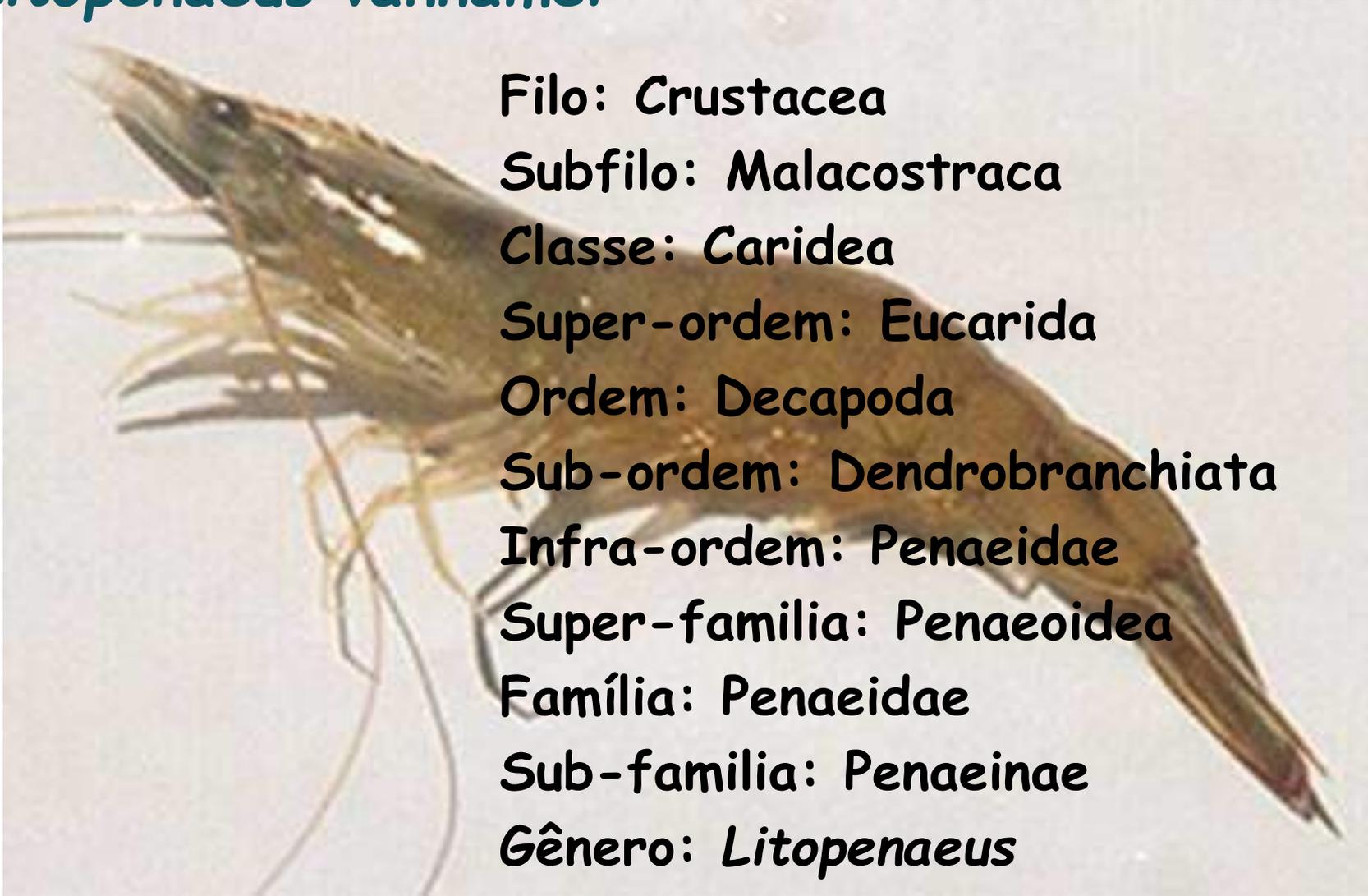


SEMINÁRIO DE RESPONSABILIDADE TÉCNICA EM ESTABELECIMENTOS DE AQUICULTURA E INDÚSTRIA DE PESCADO

Anatomia e fisiologia do camarão (sistema imune)

Litopenaeus vannamei



Filo: Crustacea

Subfilo: Malacostraca

Classe: Caridea

Super-ordem: Eucarida

Ordem: Decapoda

Sub-ordem: Dendrobranchiata

Infra-ordem: Penaeidae

Super-família: Penaeoidea

Família: Penaeidae

Sub-família: Penaeinae

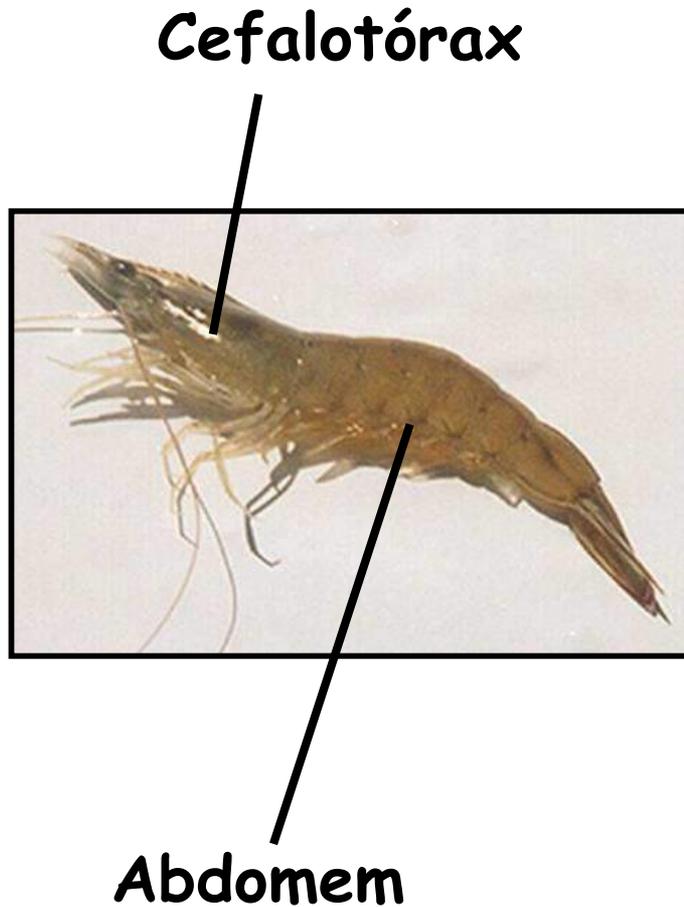
Gênero: *Litopenaeus*

Espécie: *Litopenaeus vannamei*.

