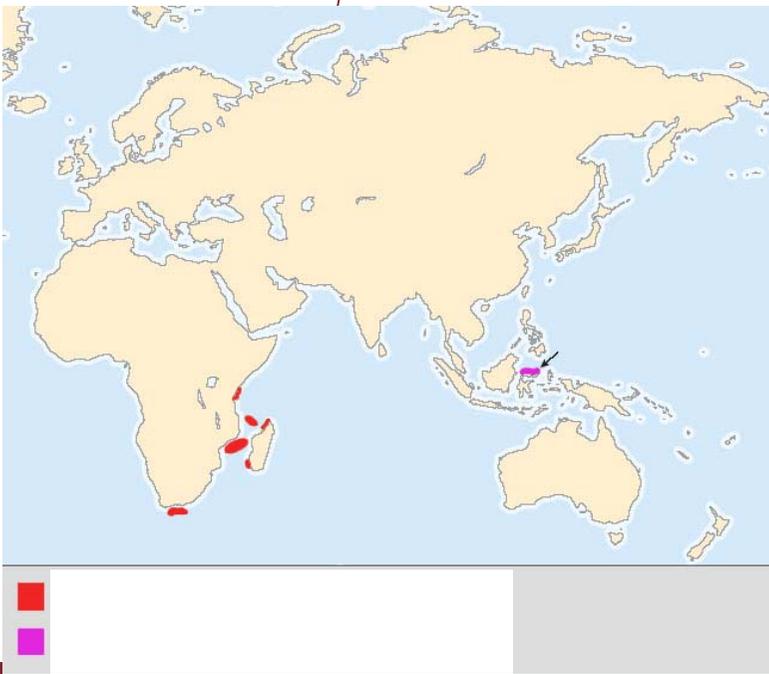


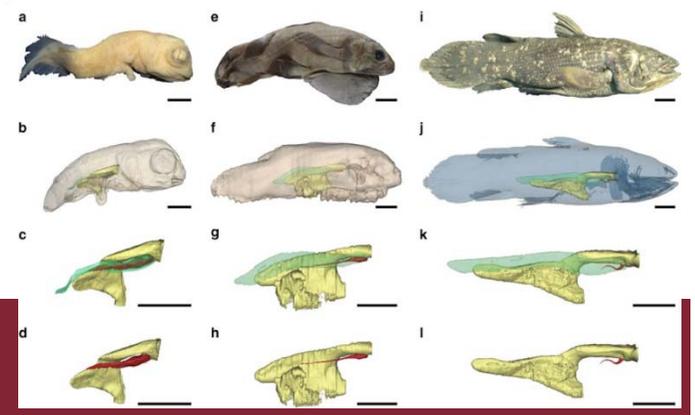
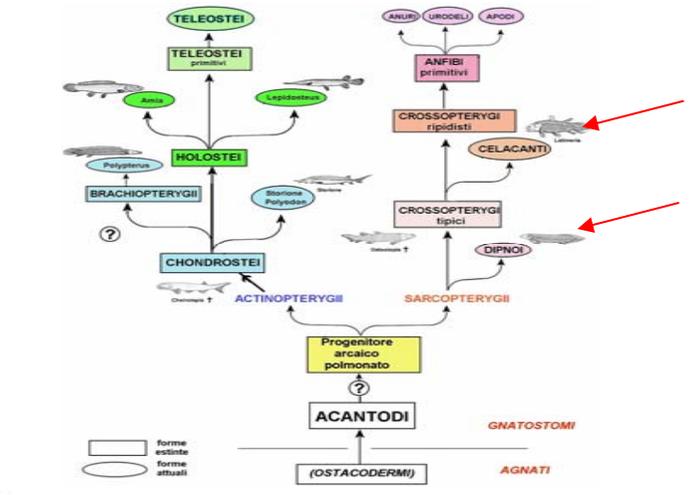
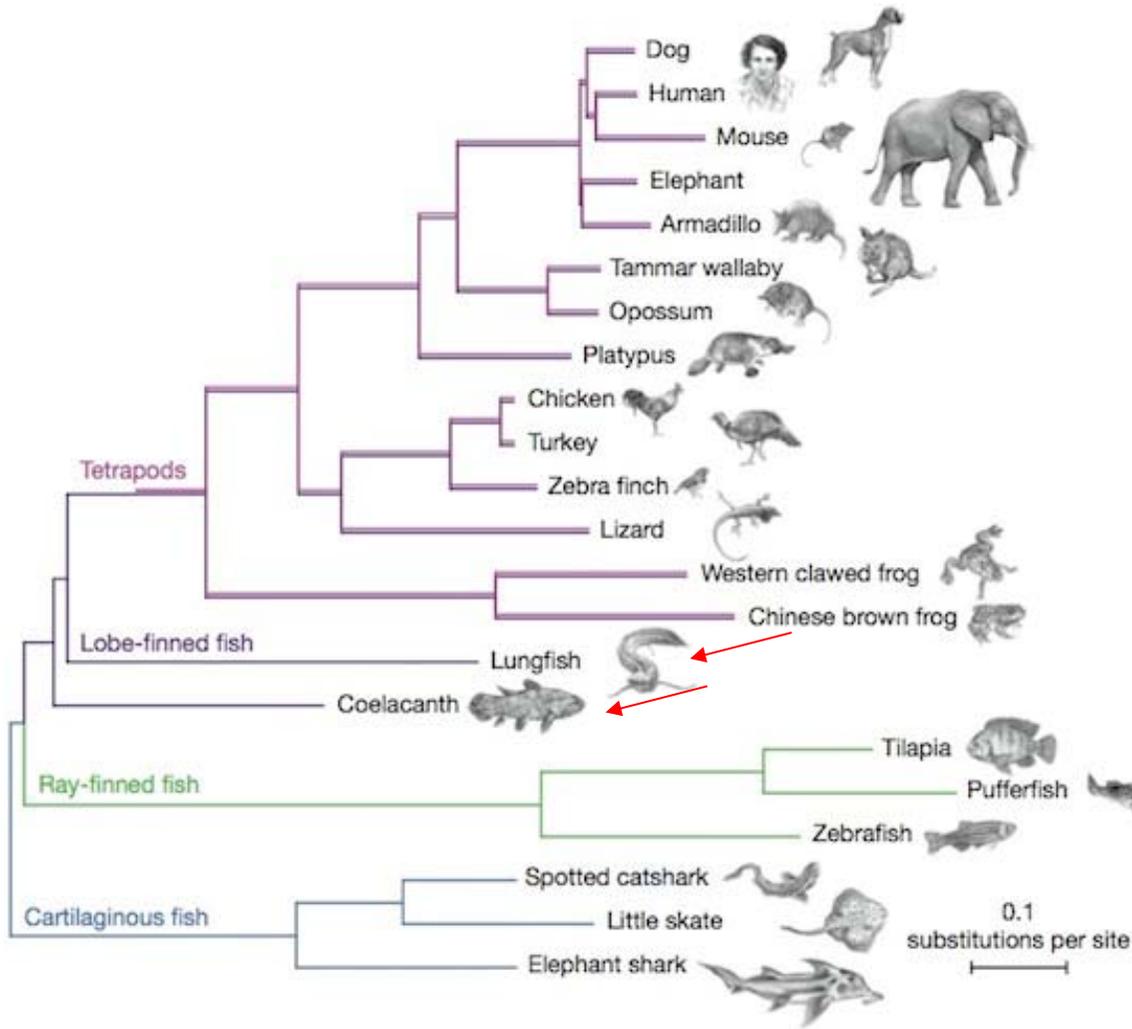
As the water level falls lungfish burrow into the bottom mud to form a cocoon and aestivate through the dry season.

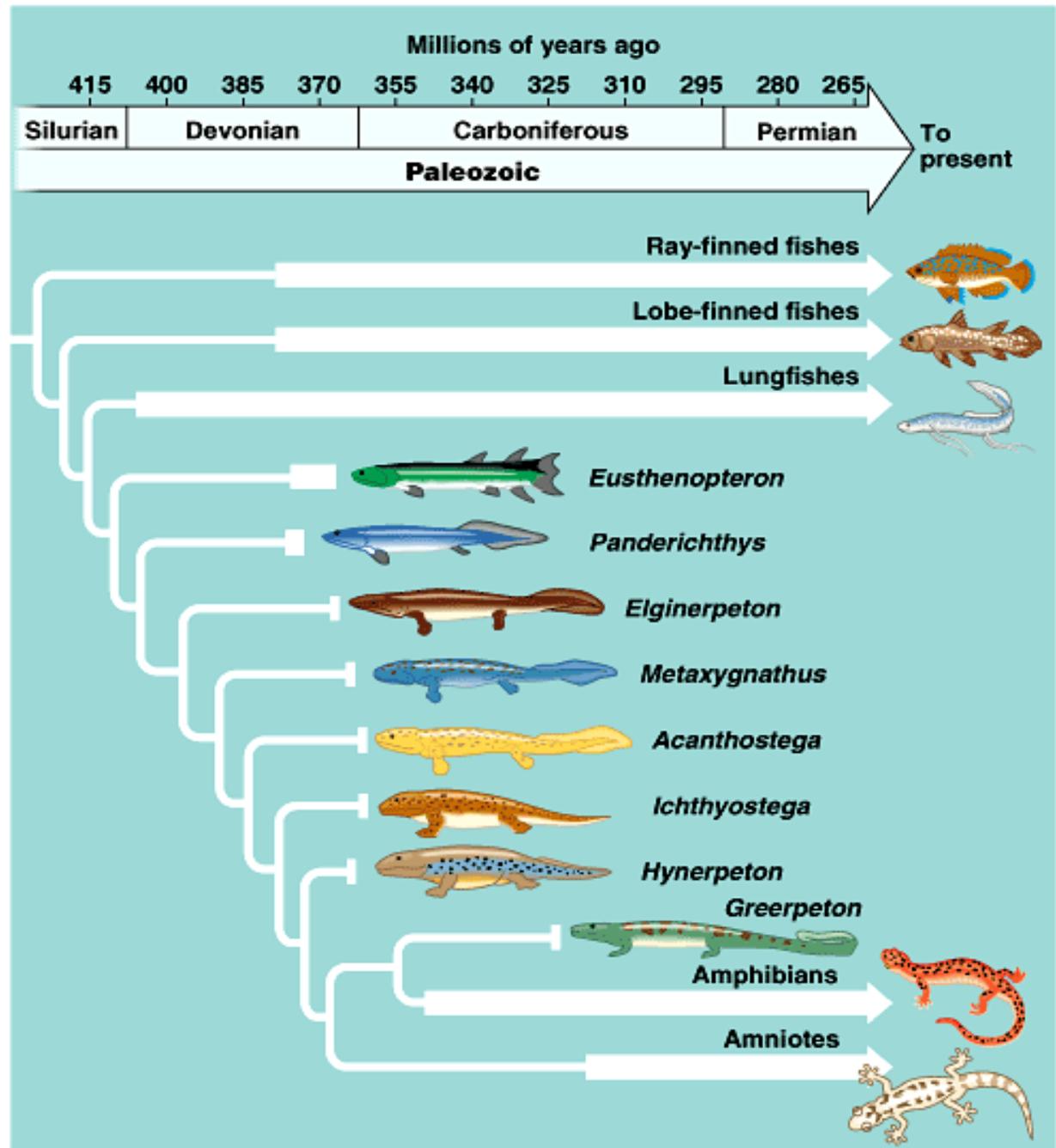












ANFIBI Urodeli



Triturus cristatus
Northern crested newt

Photograph / Copyright - R. A. Griffiths



Axolotl



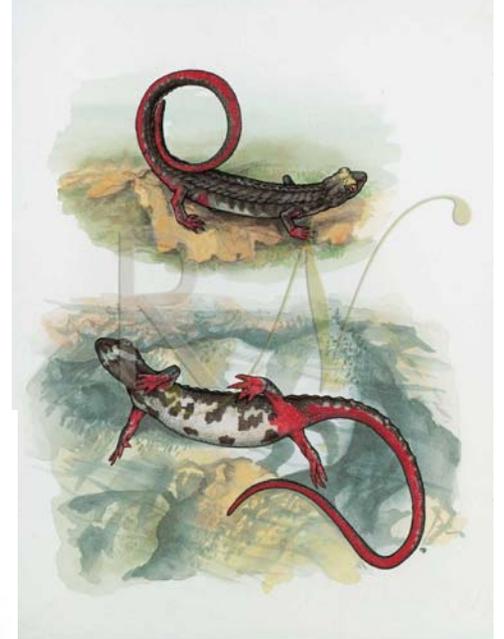
S. atra



S. a. aurorae



Salamandridae

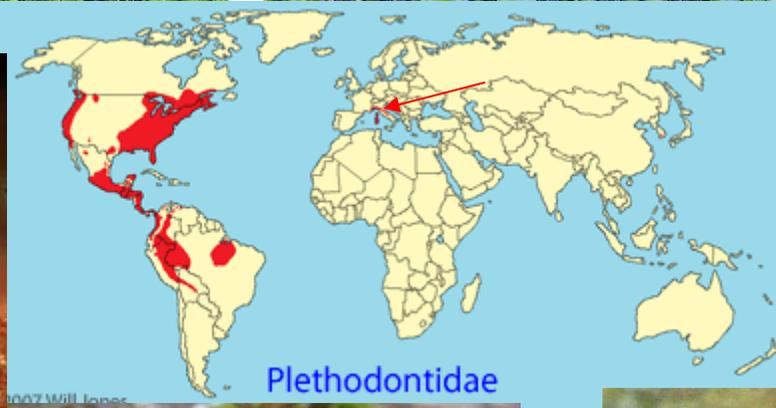




© Gary Nafis



Typhlomolge

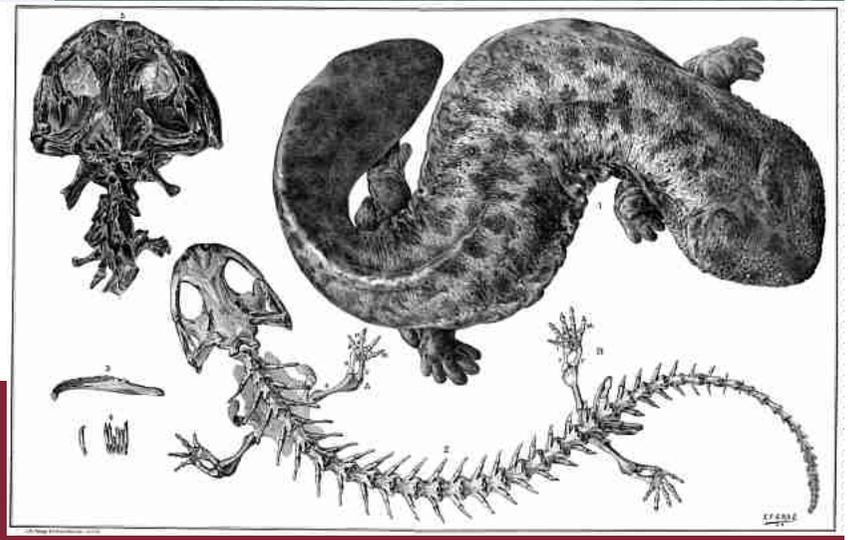


Speleomantes genei



euprocto





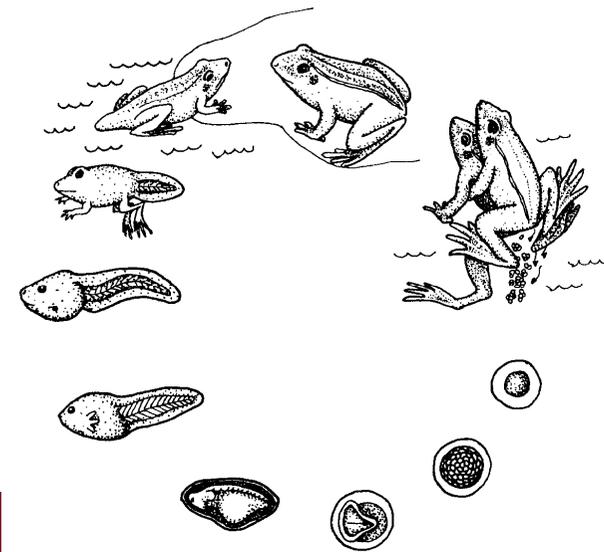
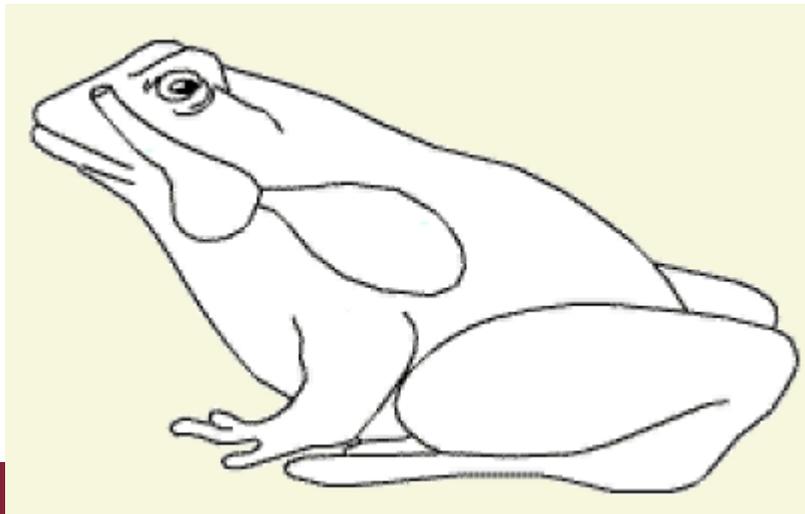