Litopenaeus vannamei

MORFOLOGIA EXTERNA

Latim *crusta*
Carapaça dura

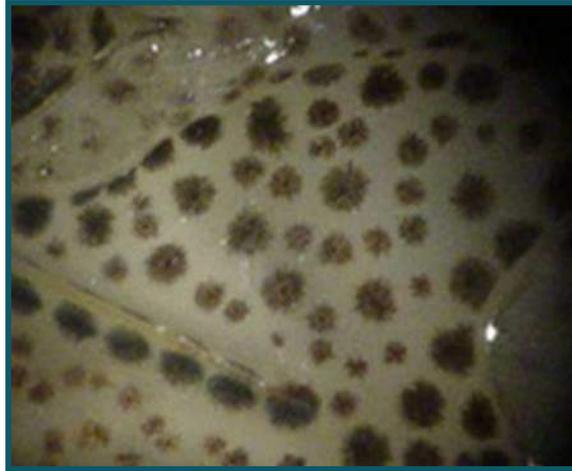


Crescimento

➡ Desfazem do exosqueleto "apertado" (formar um novo)

MUDA OU ECDISE

MORFOLOGIA EXTERNA



Melanóforos - grânulos pretos

Leucóforos - grânulos brancos

Eritróforos - grânulos vermelhos

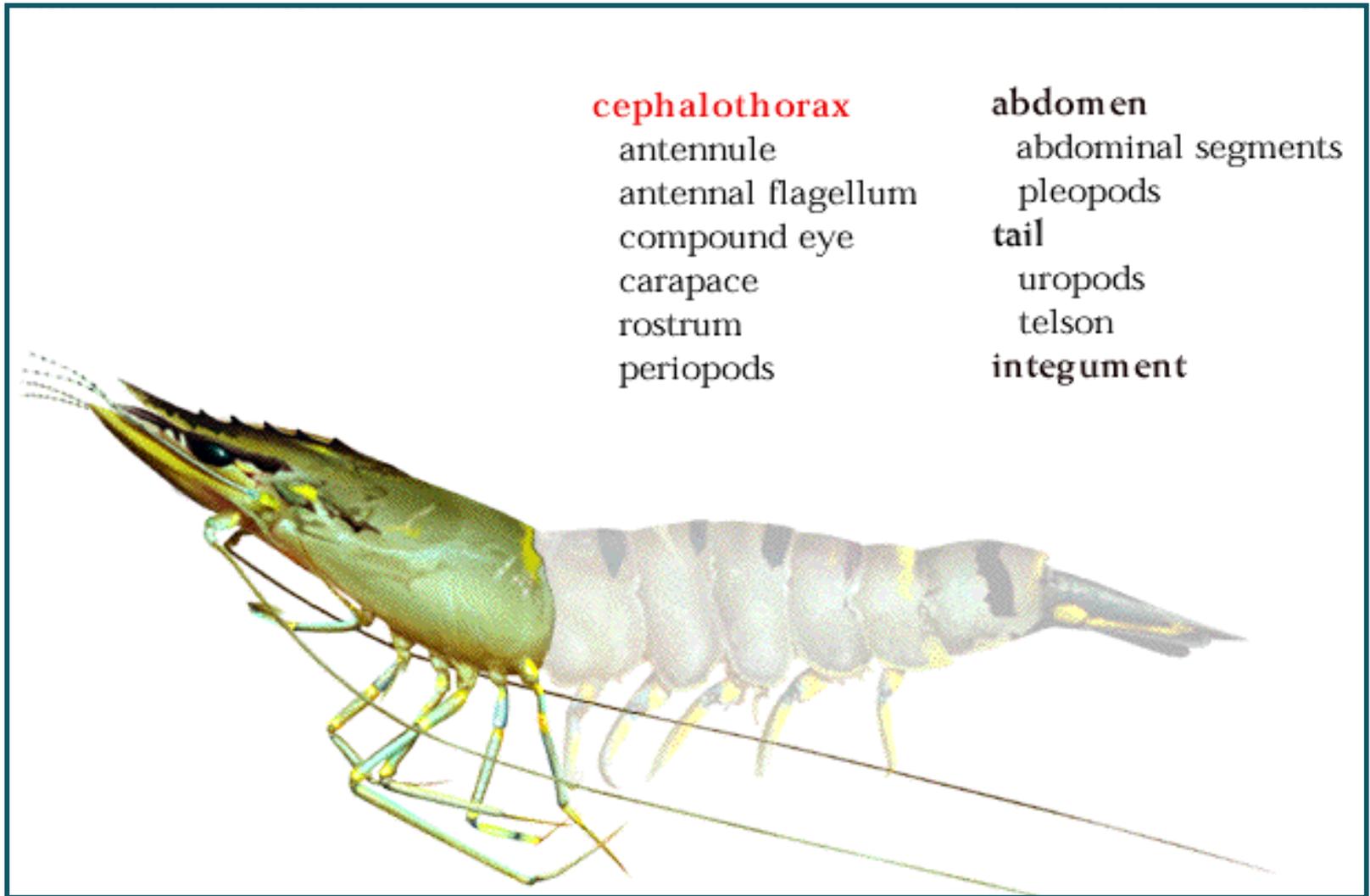
Xantoforos - grânulos amarelos



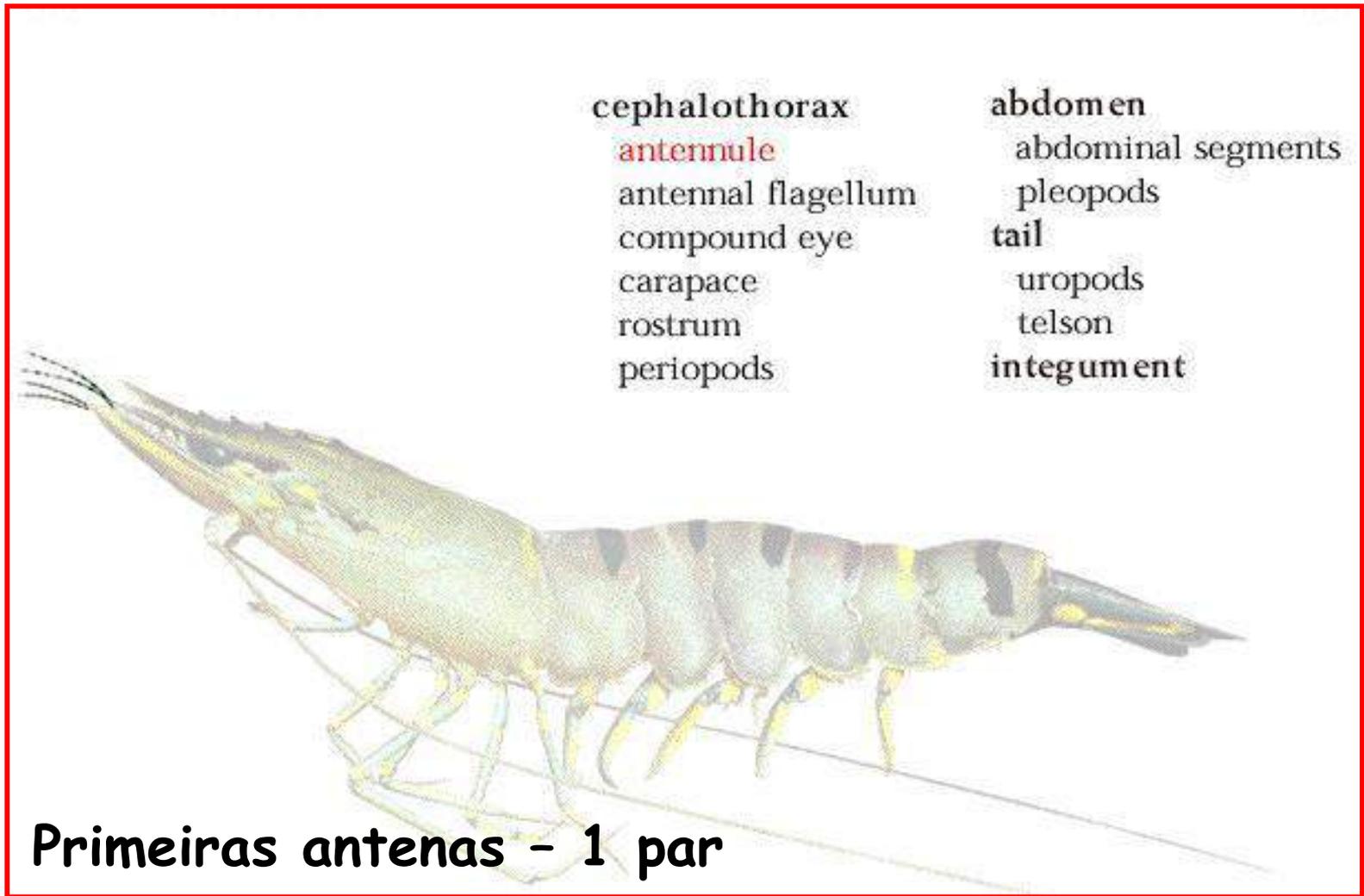
CROMATÓFOROS

Controlado por hormônios
(glândula sinus)
e pelo sistema nervoso
central anterior