ANFIBI Anuri

Rospo comune



Rana verde











www.naturfoto.cz

© Jiří Bo



APODI-GIMNOFIONI

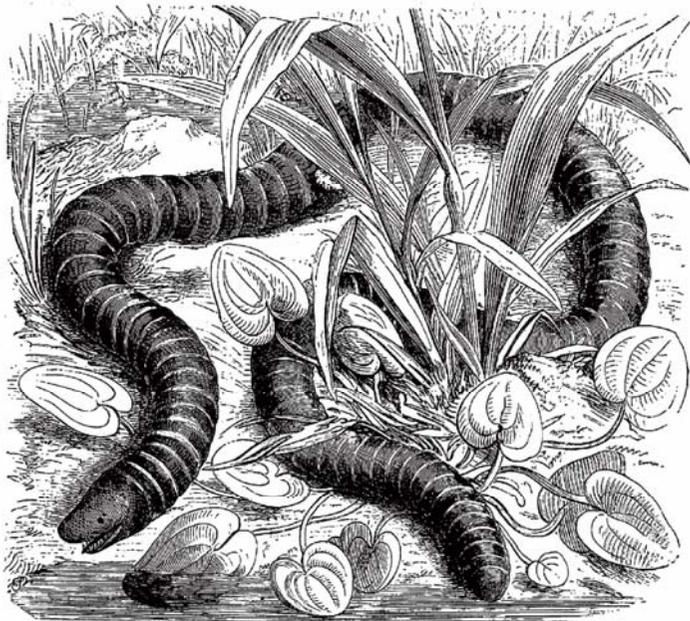
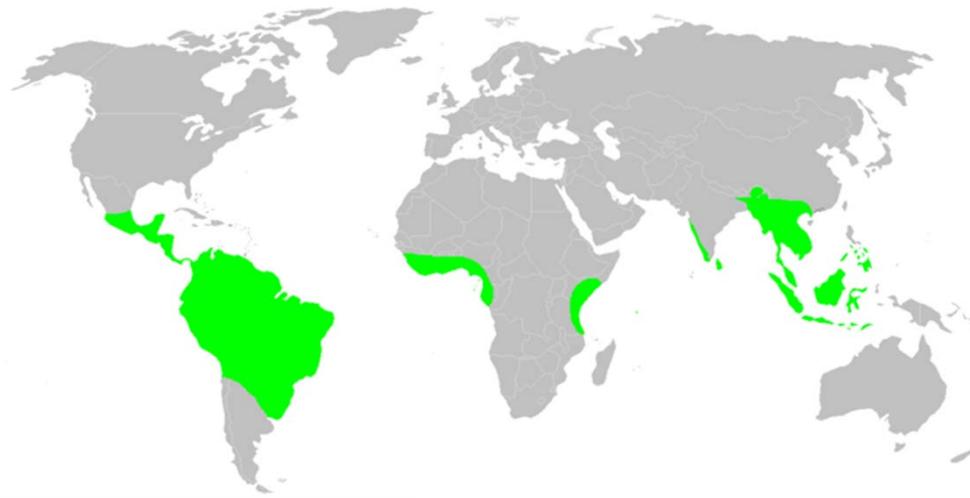
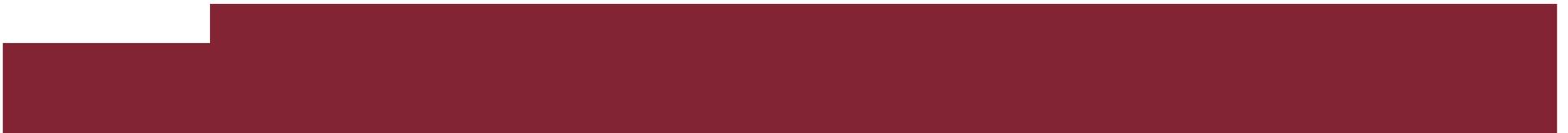
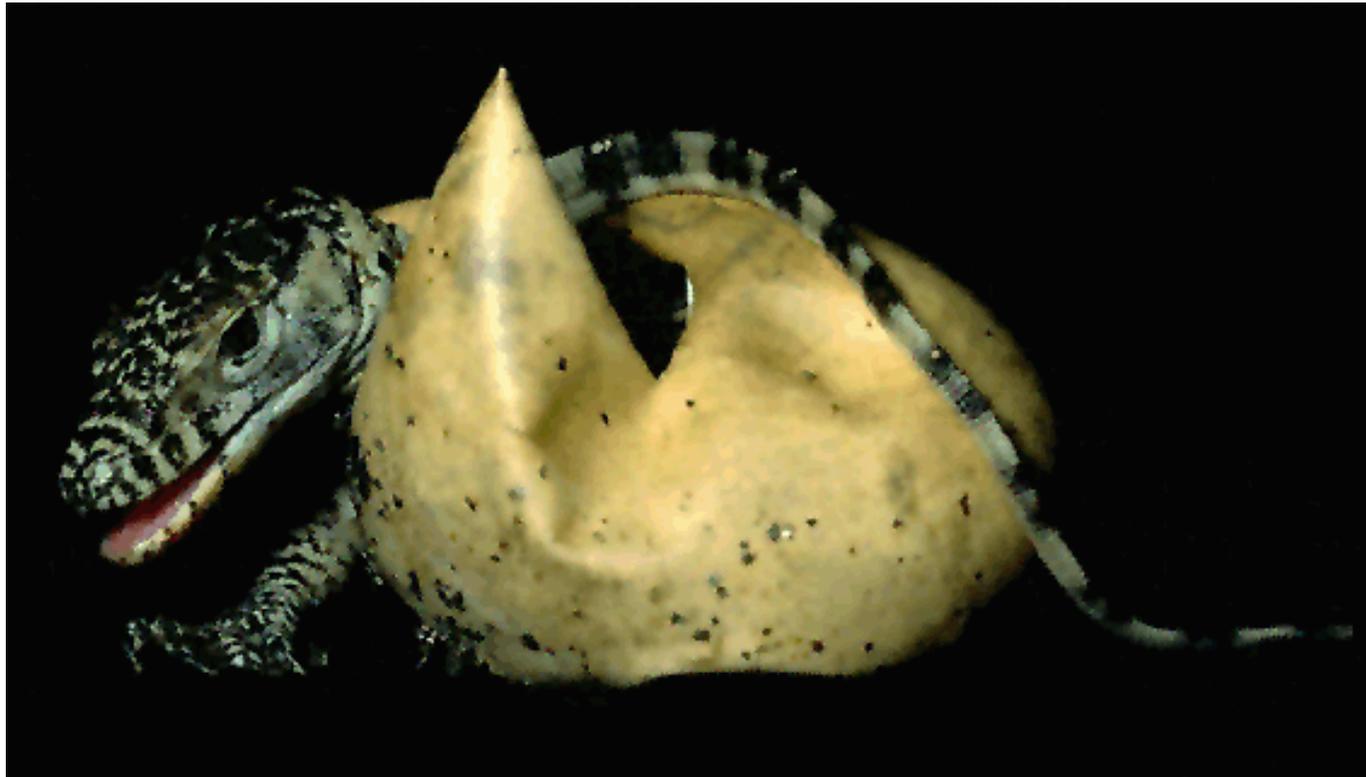
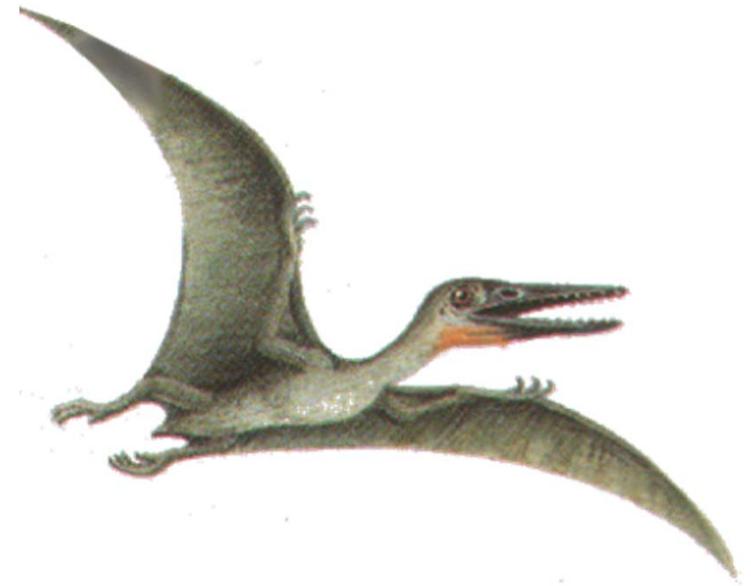
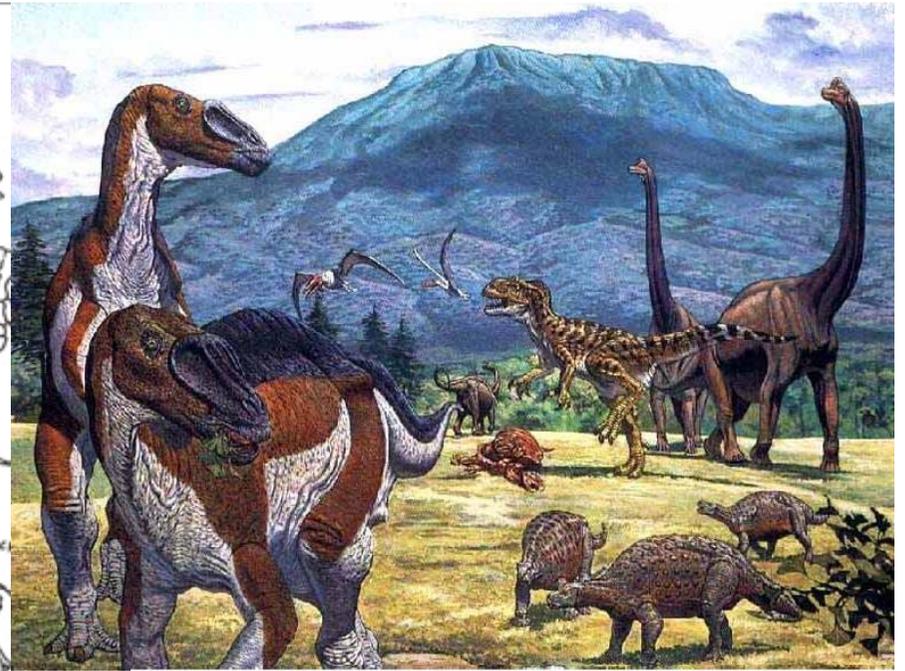


Fig. 497. — Le Siphonops annelé (grand. nat.).

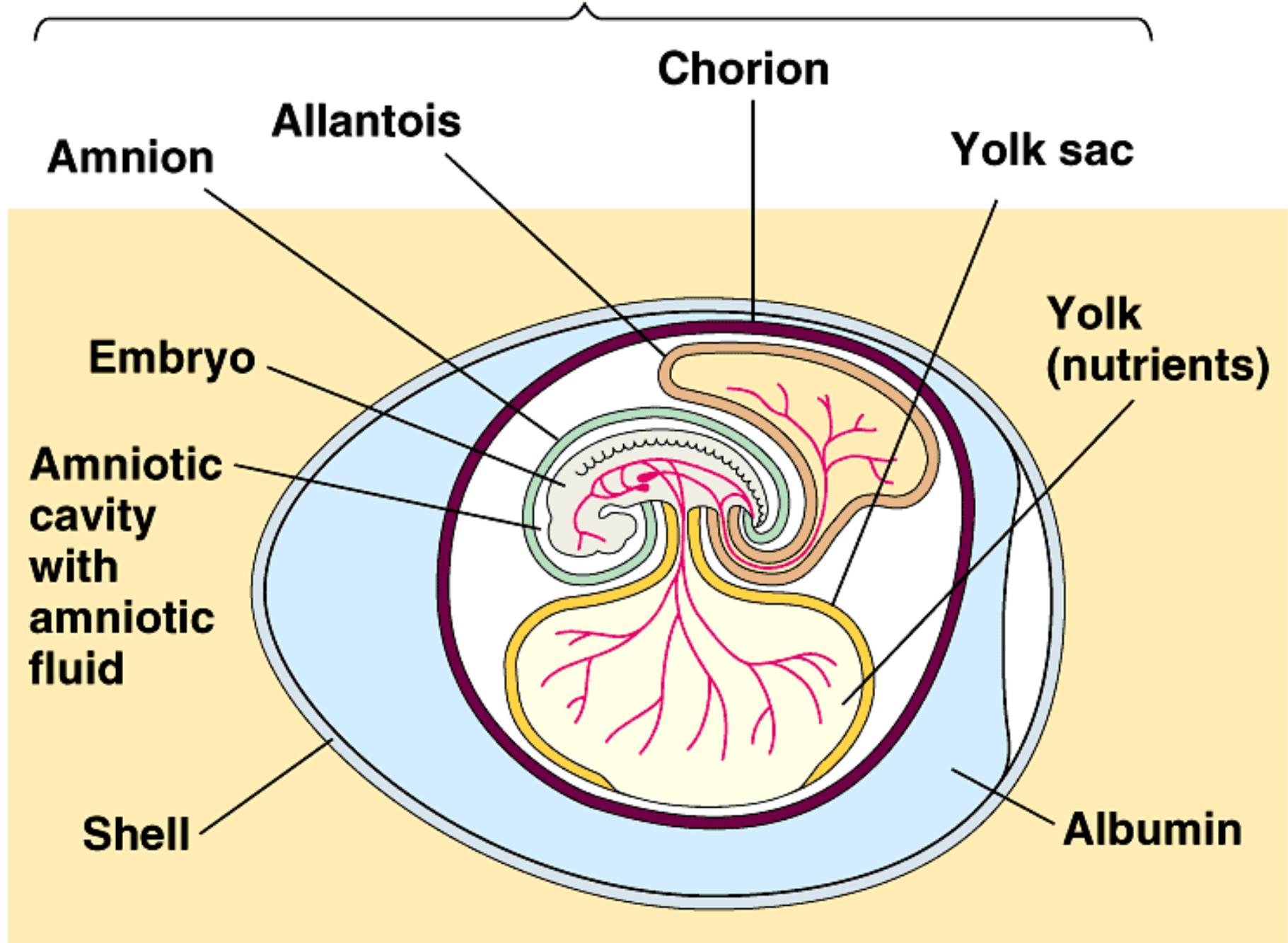


VERTEBRATI AMNIOTI





Extraembryonic membranes



RETTILI











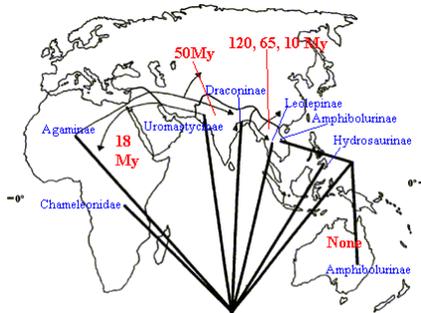
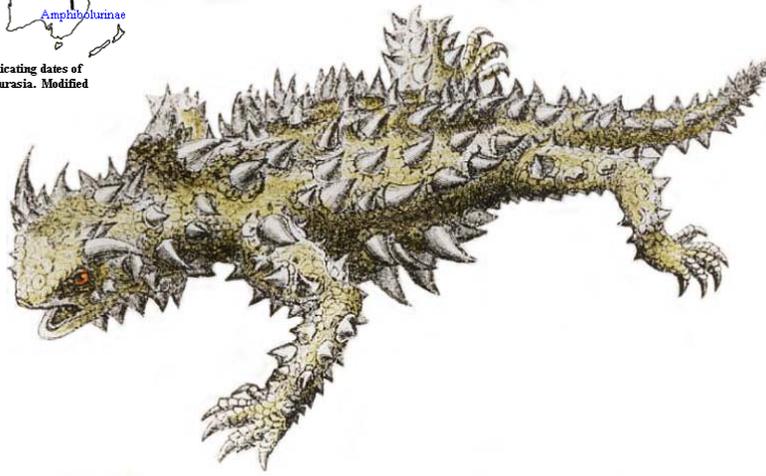
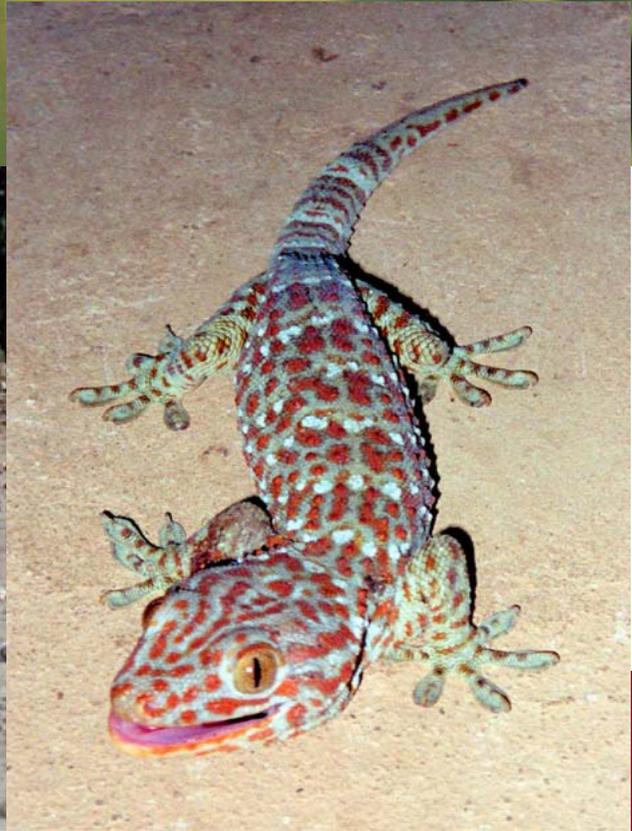


Fig. 1. Taxonomic distribution of Agamidae, indicating dates of accretion of various Gondwanan blocks onto Laurasia. Modified from Macey et al. (2000a).



agamidi











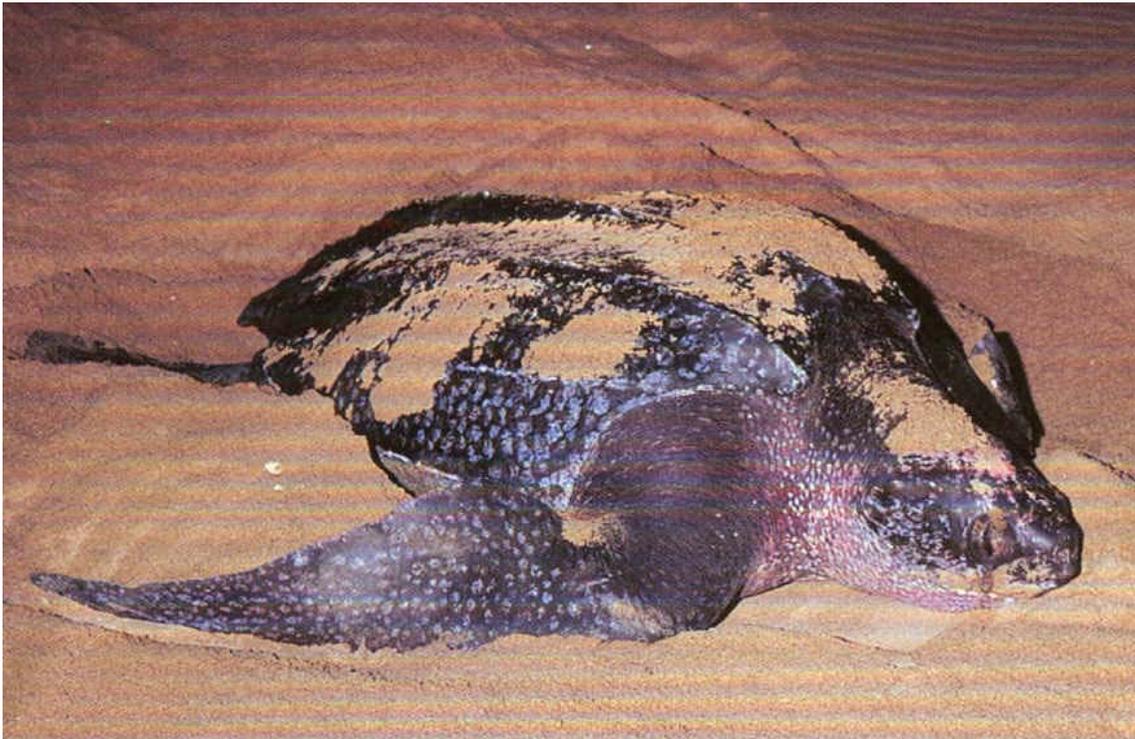




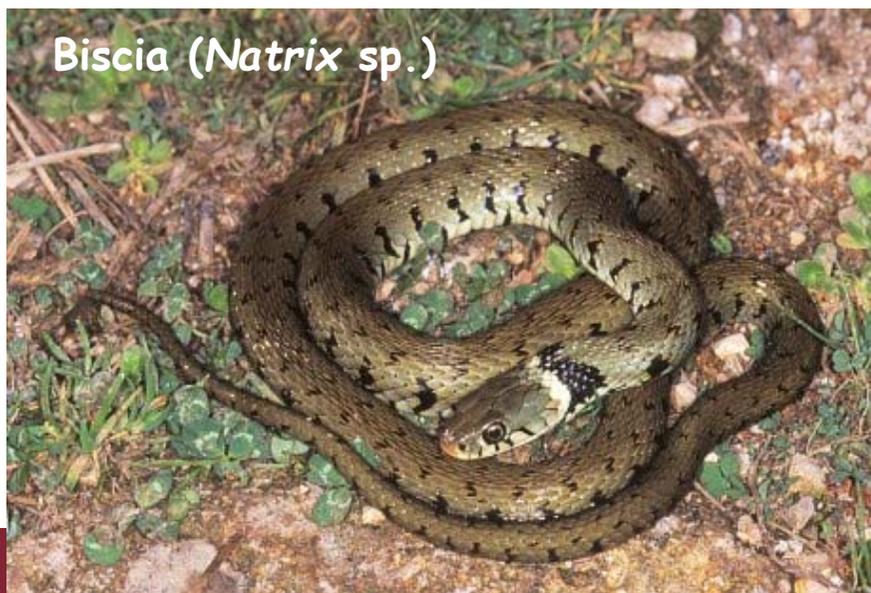
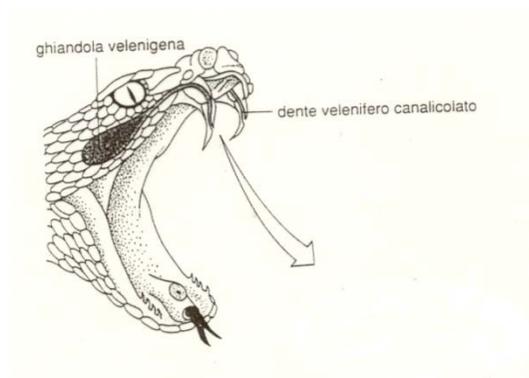








Rettili squamati: ofidi

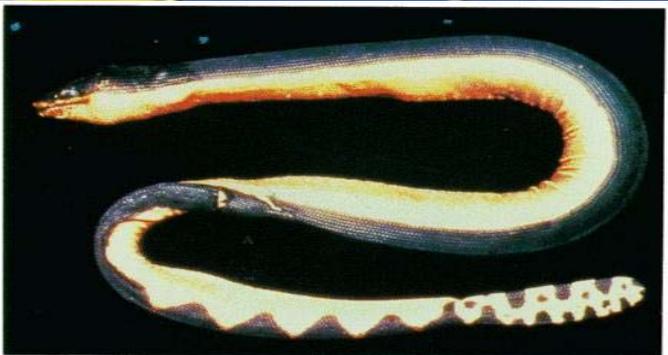






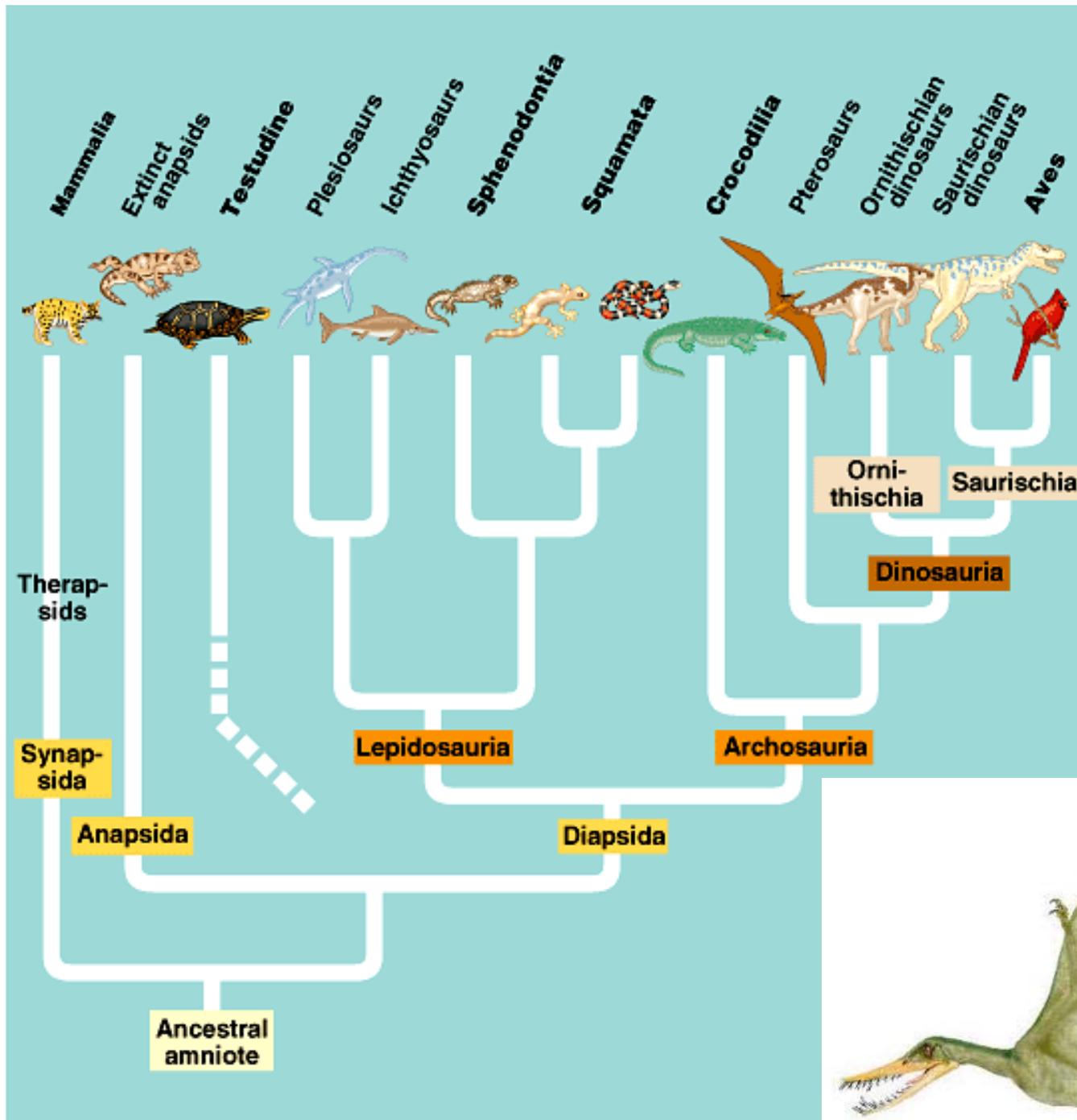


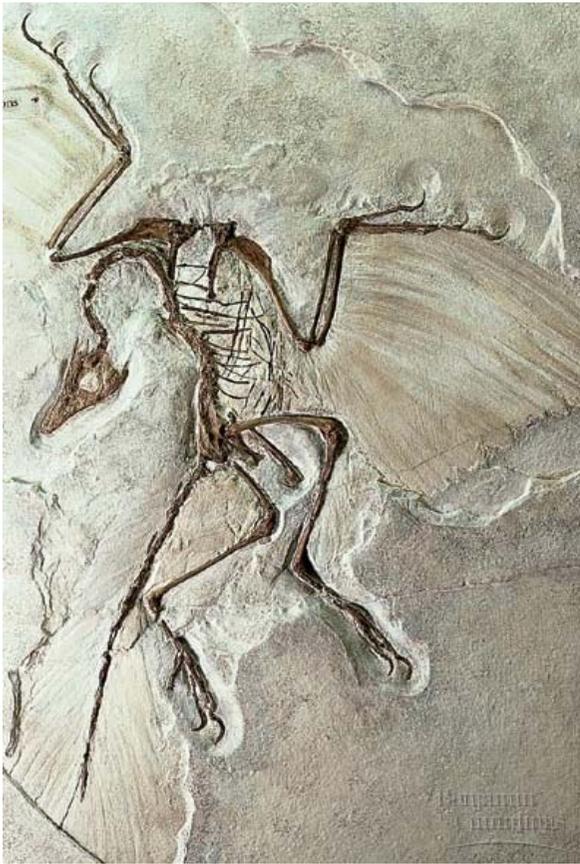




WAIKIKI AQUARIUM

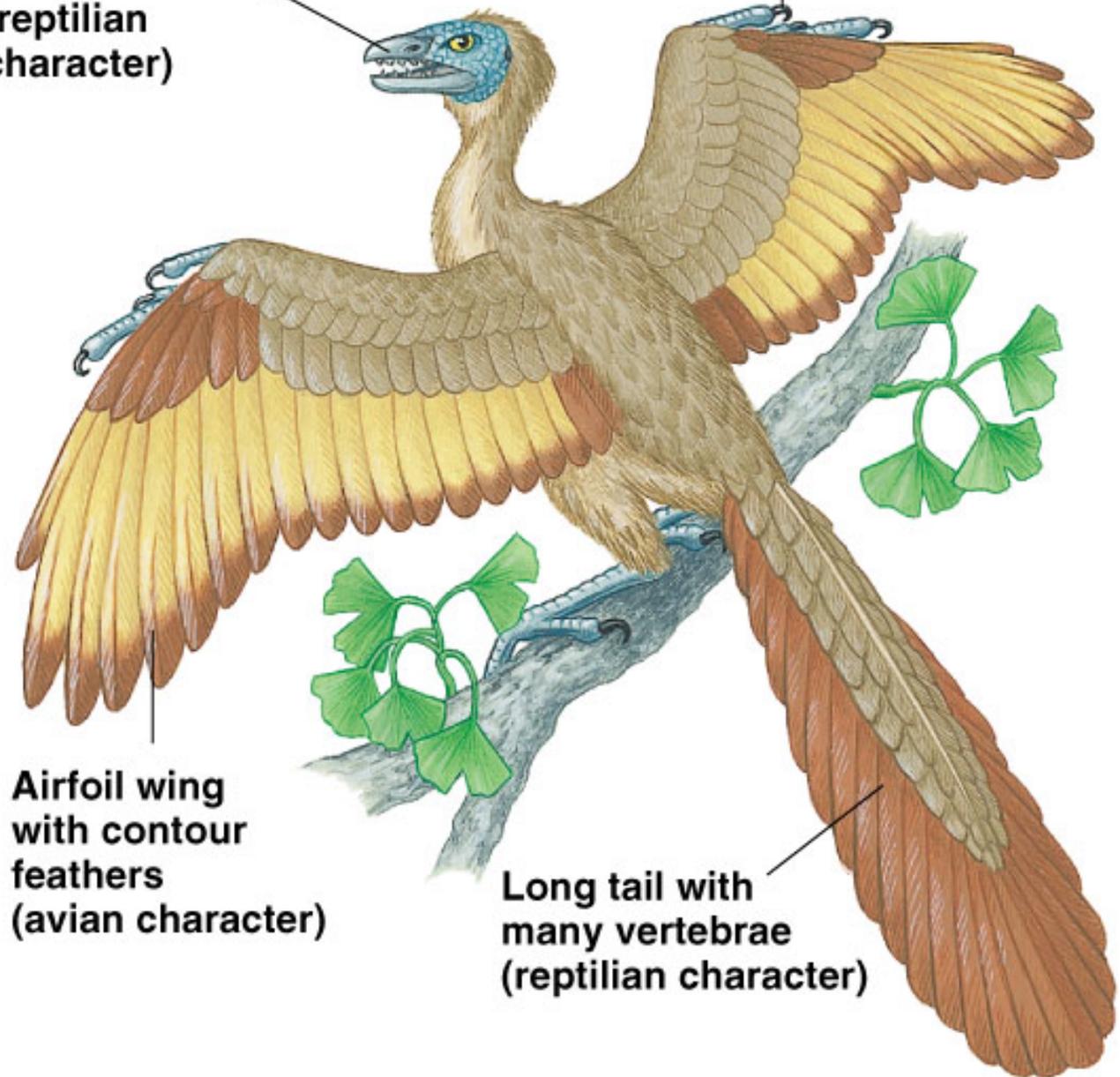






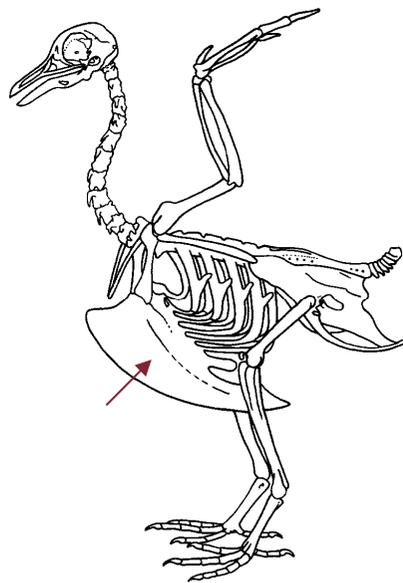
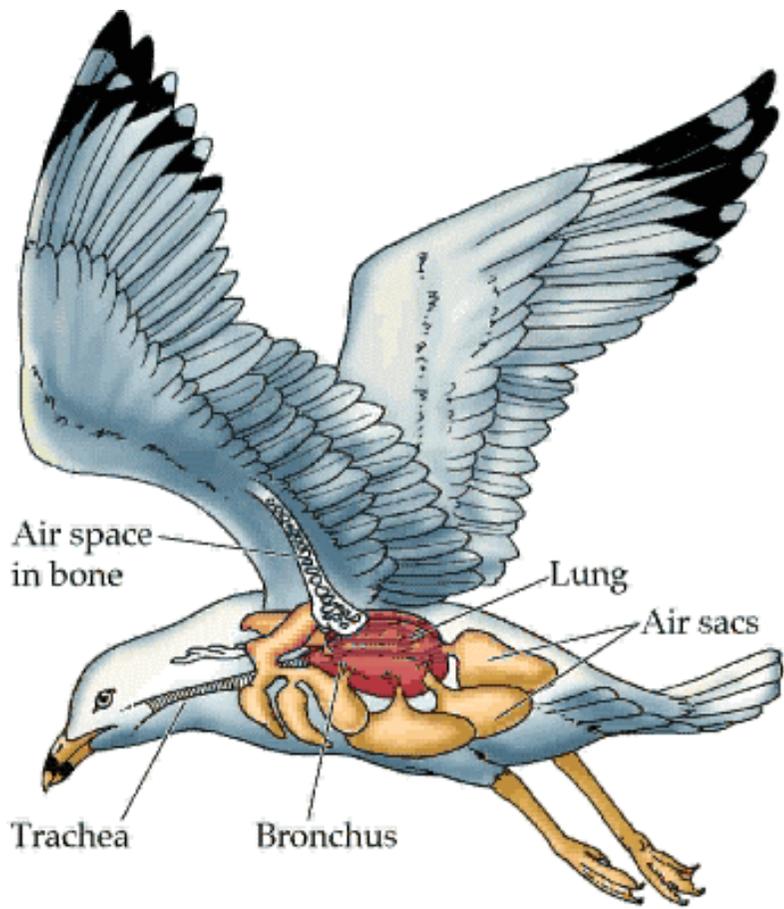
**Toothed beak
(reptilian
character)**

**Wing claw
(reptilian character)**

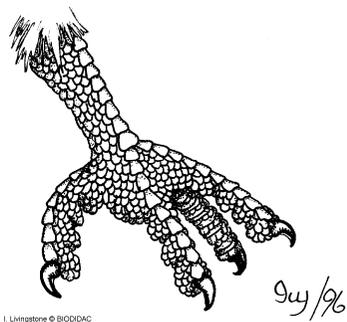


**Airfoil wing
with contour
feathers
(avian character)**

**Long tail with
many vertebrae
(reptilian character)**



J.Soudie©BIODIDAC

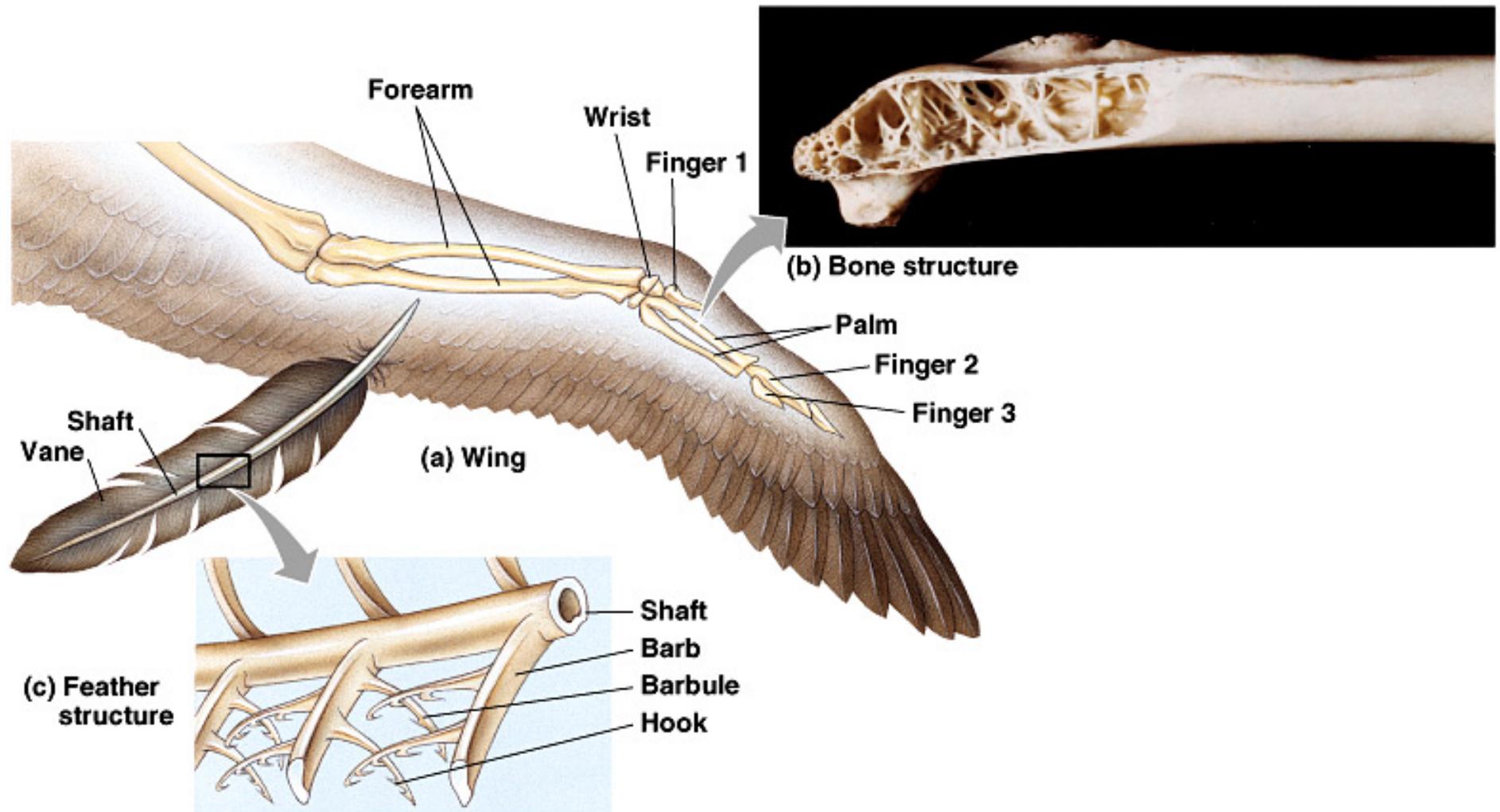


I. Livingstone © BIODIDAC



9y/96





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rapaci



anseriformi



galliformi



ciconiformi



passeriformi



caradriformi



fenicotteriformi



strigiformi



apodiformi



piciformi



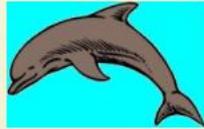




0 5cm

[Handwritten signature]