MORFOLOGIA EXTERNA



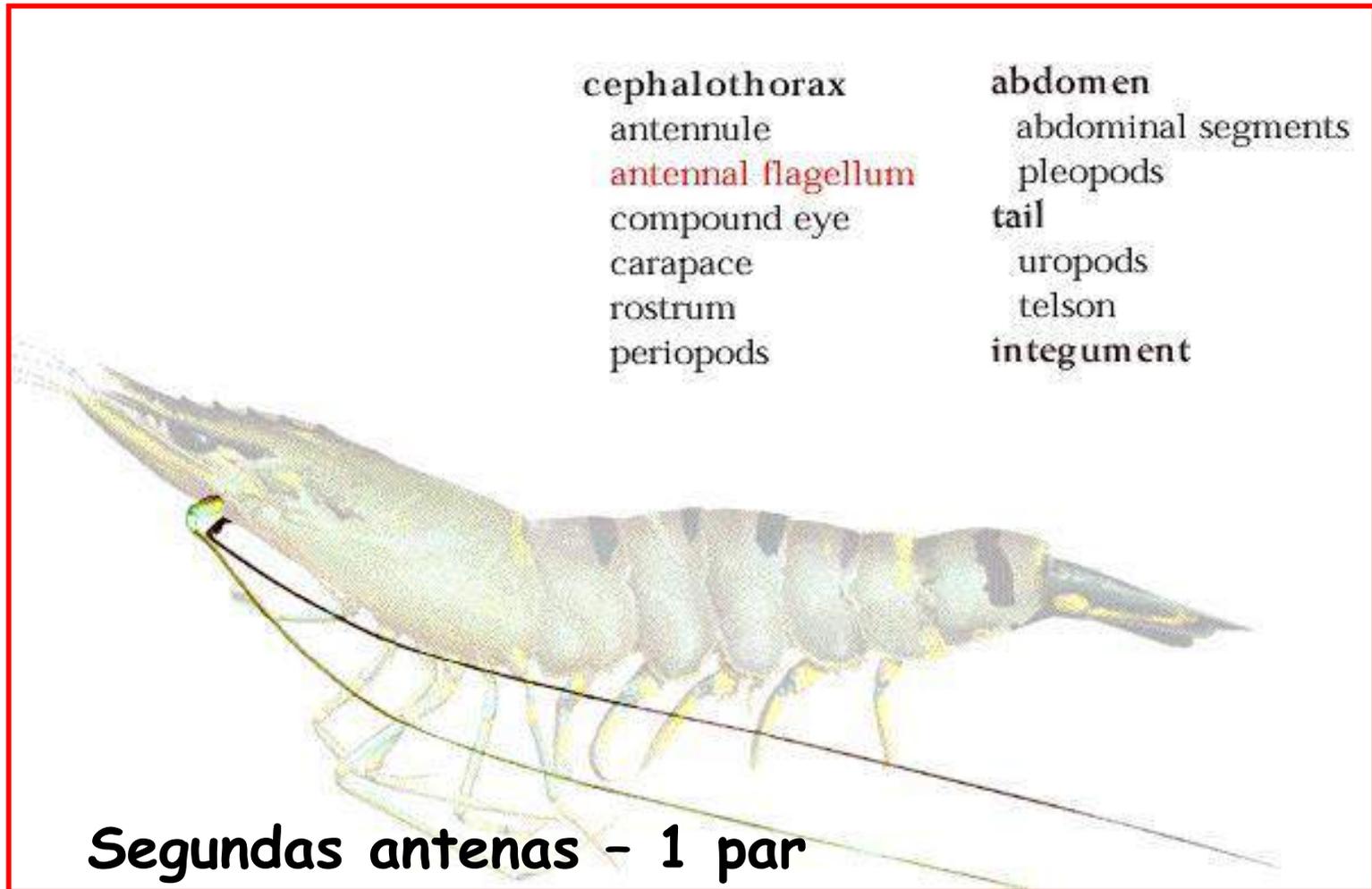
ANTÊNULAS



Primeiras antenas - 1 par

Função: quimiorreceptores

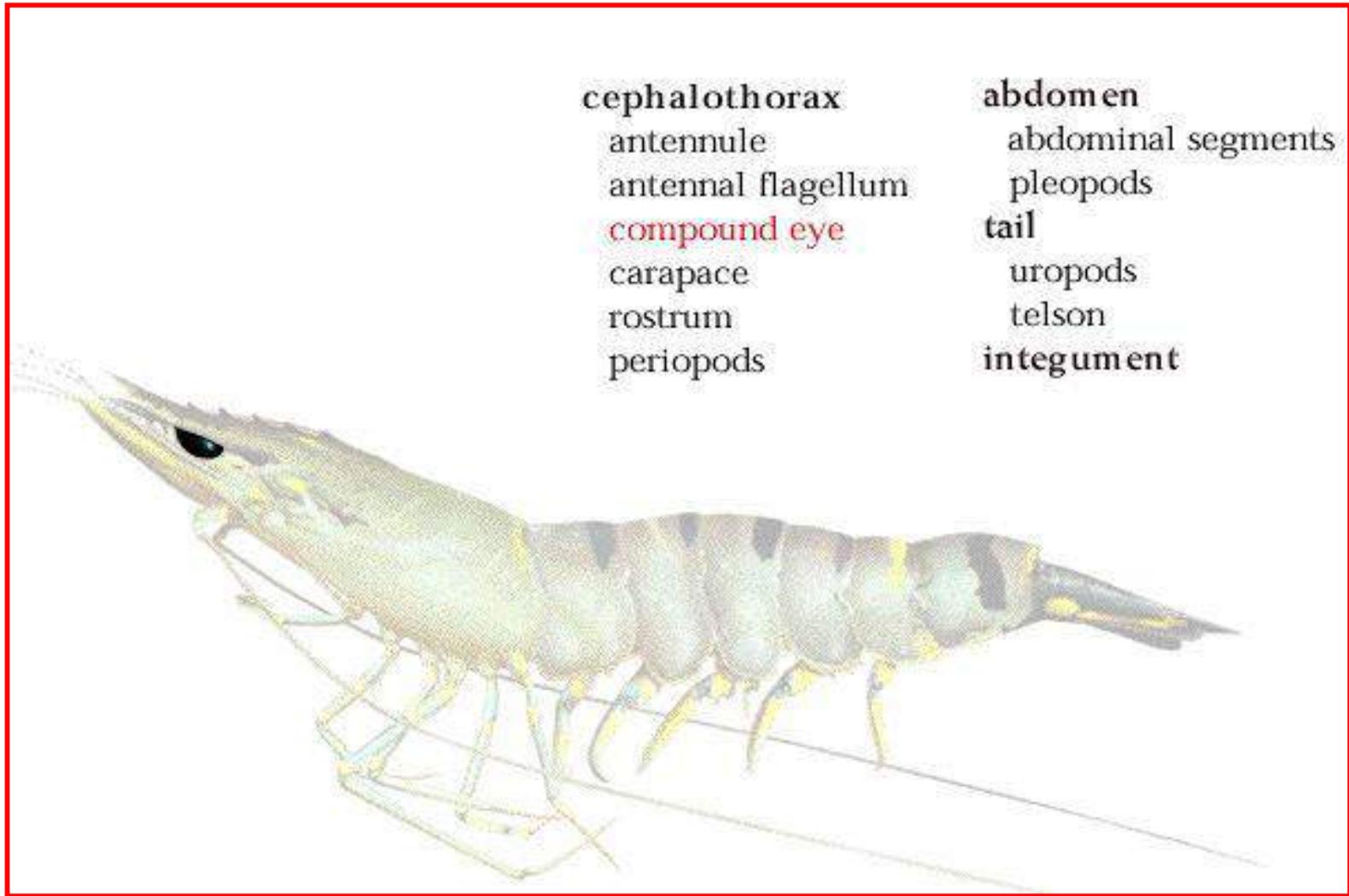
FLAGELO ANTENAL



Segundas antenas - 1 par

Função: sensores tácteis (detecção de predadores, alimentos)

OLHOS



Função: reprodução (fêmea) - ablação

CARAPAÇA

cephalothorax

antennule

antennal flagellum

compound eye

carapace

rostrum

periopods

abdomen

abdominal segments

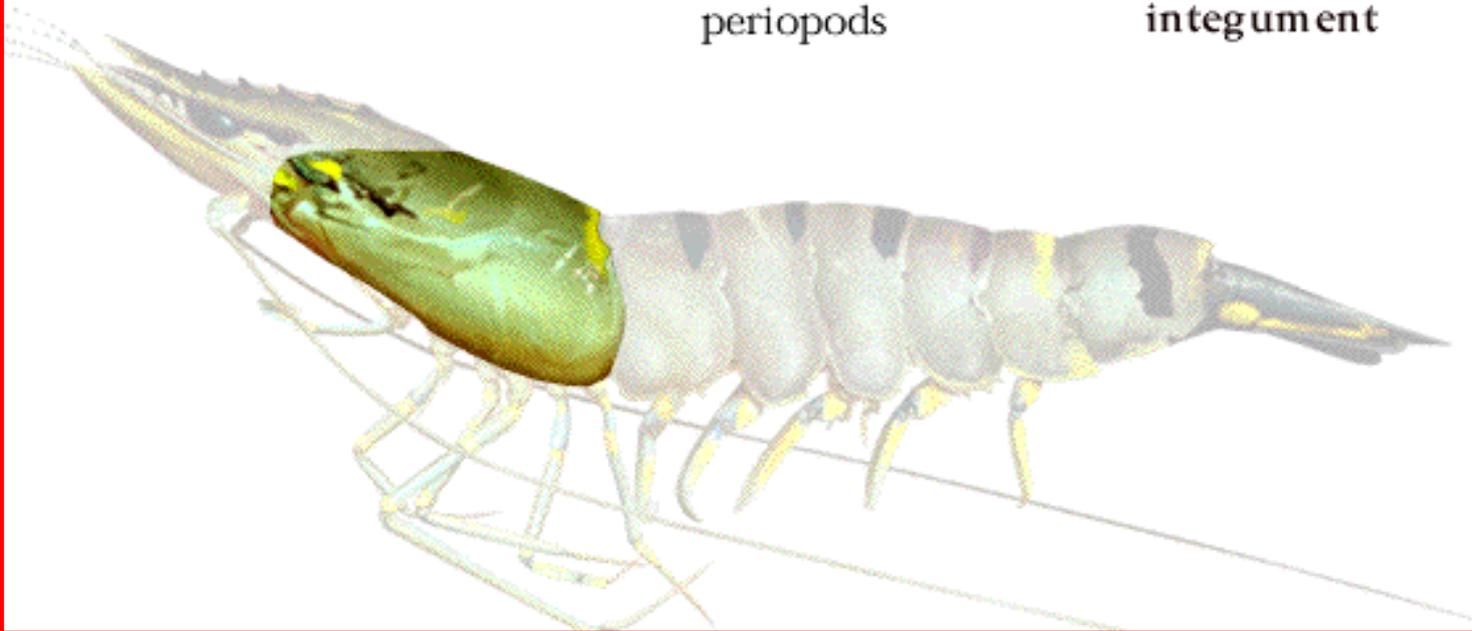
pleopods

tail

uropods

telson

integument



Função: suporte e barreira protetora

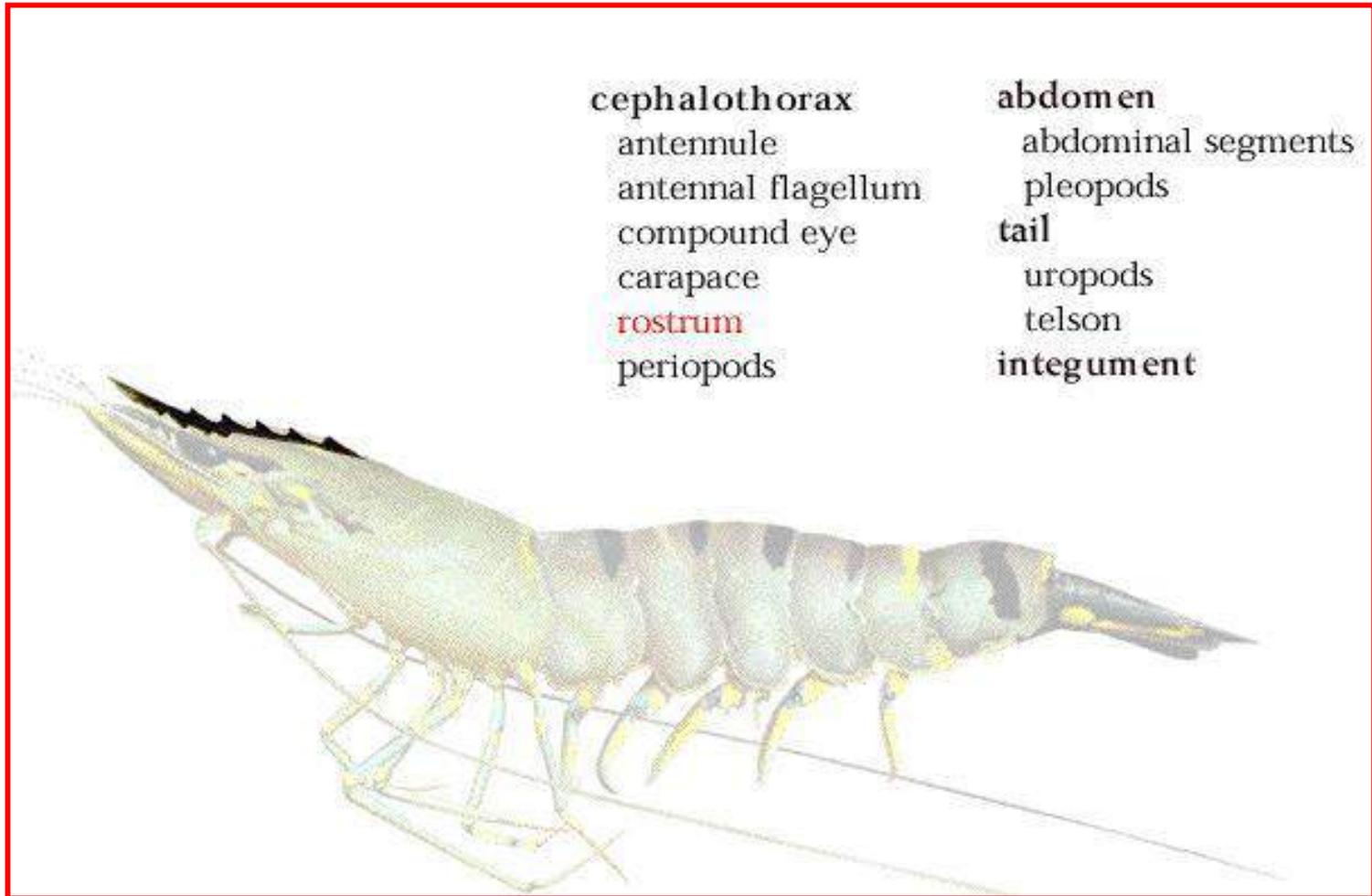
Emiko Shinozaki Mendes

Anatomia e fisiologia

SEMINÁRIO DE RESPONSABILIDADE TÉCNICA

Fonte: Lightner, D.V.