VERTEBRATI - Mammiferi



MAMMIFERI



Prototeri



Metateri (marsupiali)

Euteri (placentati)



MAMMIFERI



... il mestiere più antico del mondo

“Allora il Signore Dio plasmò dal suolo ogni sorta di bestie selvatiche e tutti gli uccelli del cielo e li condusse all'uomo, per vedere come li avrebbe chiamati: in qualunque modo l'uomo avesse chiamato ognuno di tutti gli uccelli del cielo e a tutte le bestie selvatiche



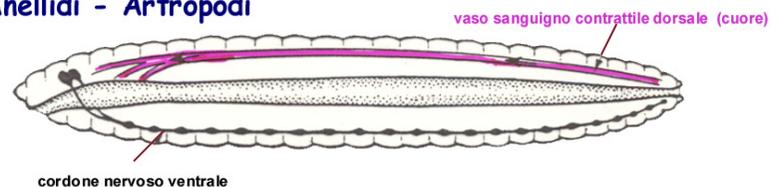
buono studio e ...

..... in bocca al lupo !

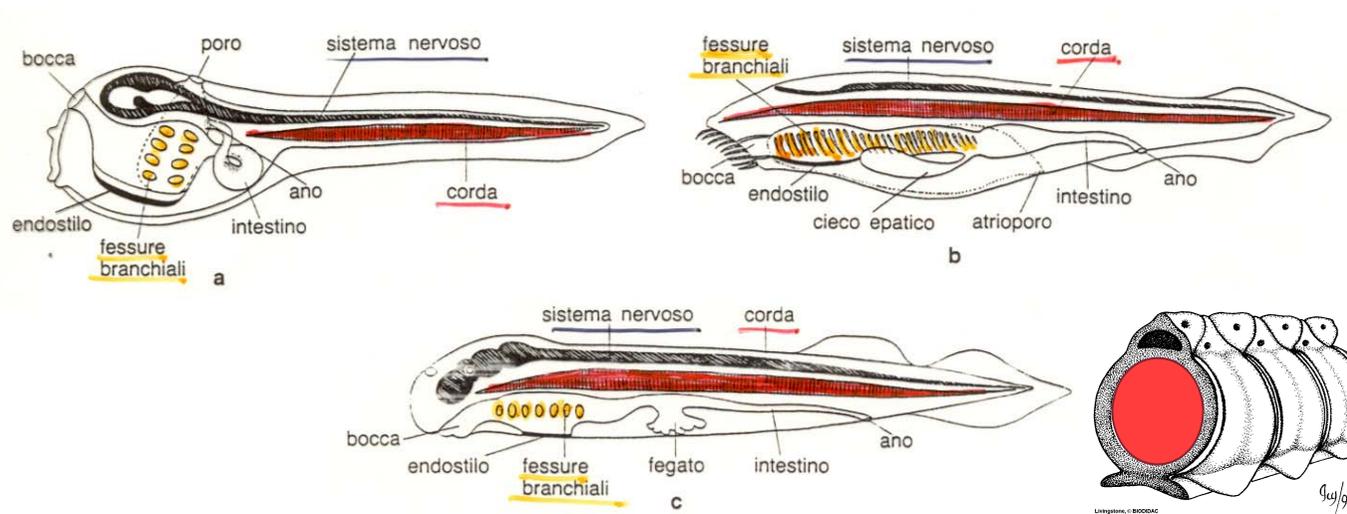
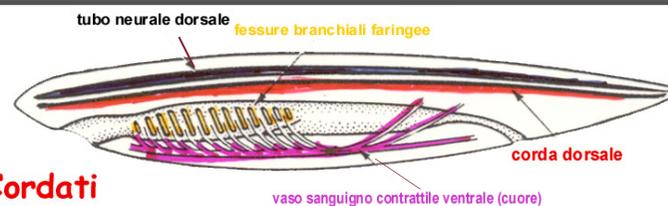


Caratteristiche principali dei Cordati

Anellidi - Artropodi



Cordati



Vertebrati

CLASSIFICAZIONE

phylum CORDATI

subphylum CEFALOCORDATI

subphylum UROCORDATI

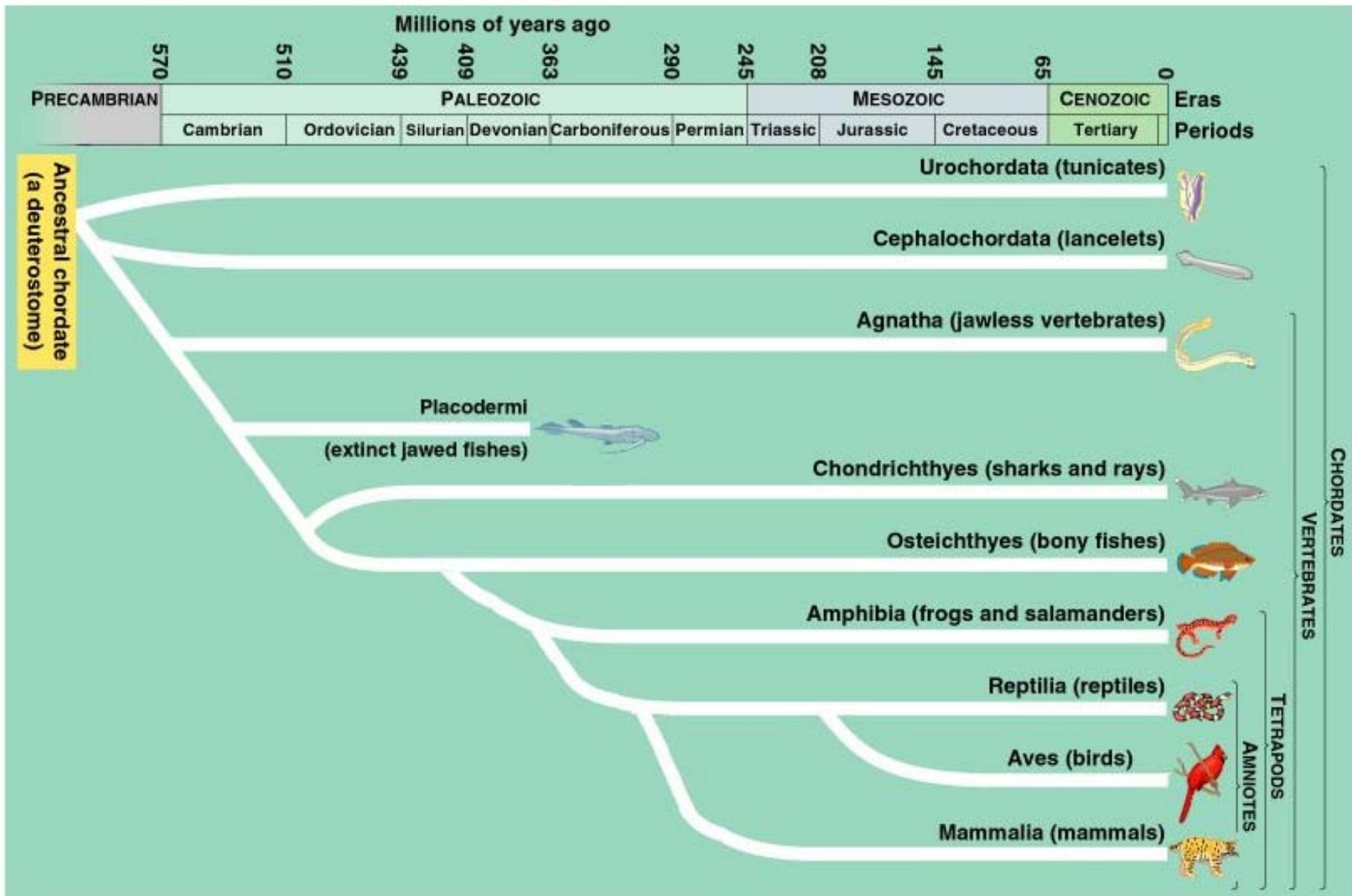
classe ASCIDIACEI

classe TALIACEI

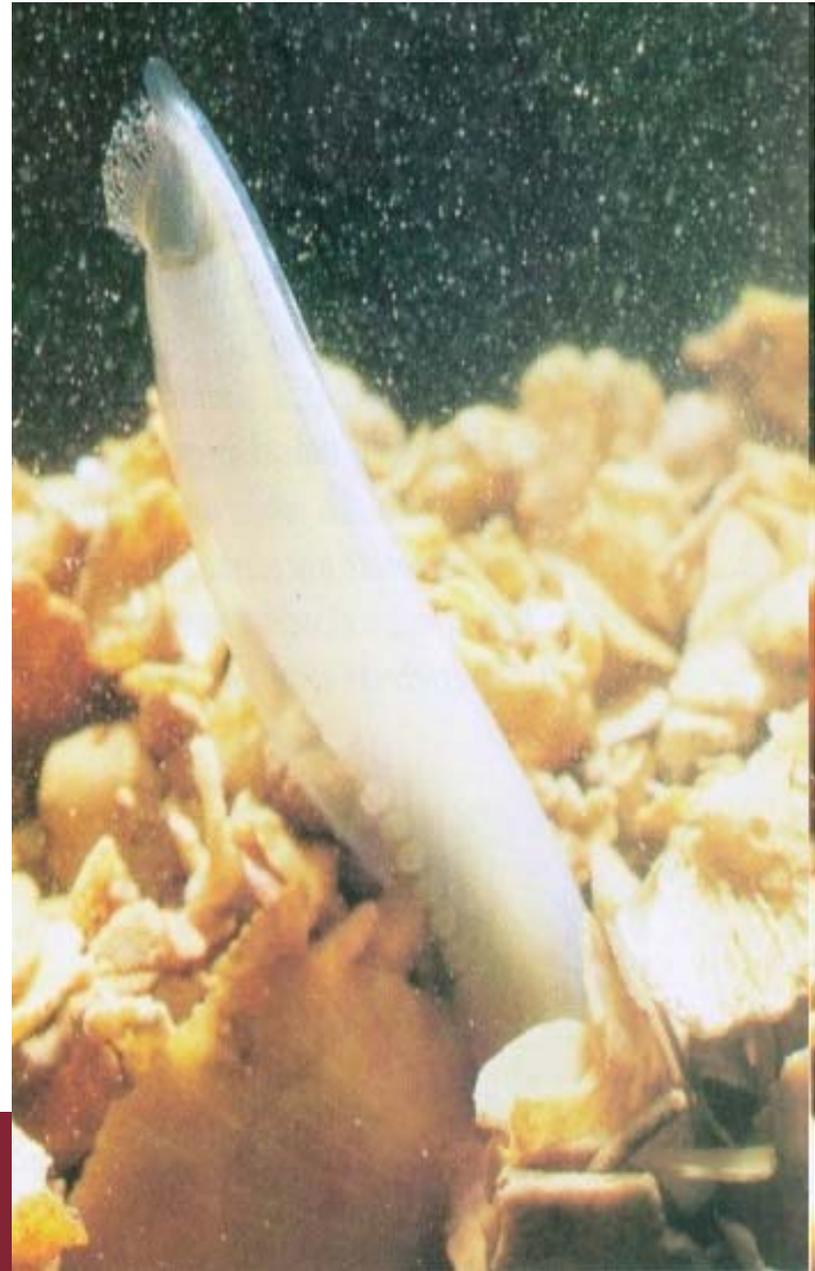
classe LARVACEI

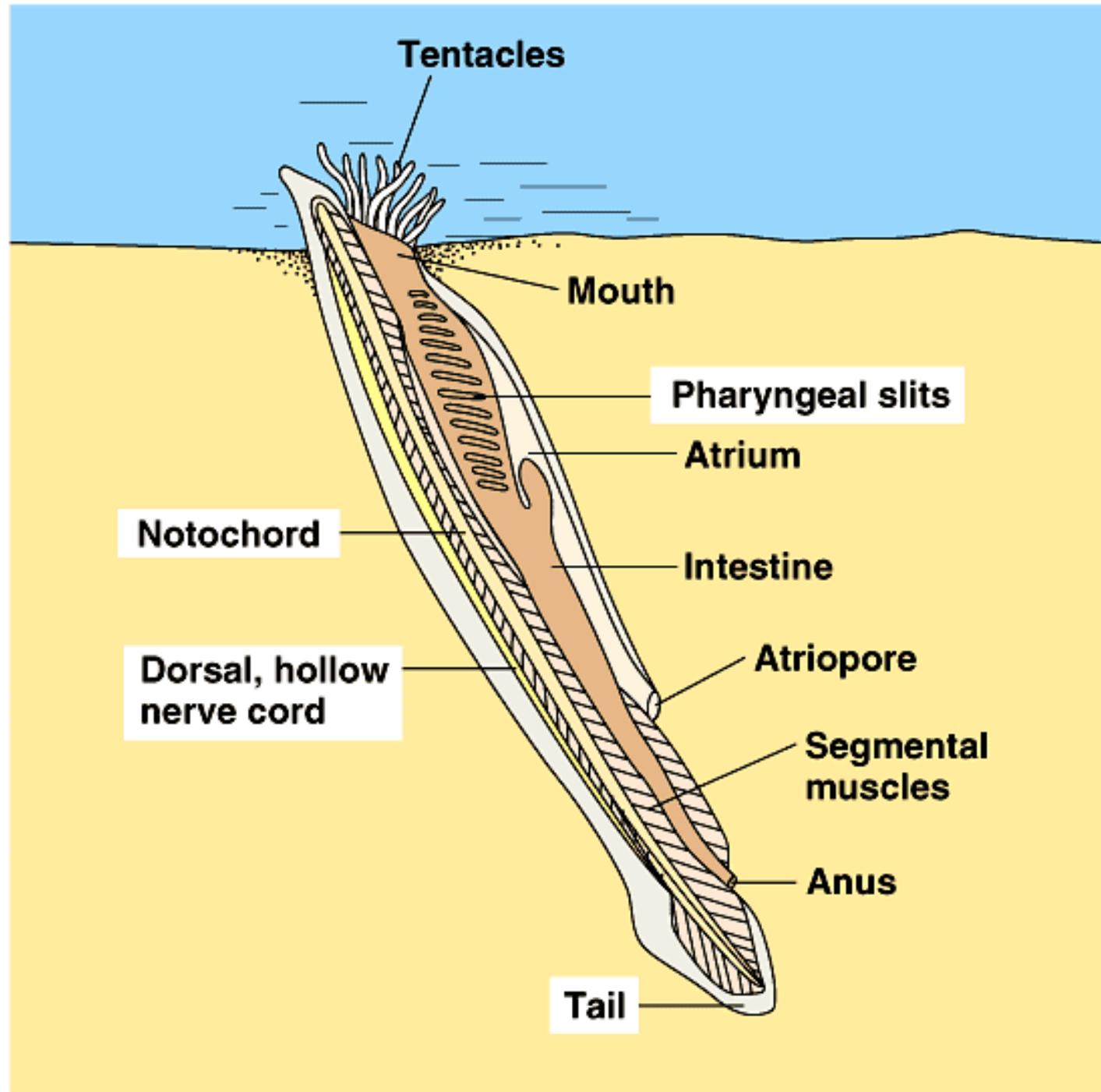
subphylum VERTEBRATI

classi: CONDROITTI, OSTEITTI, ANFIBI
RETTILI, UCCELLI, MAMMIFERI

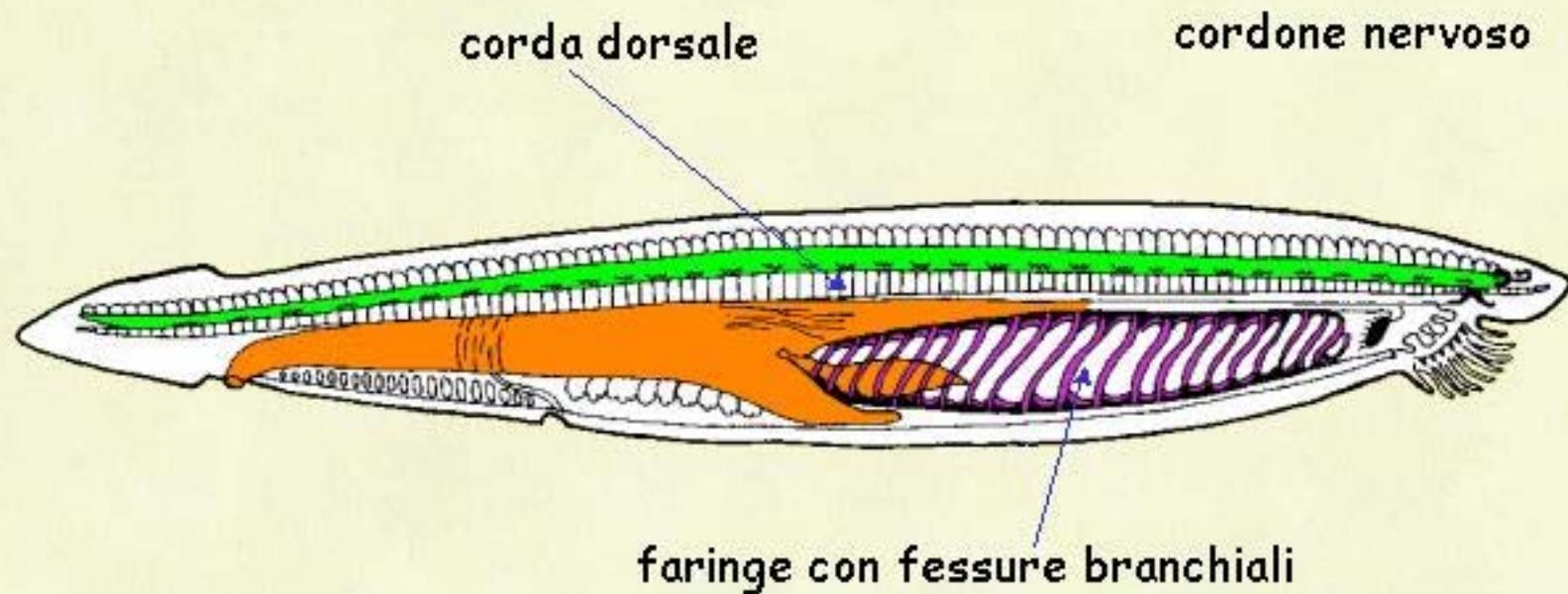


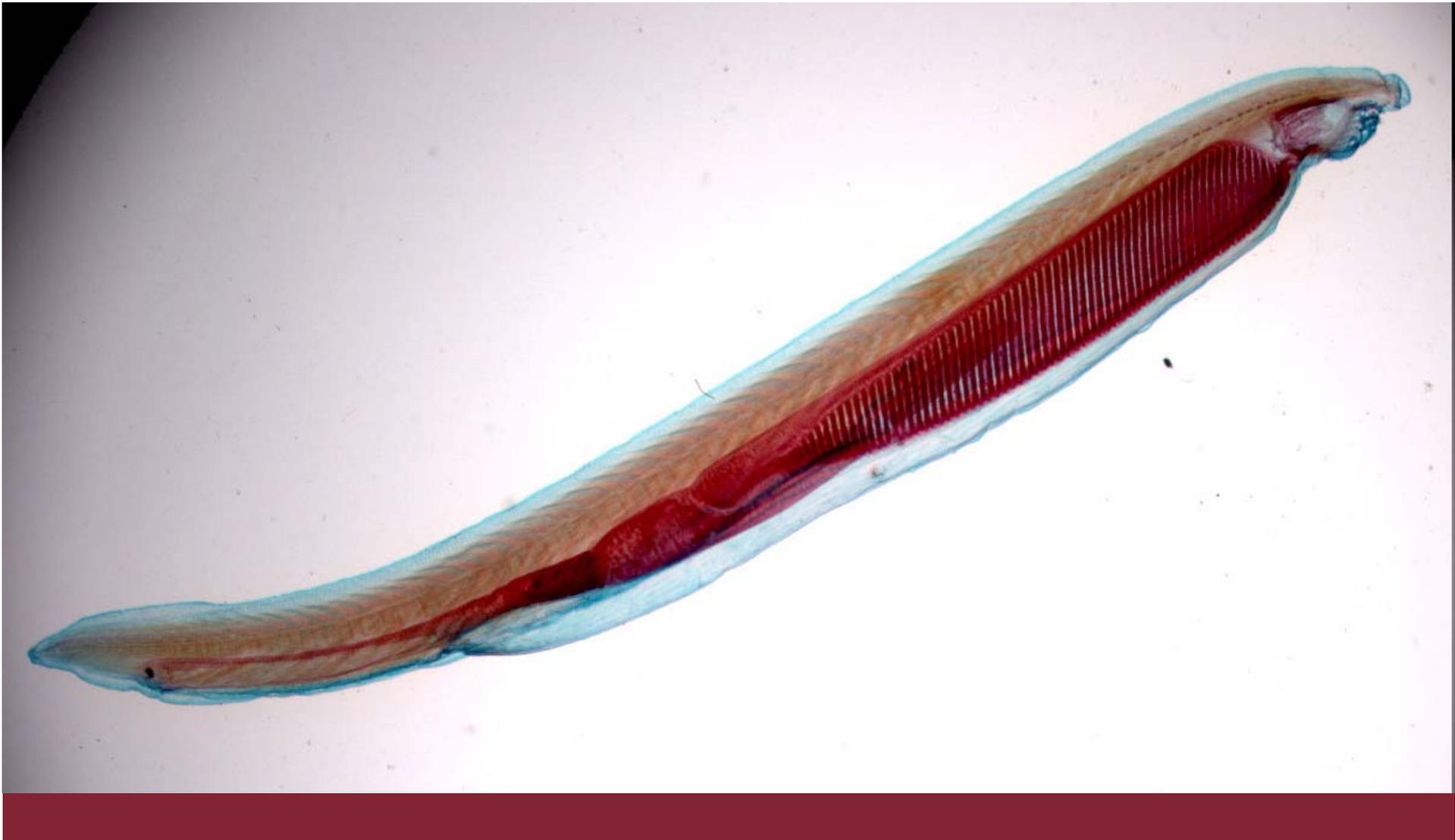
CEFALOCORDATI

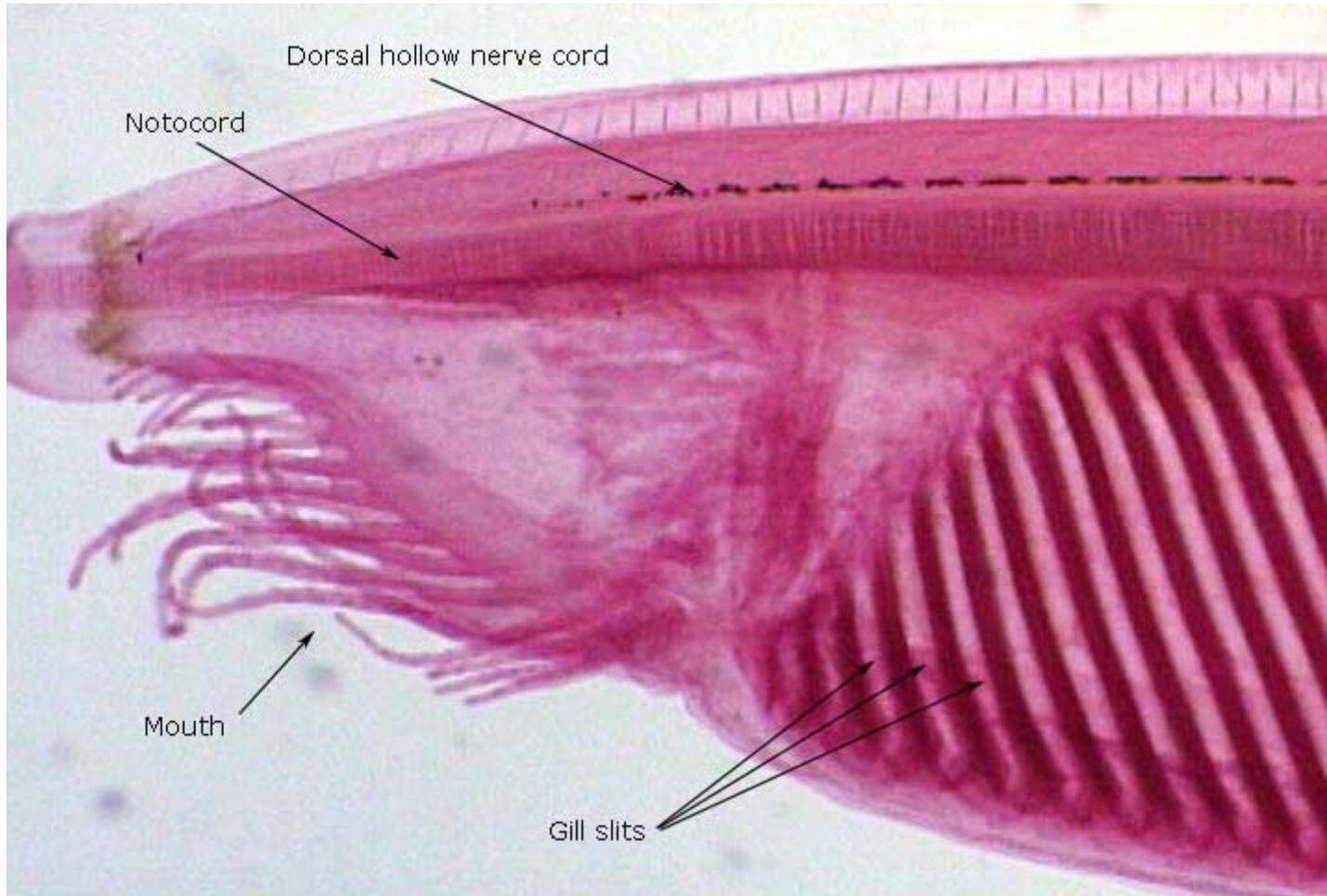




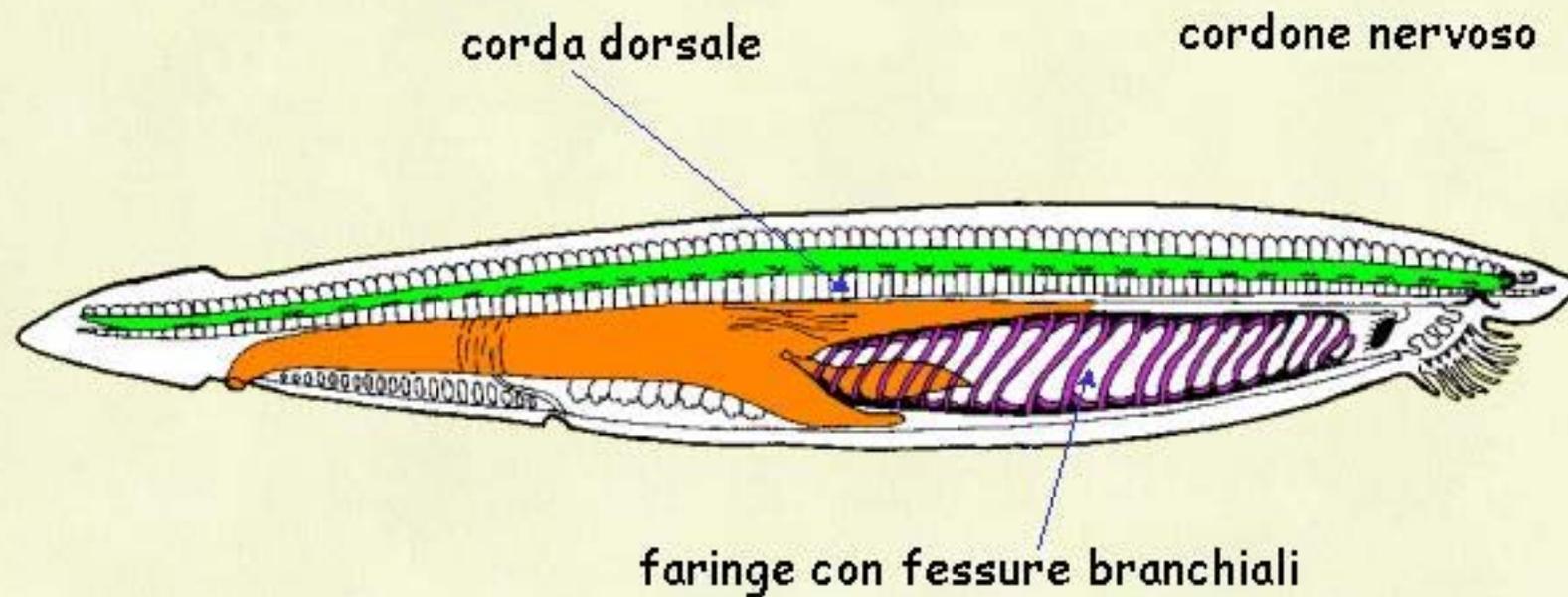
NOTOCORDA E FARINGE



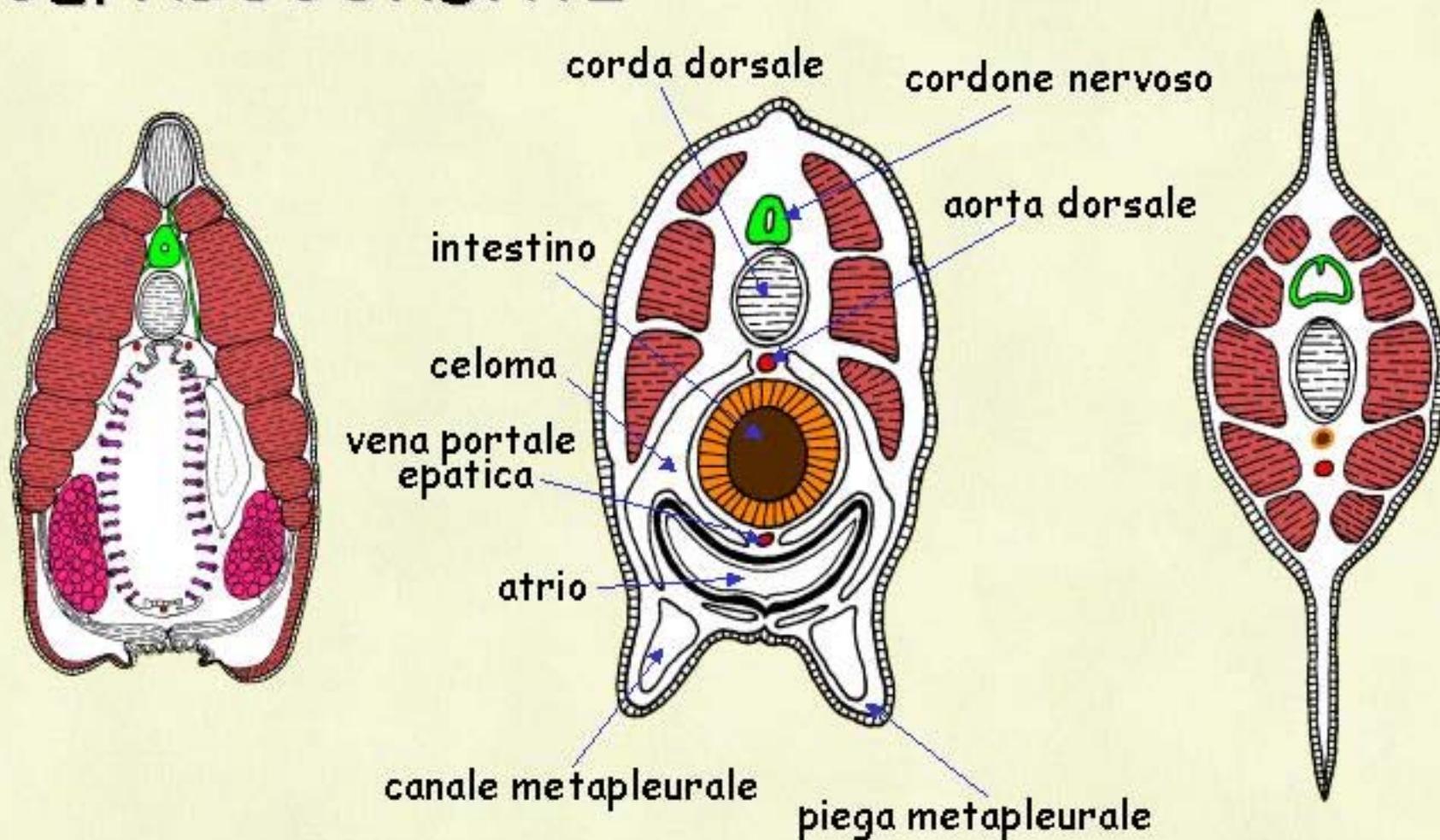




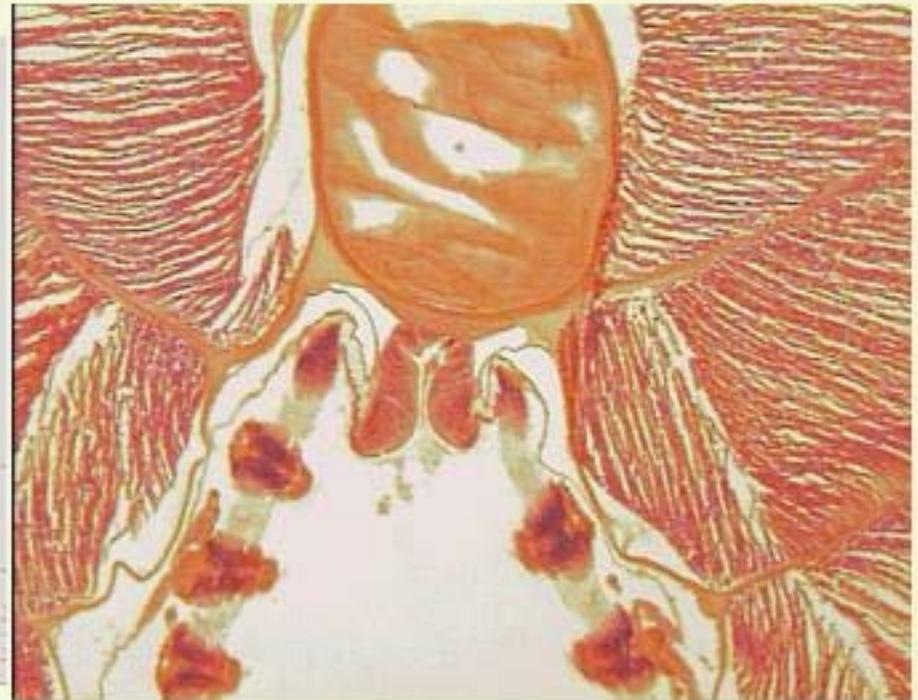
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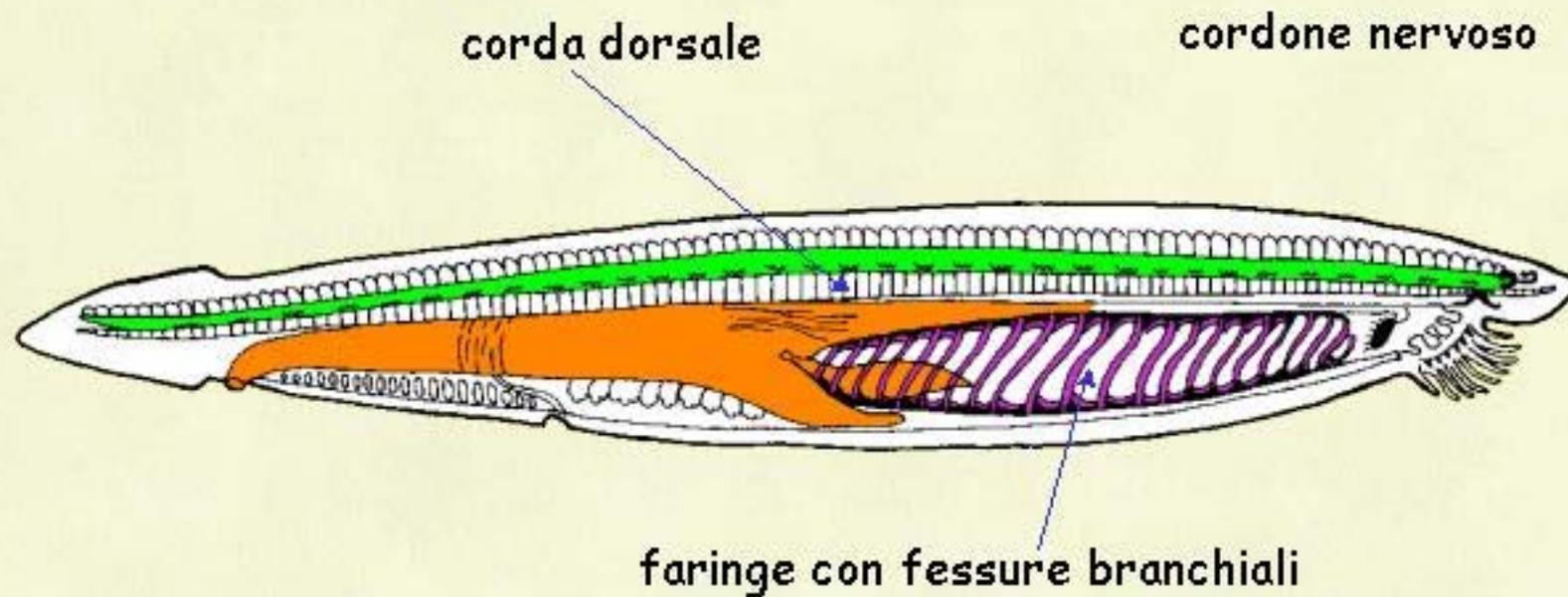
CEFALOCORDATI