ROSTRUM



Função: defesa?

PERIÓPODOS

cephalothorax

antennule

antennal flagellum

compound eye

carapace

rostrum

periopods

abdomen

abdominal segments

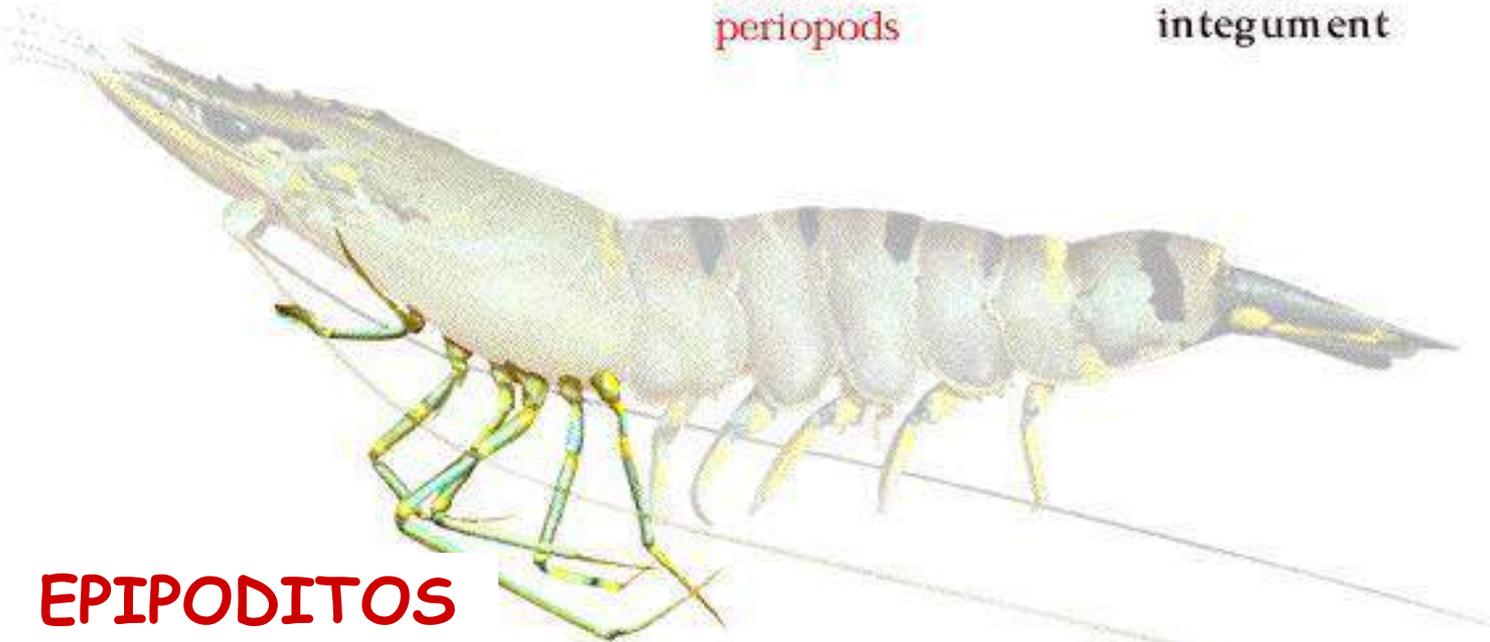
pleopods

tail

uropods

telson

integument



EIPIODITOS

Função: locomoção (andar)

PATA QUELADA OU PINÇA



Função: apreensão de alimentos; defesa.