CEFALOCORDATI

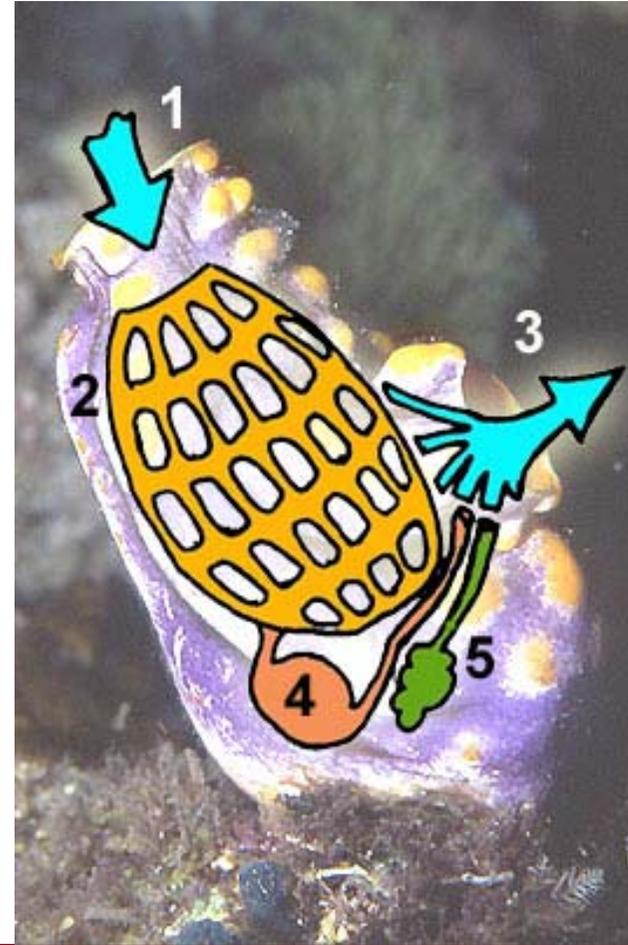


NOTOCORDA E FARINGE

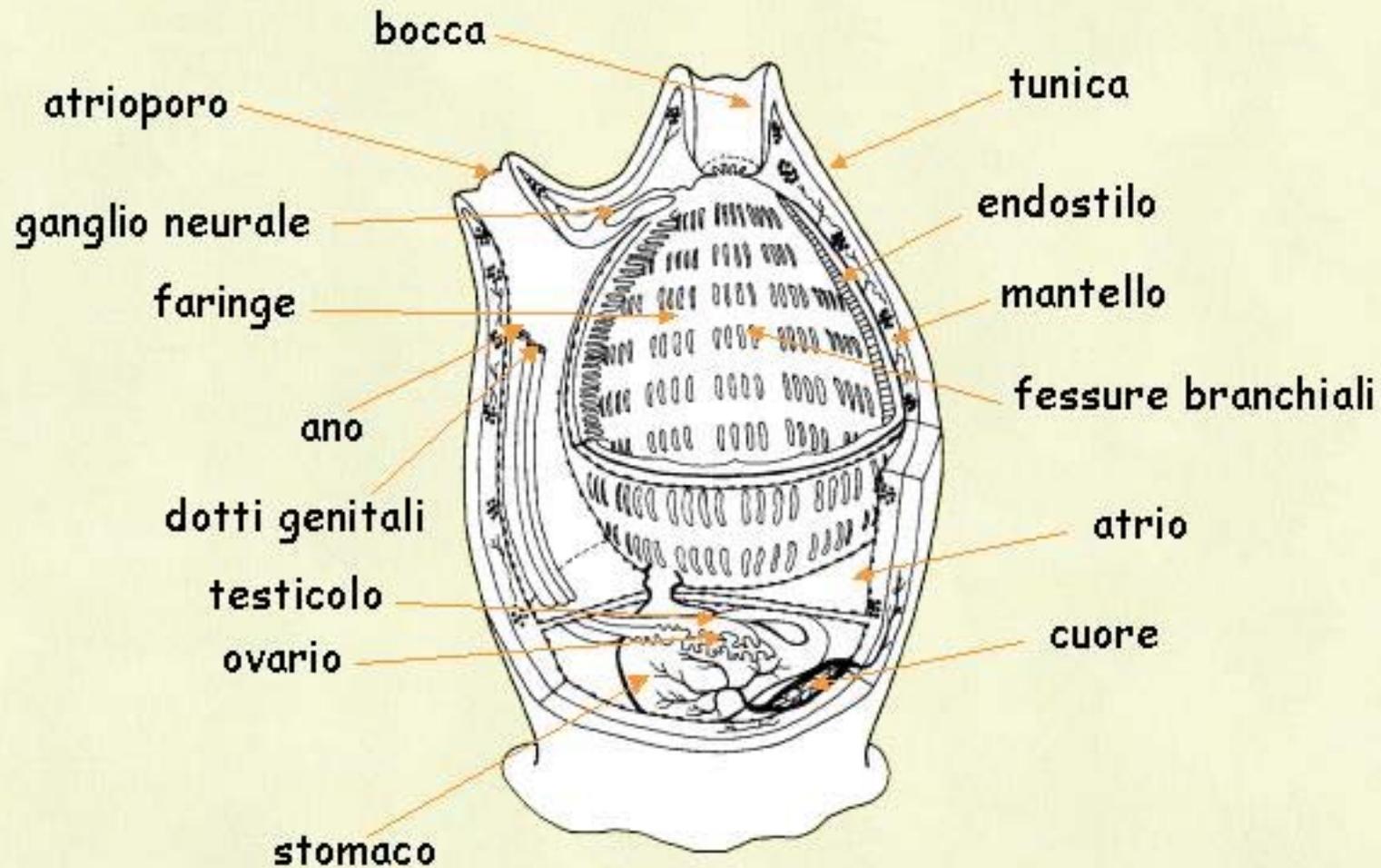




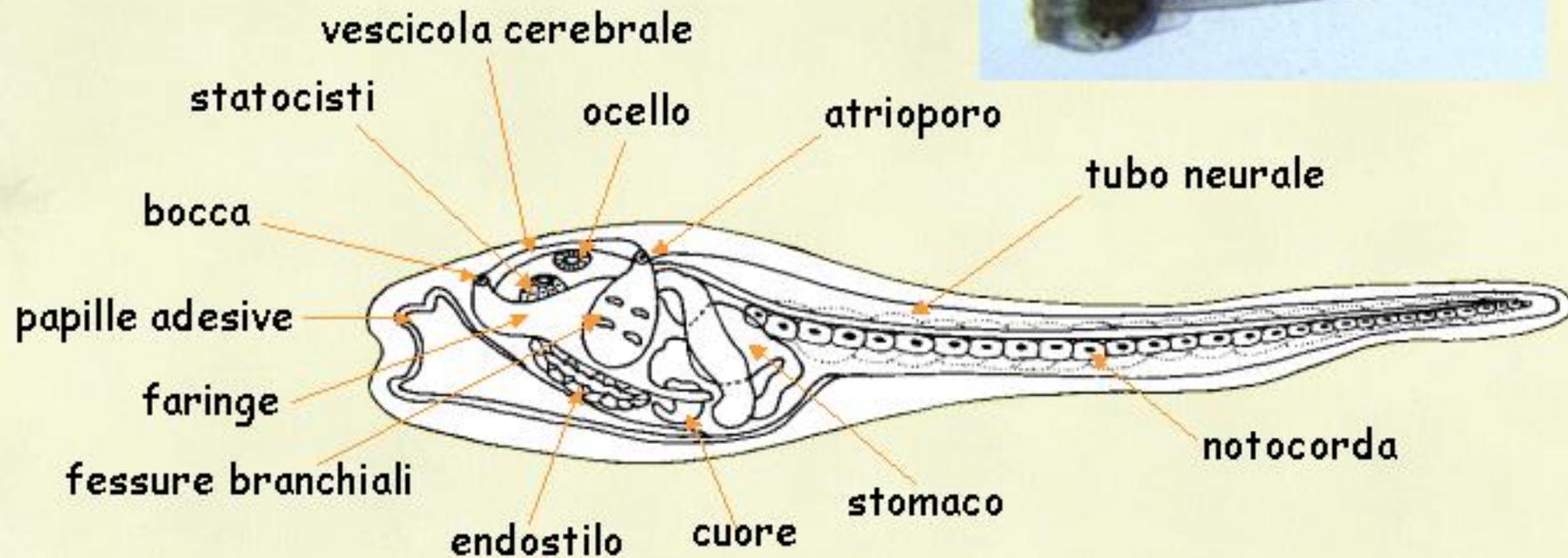
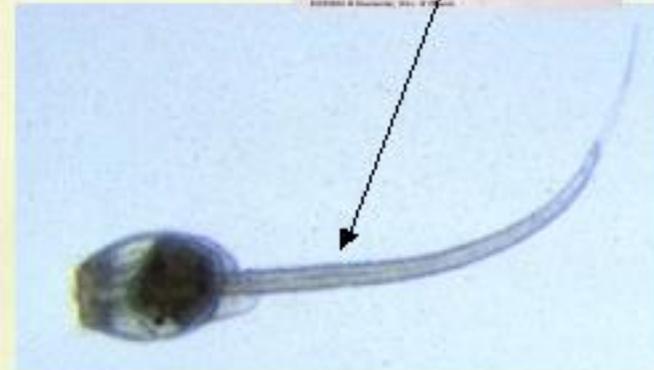
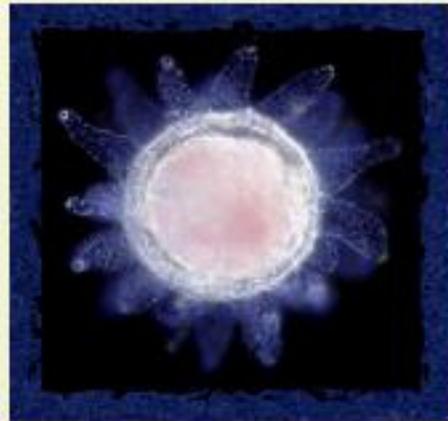
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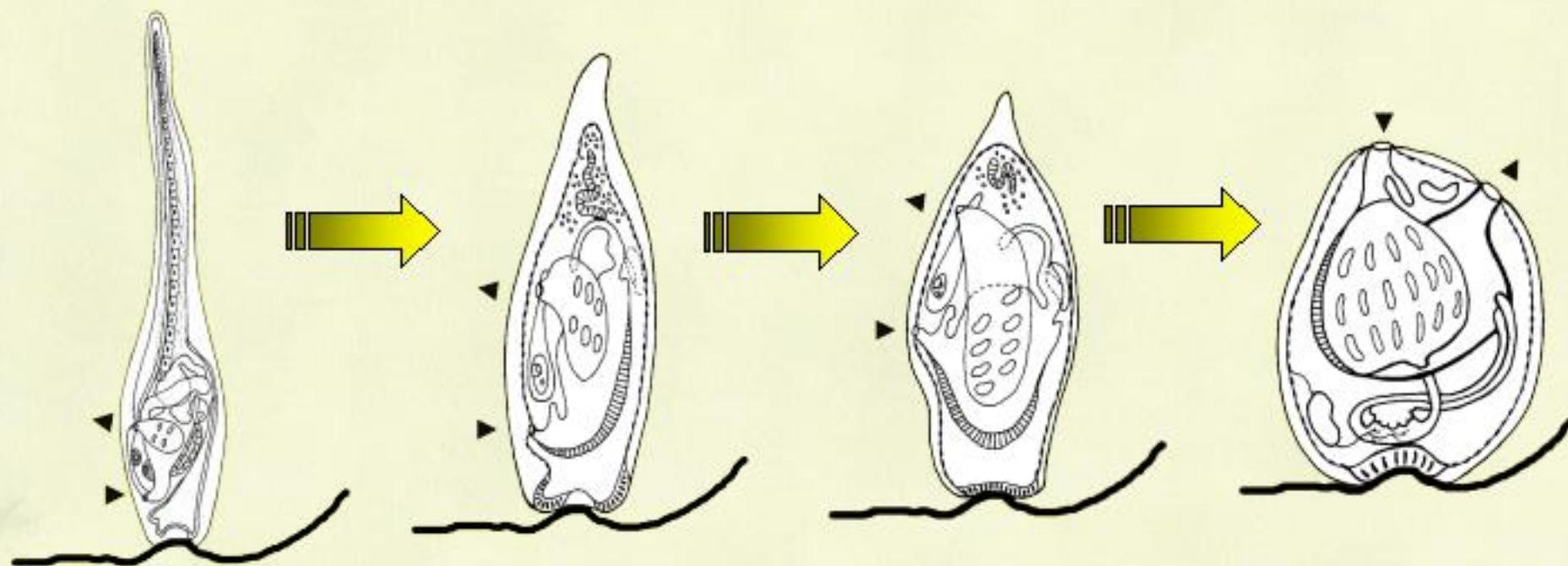
UROCORDATI - Ascidiacei