SEGMENTOS ABDOMINAIS

cephalothorax

antennule

antennal flagellum

compound eye

carapace

rostrum

periopods

abdomen

abdominal segments

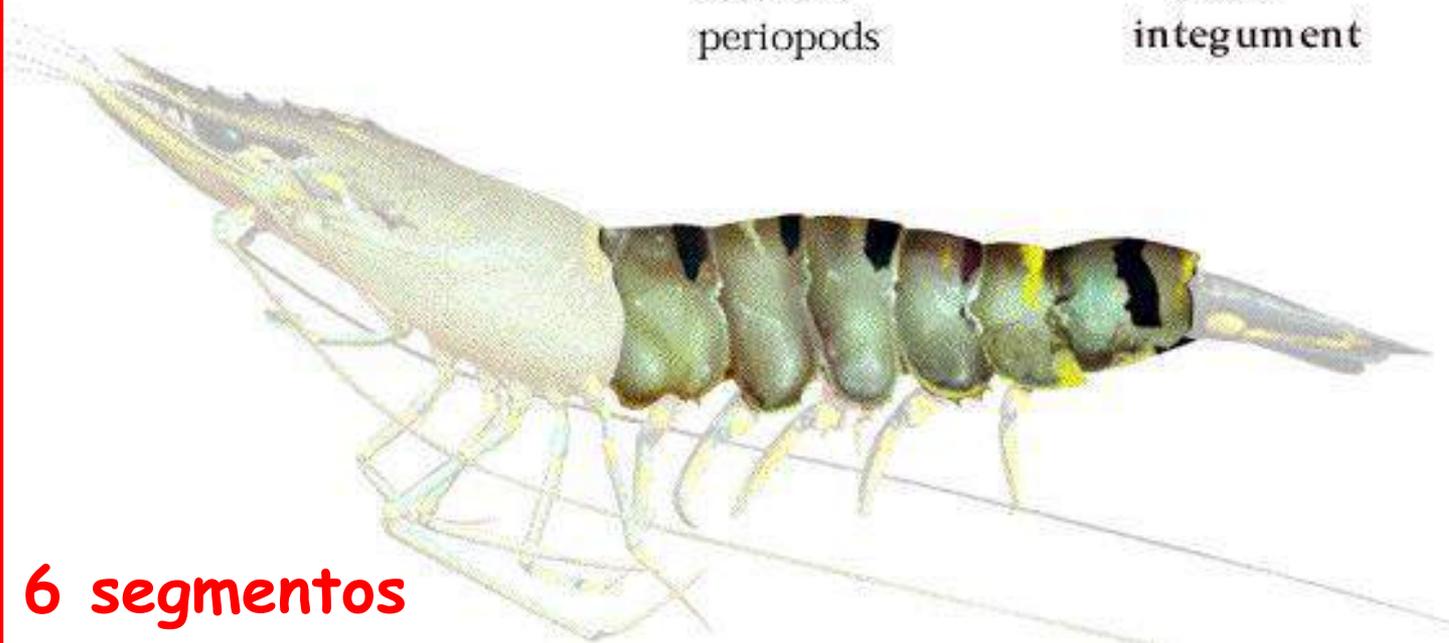
pleopods

tail

uropods

telson

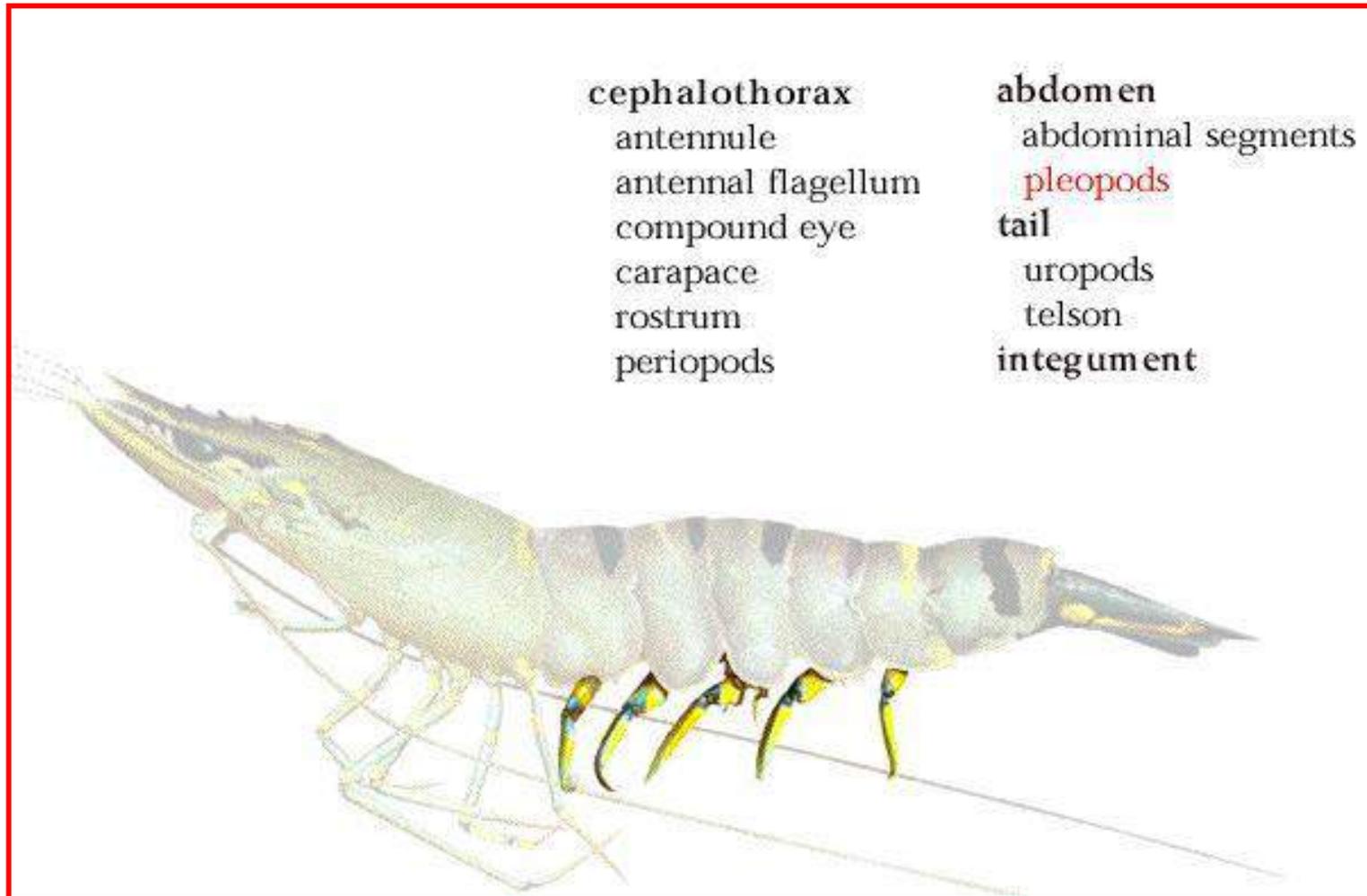
integument



6 segmentos

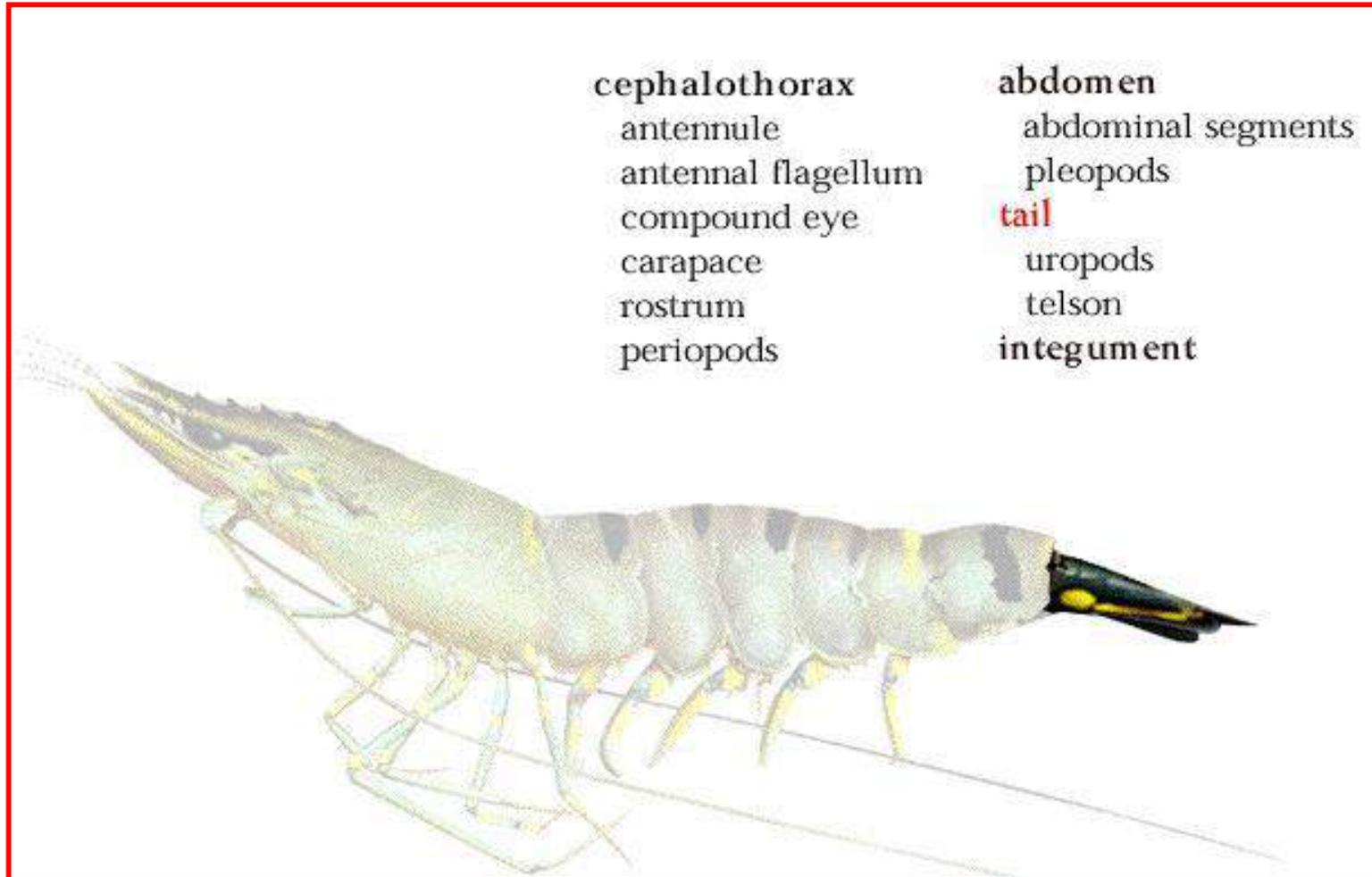
Função: contrações rápidas para o escape de predadores