UROCORDATI - Ascidiacei



UROCORDATI - Ascidiacei

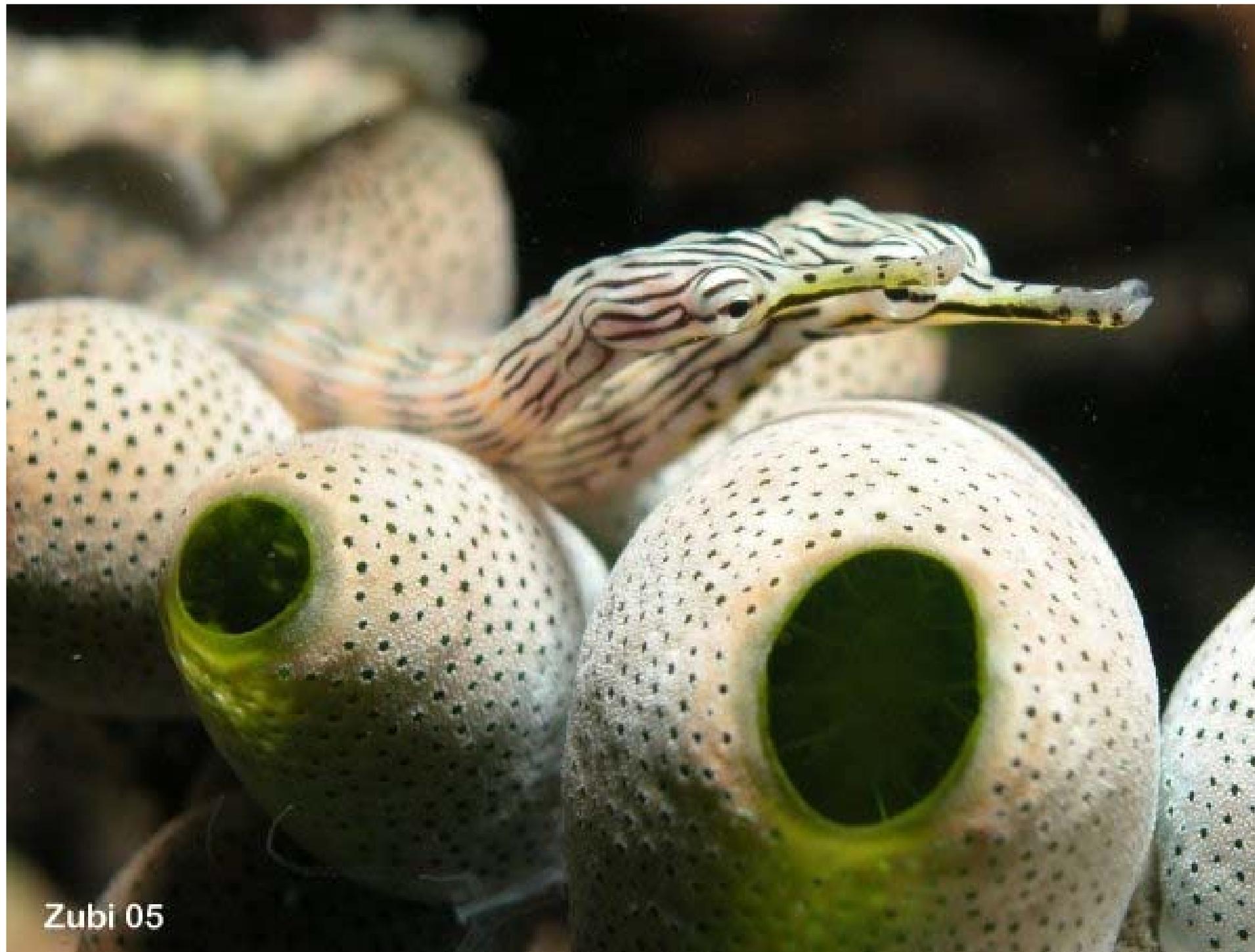












Zubi 05

Zubi 06



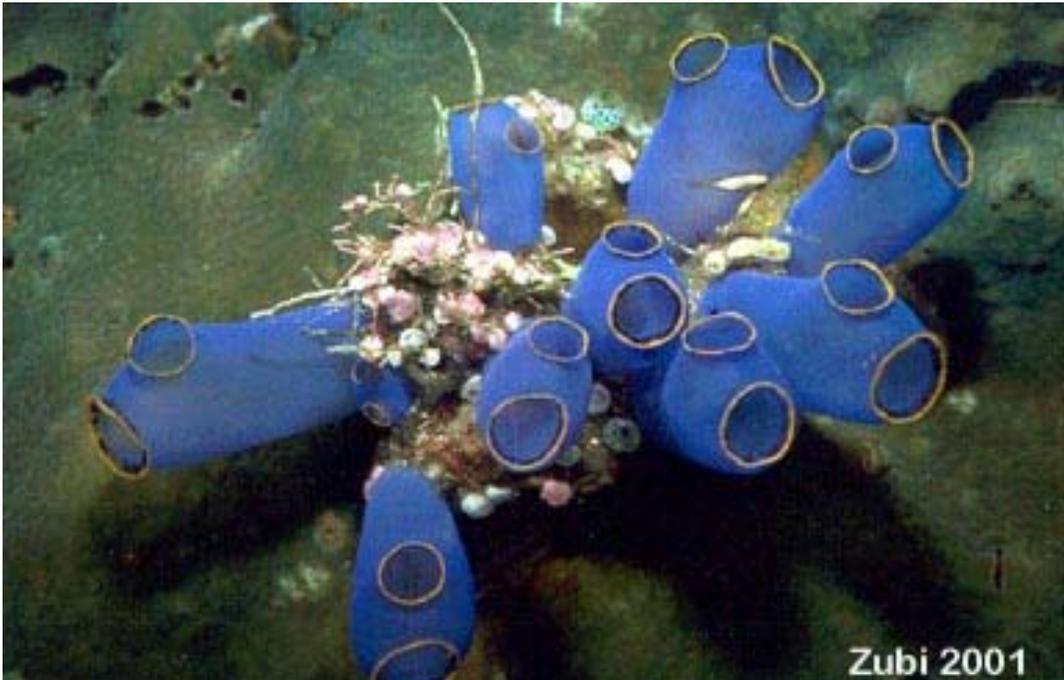


Zubi 03



Rhopalaea





Zubi 2001



Zubi 2001

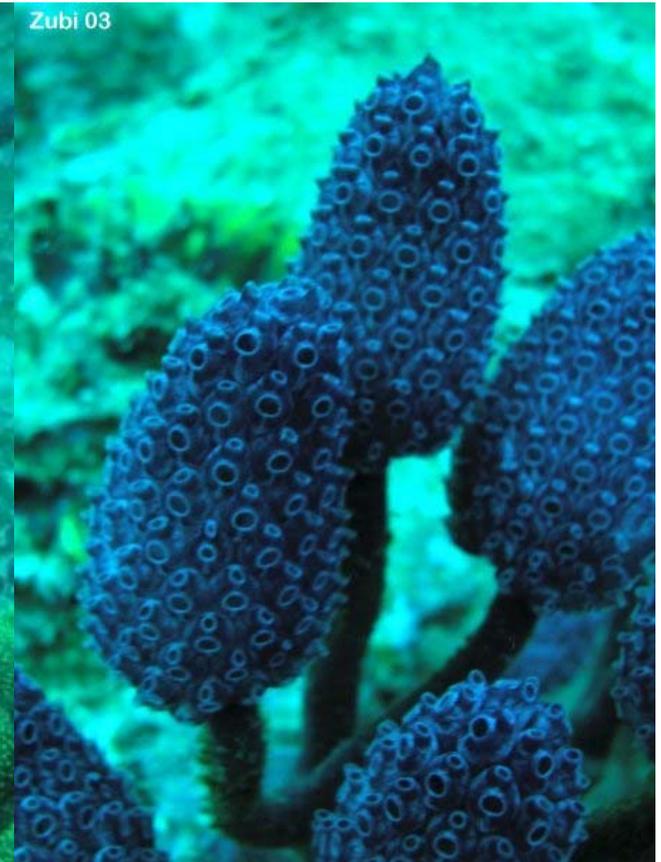


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Zubi 03

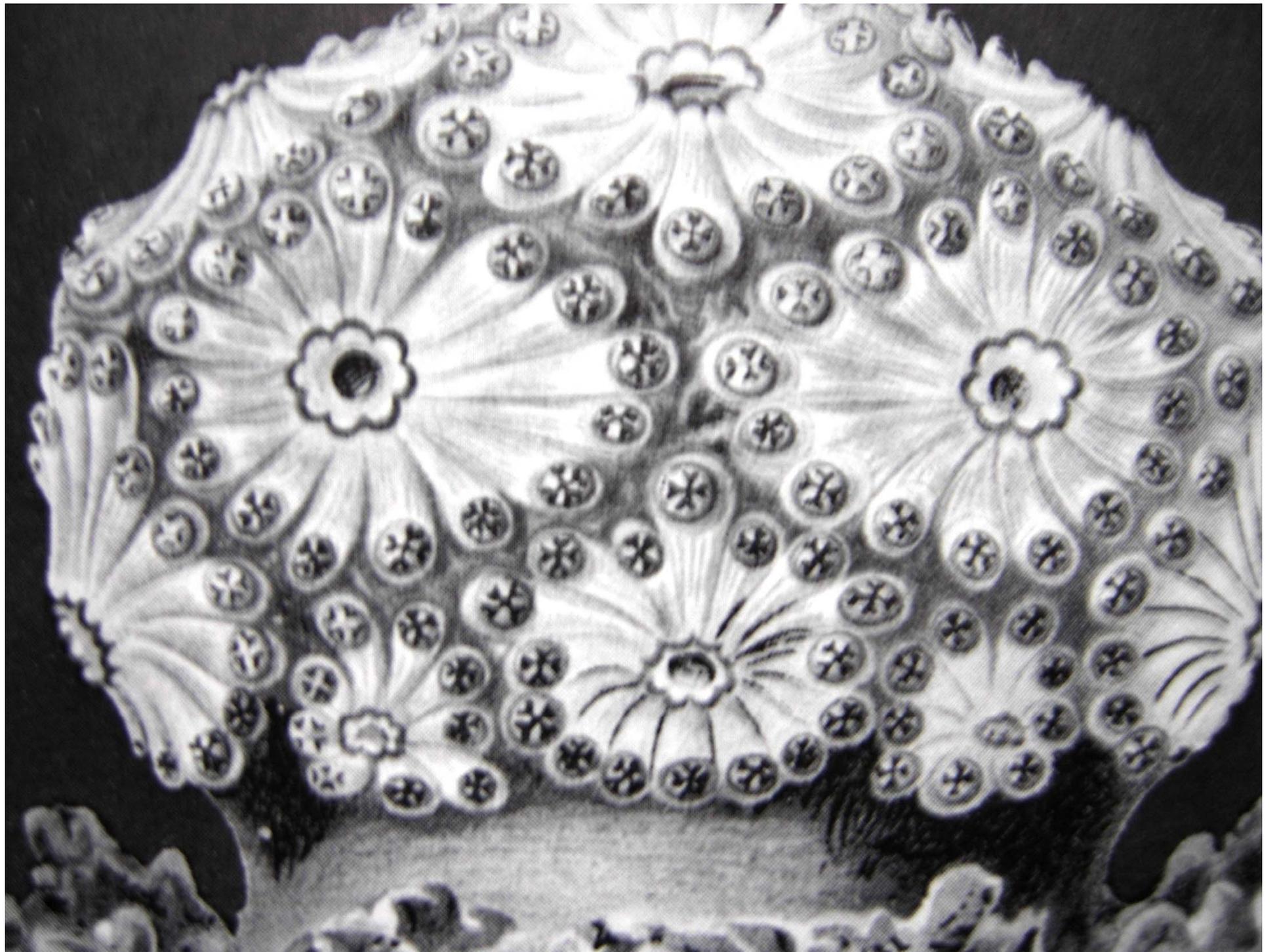


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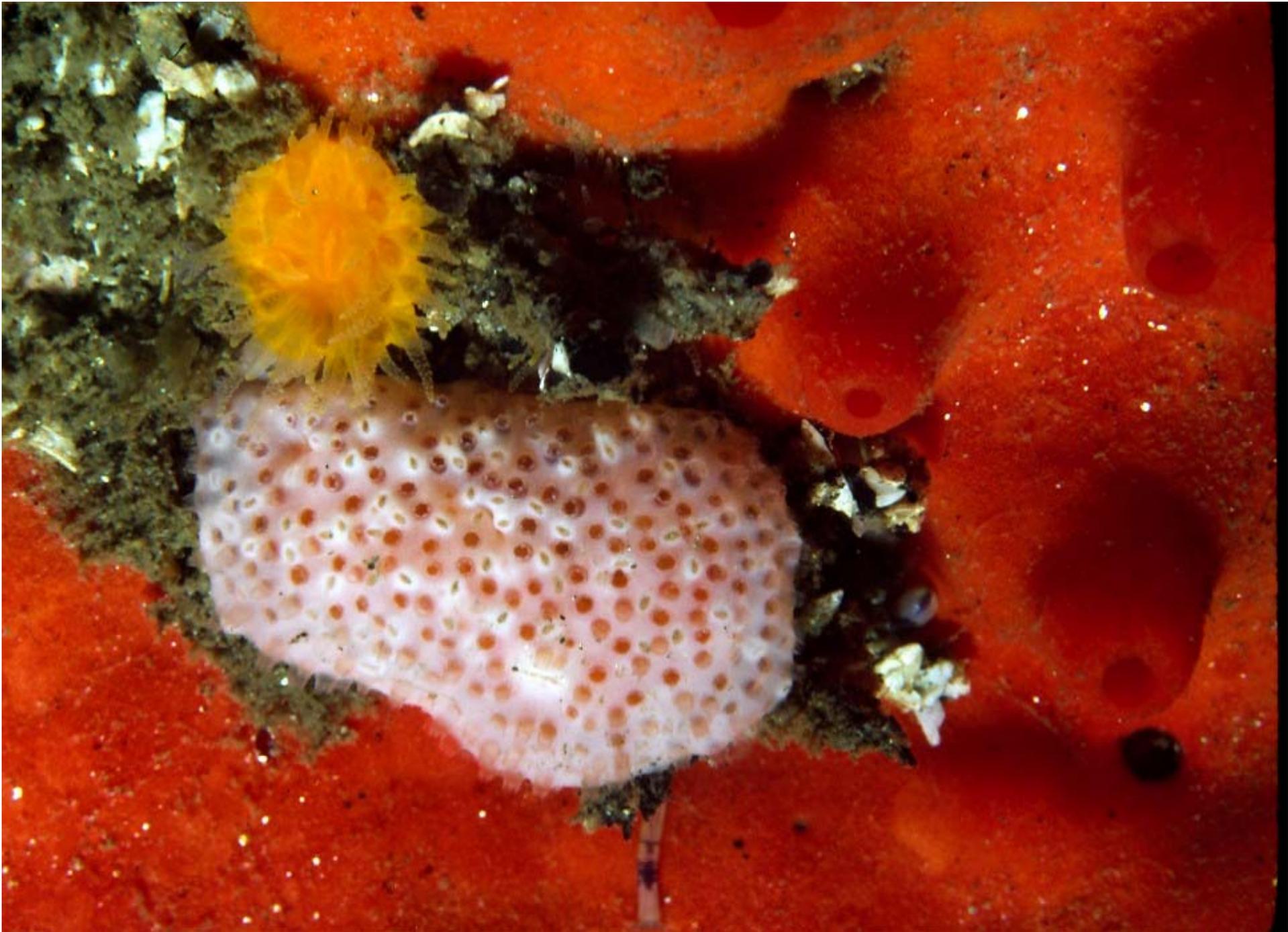




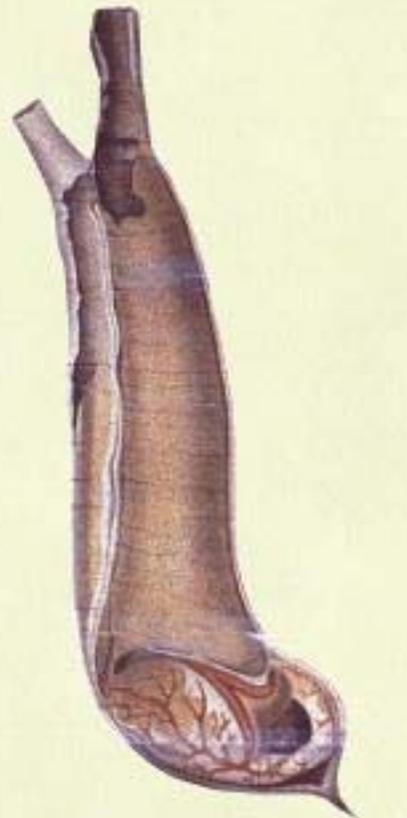




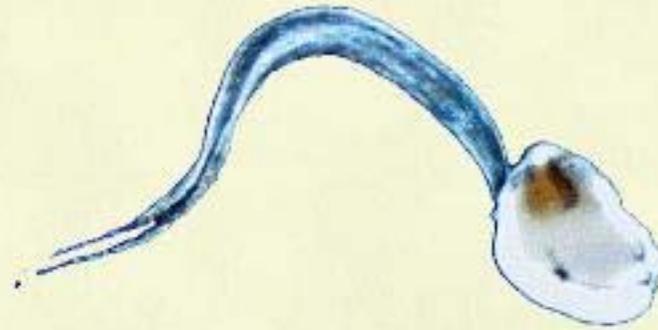




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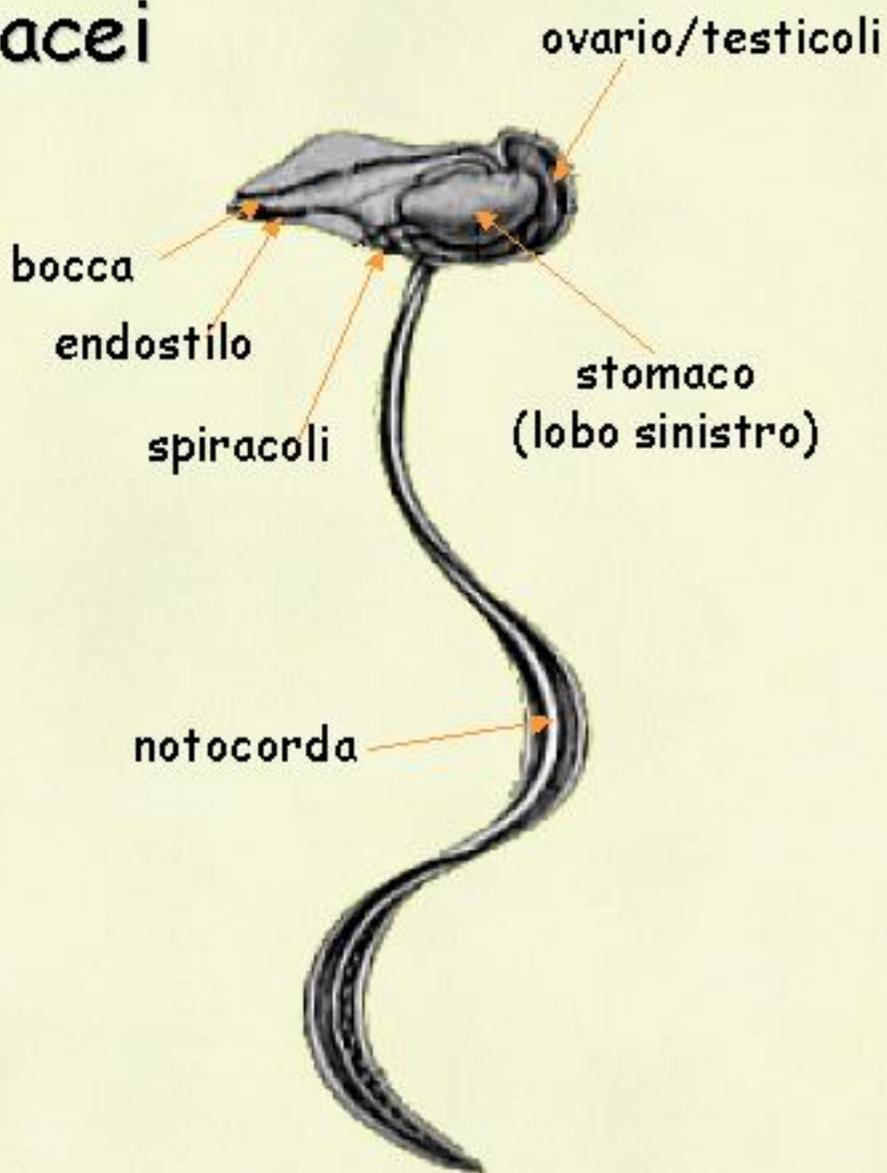