PLEIÓPODOS



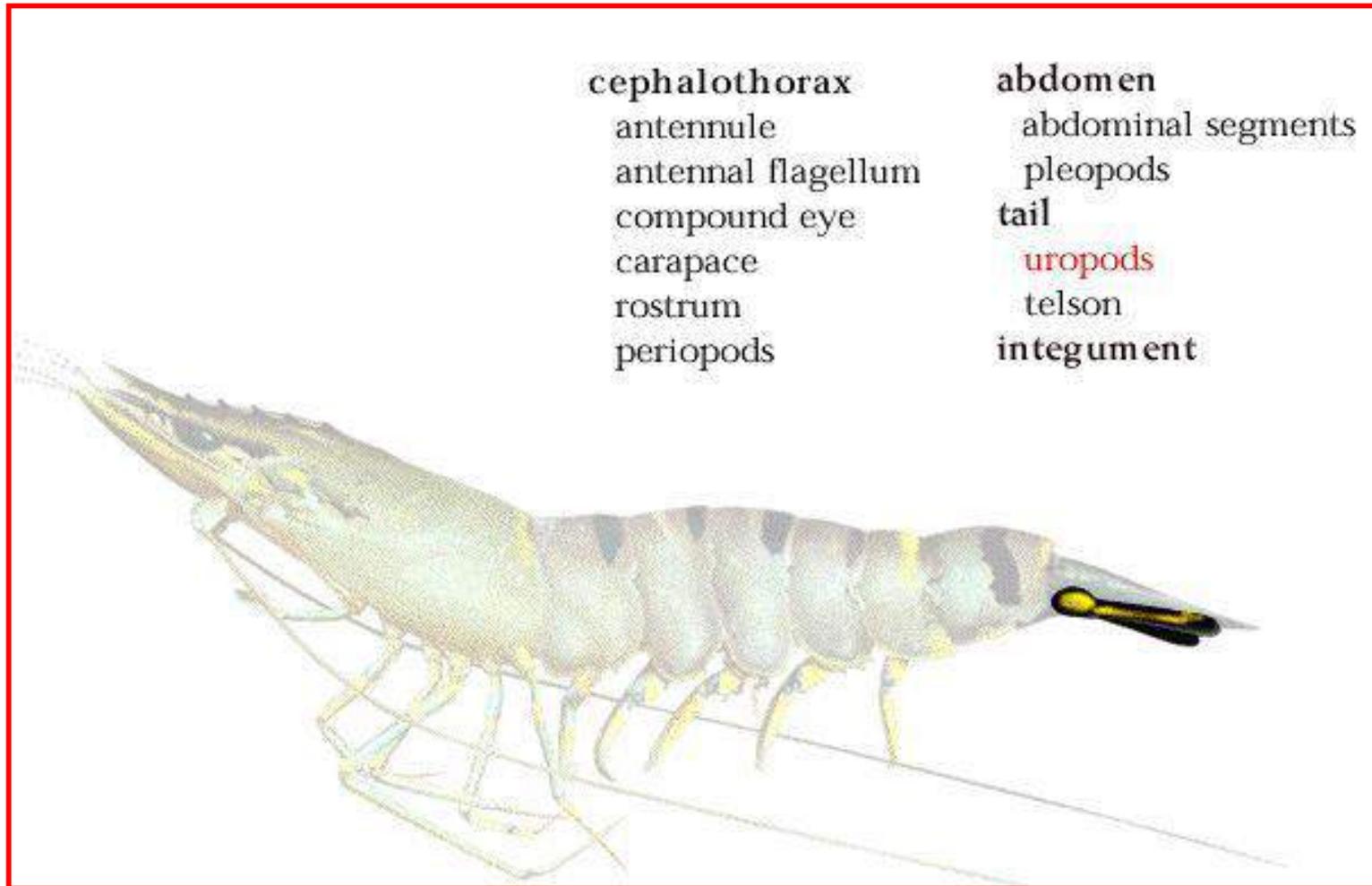
Função: locomoção (natação)

CAUDA



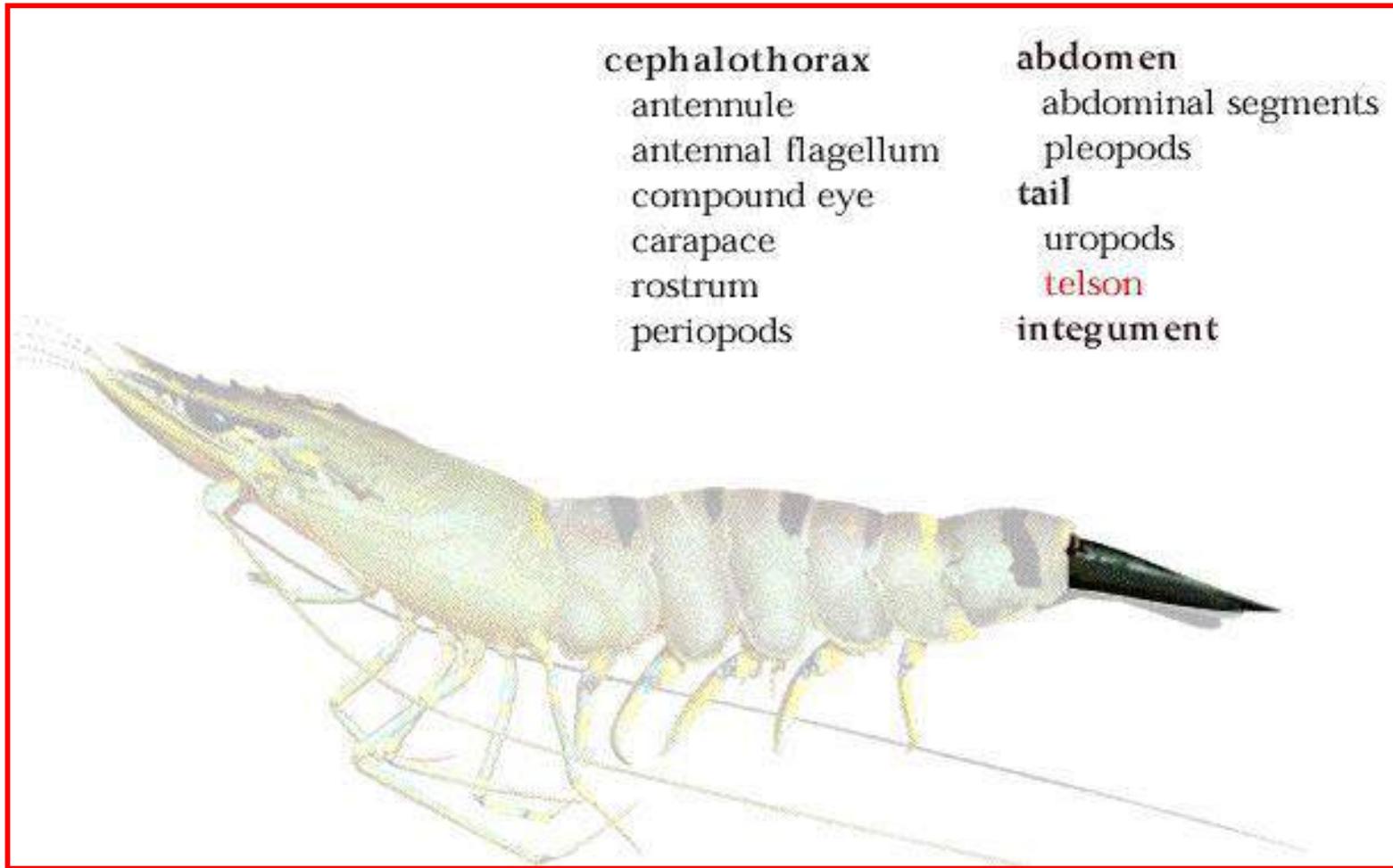
Função: natação (direção)