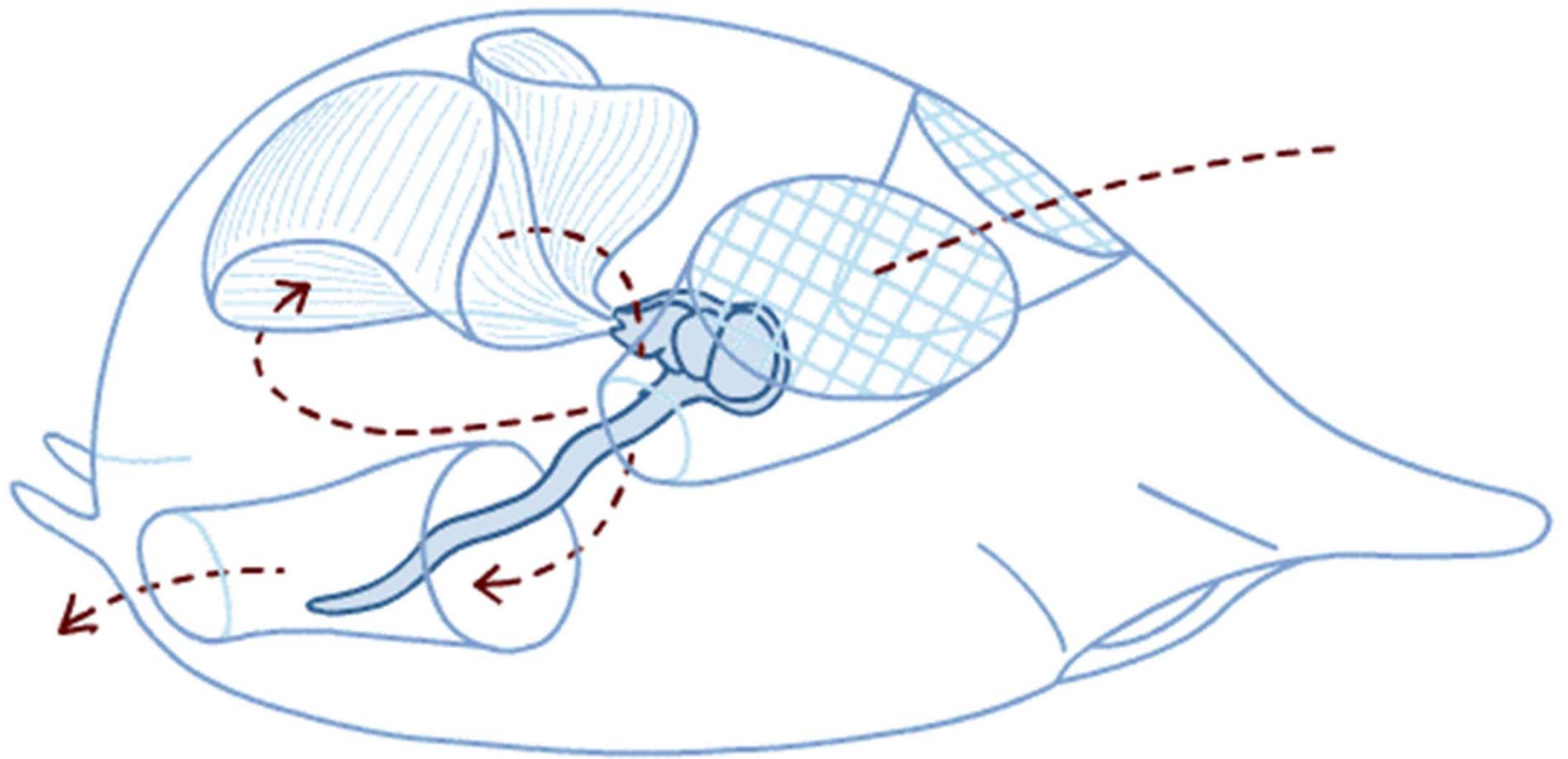
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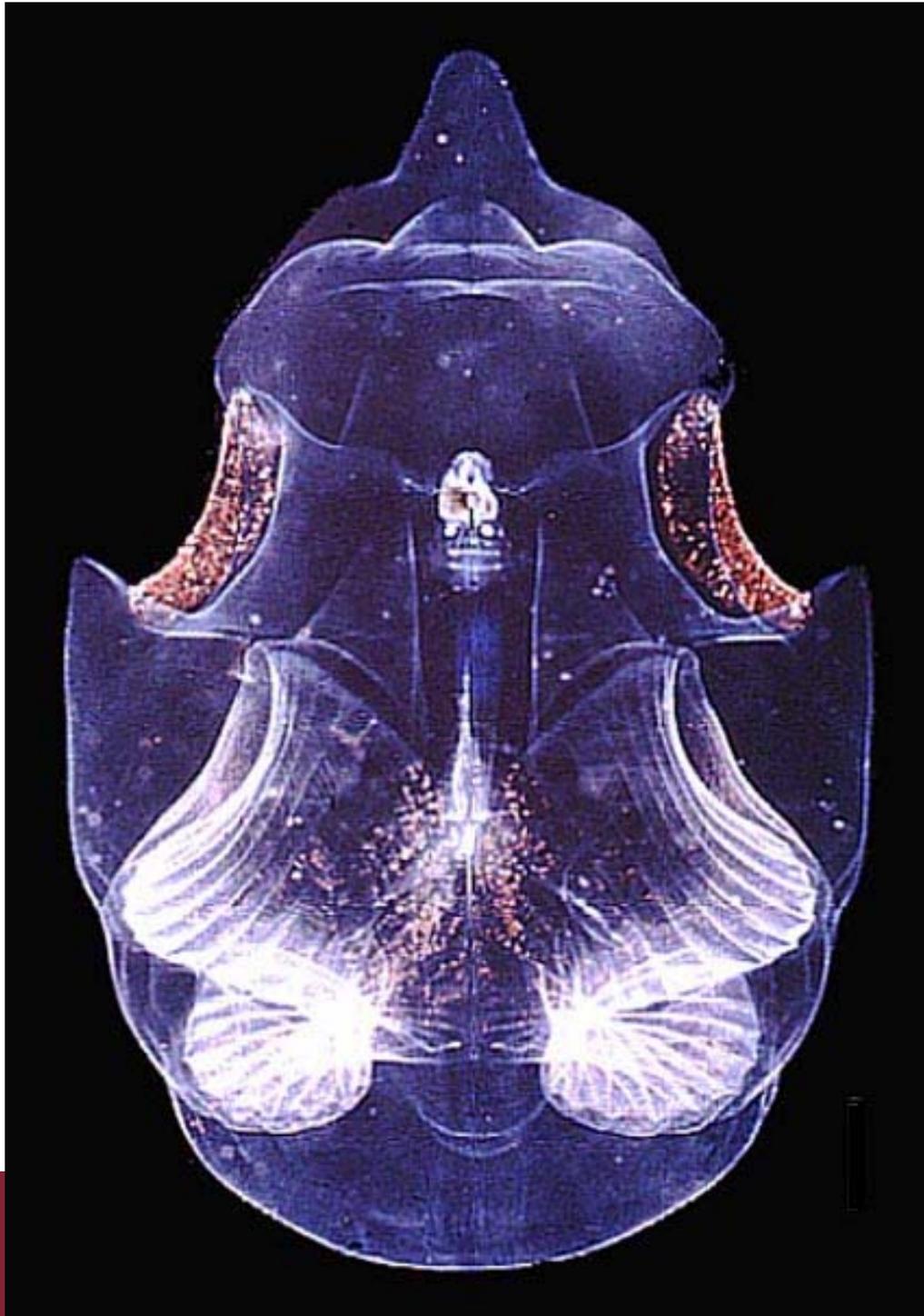


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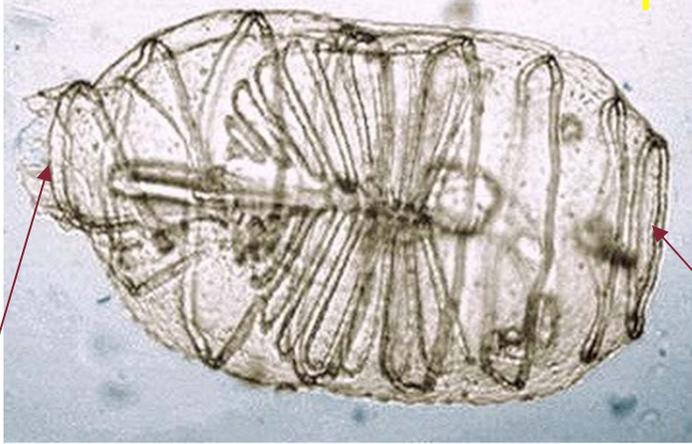
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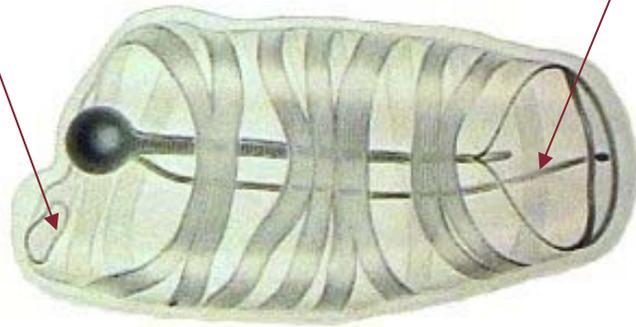


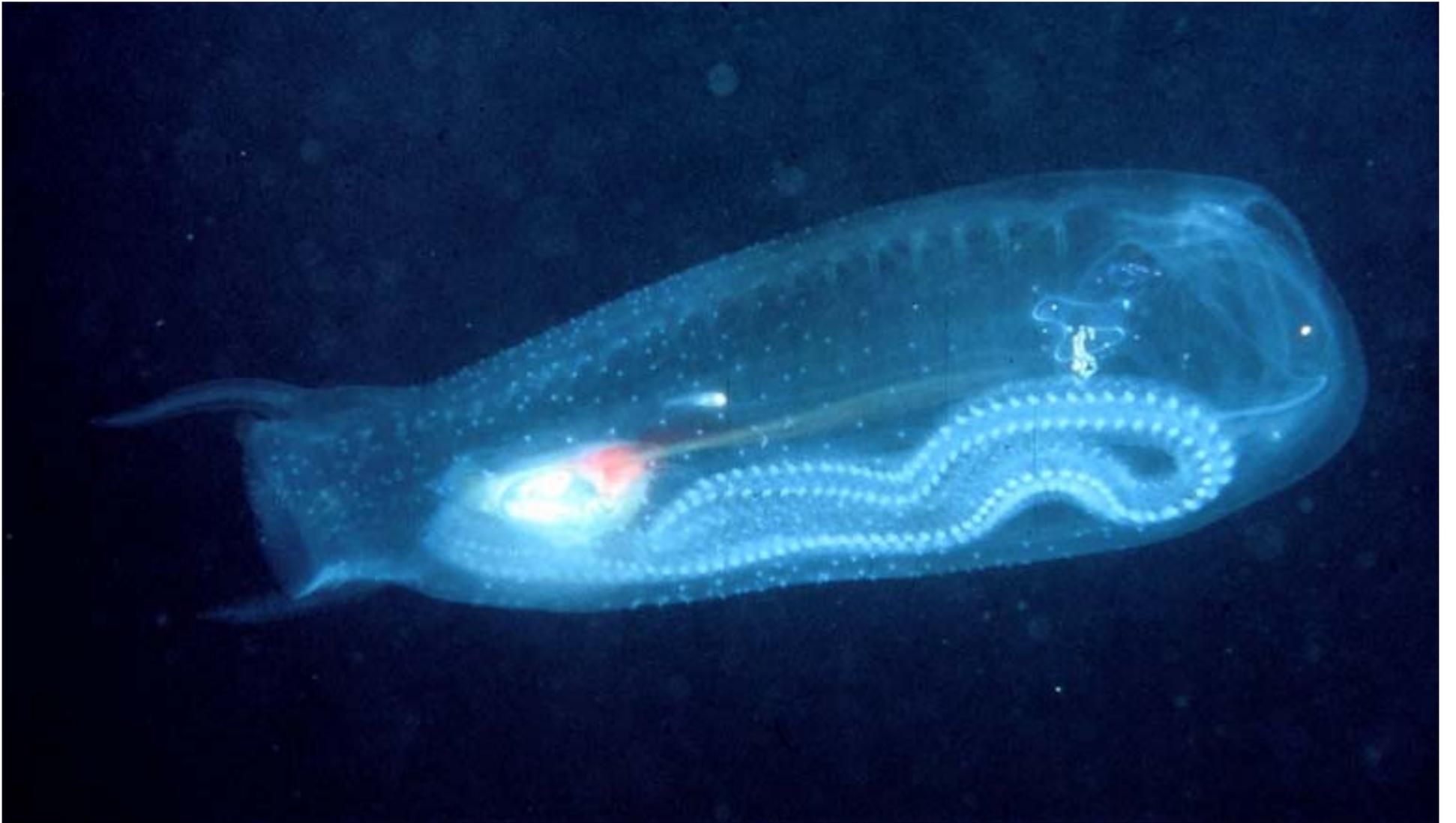
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TALIACEI

Desmomiari (salpe)





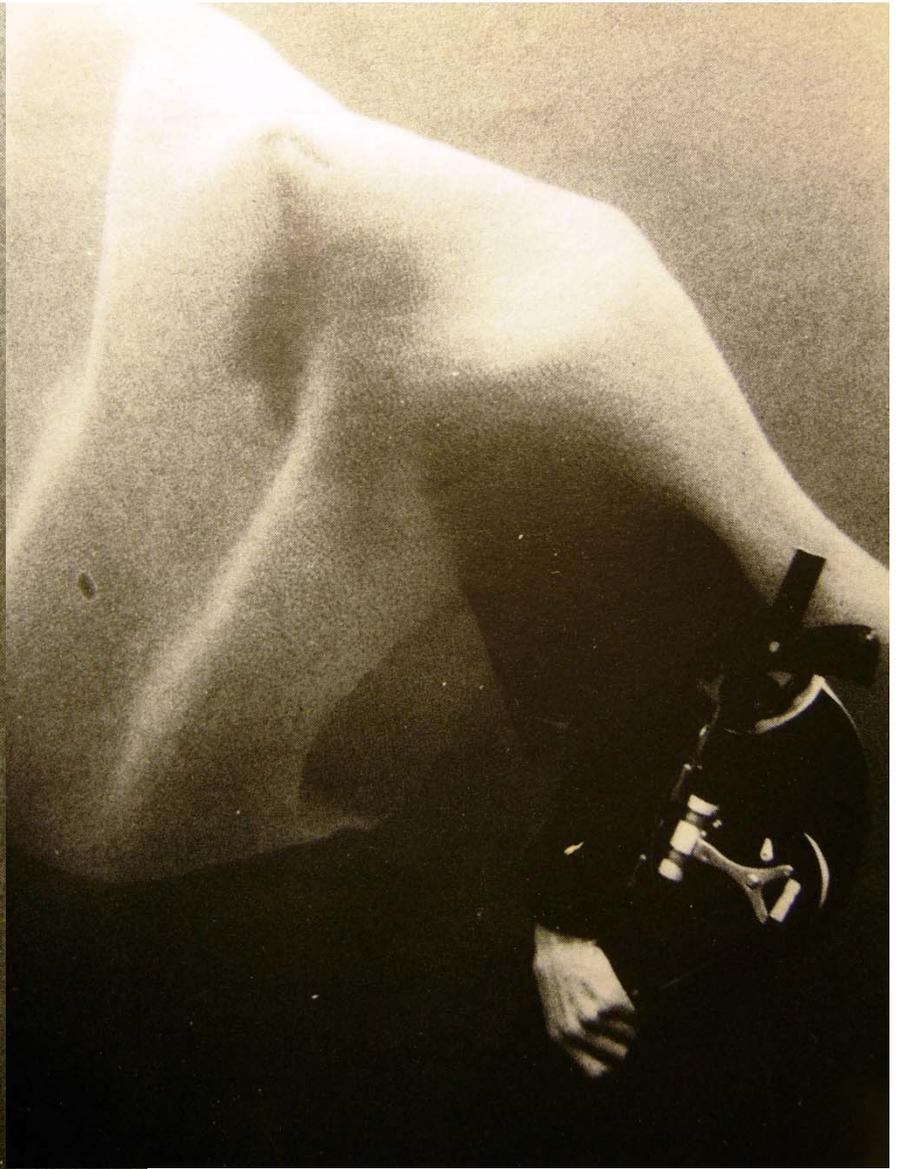
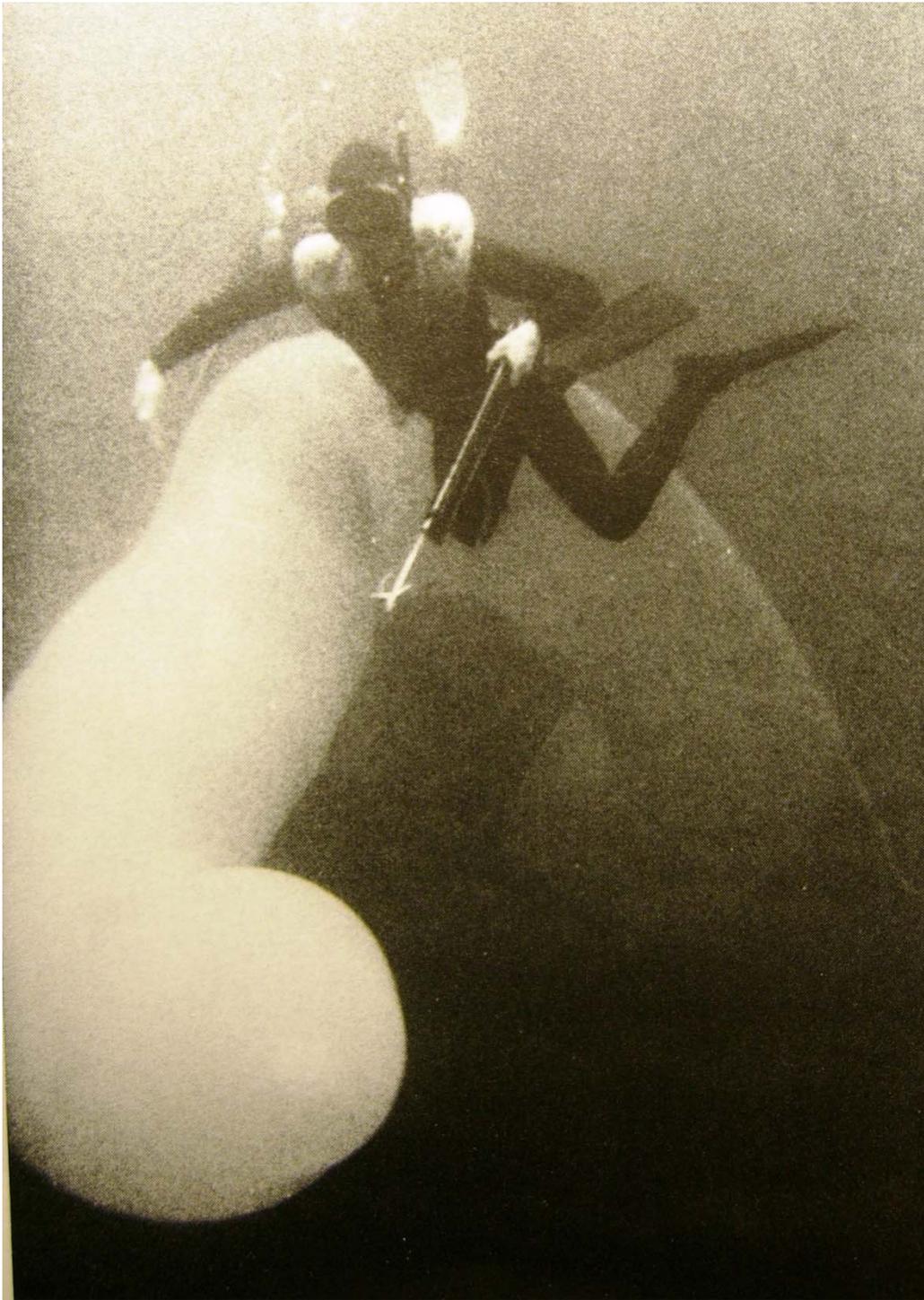
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TALIACEI

Pirosomidi







VERTEBRATI