URÓPODOS



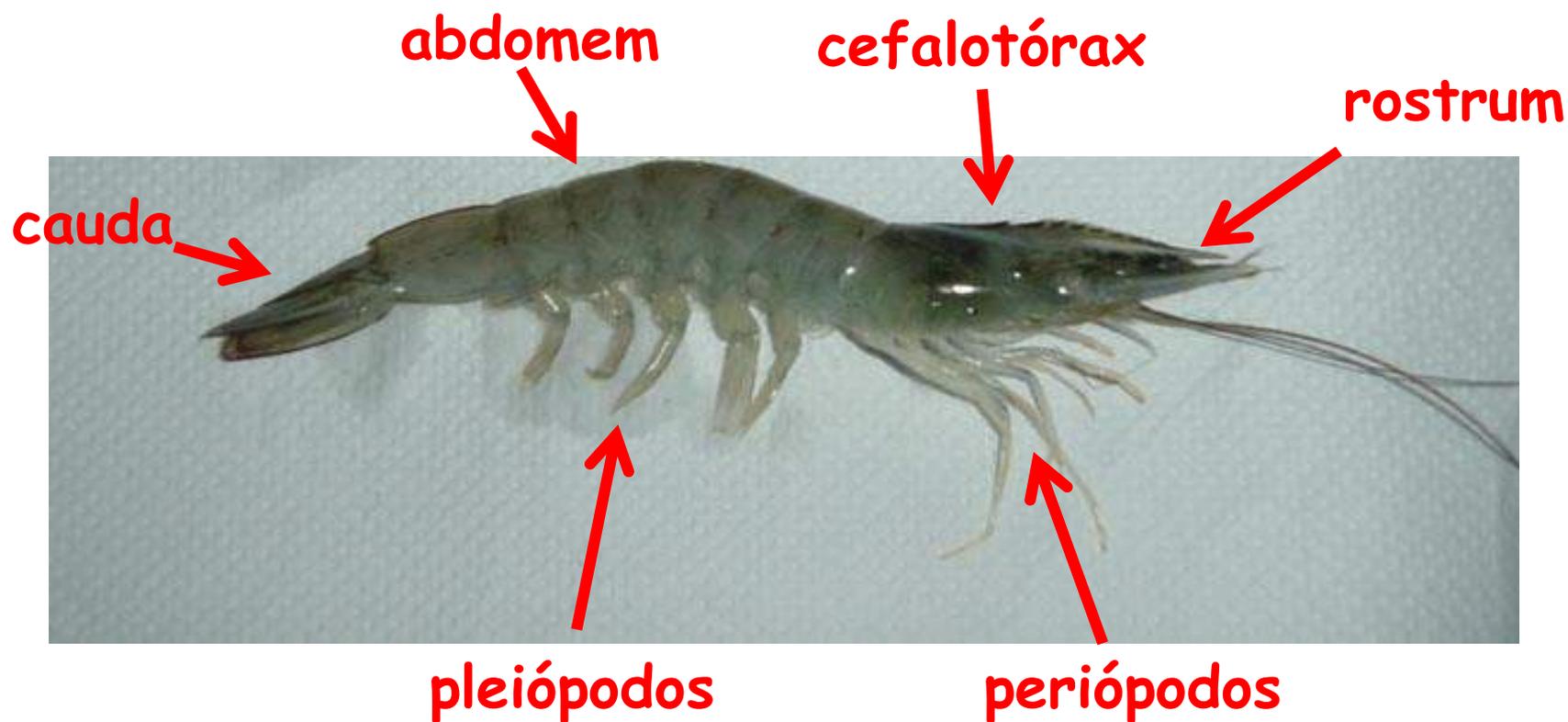
Função: natação (direção)

TELSON

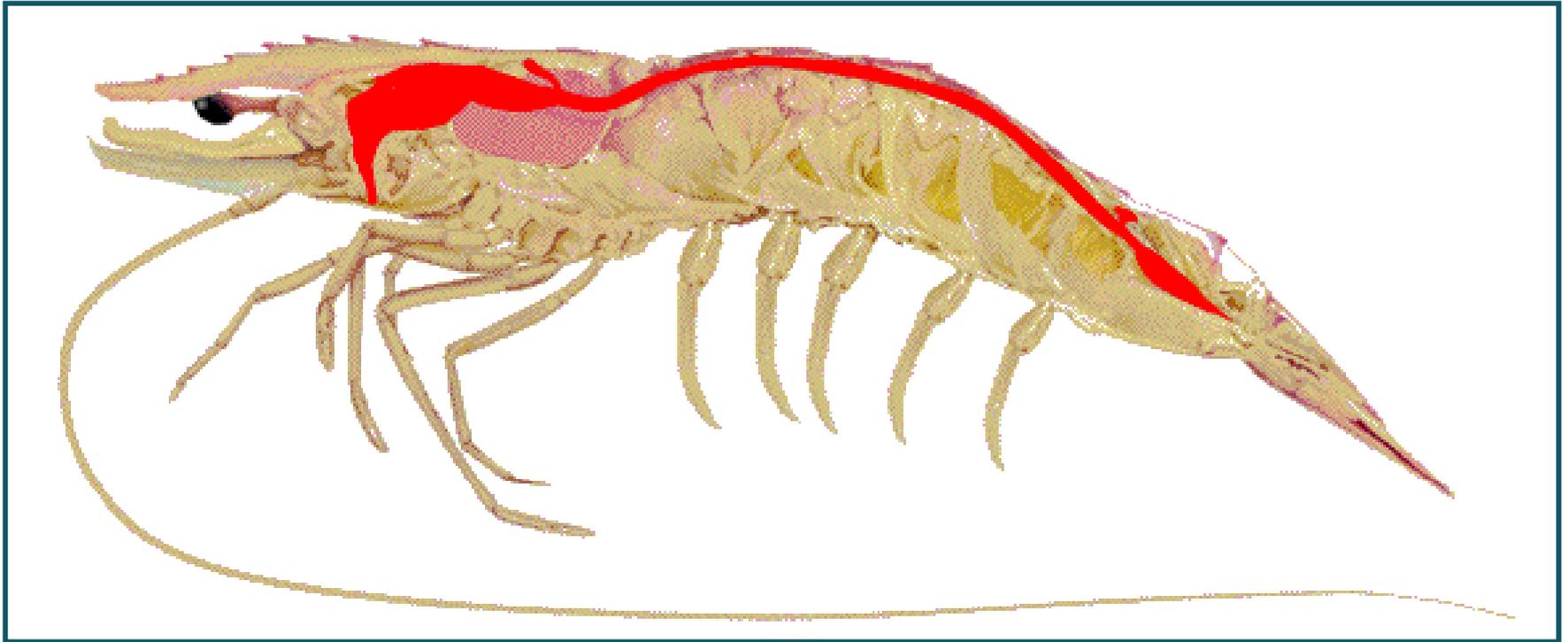


Função: locomoção (natação)

Morfologia externa



MORFOLOGIA INTERNA



SISTEMA DIGESTÓRIO

BOCA

digestive system

oral region

stomach

midgut

hindgut, anus

midgut ceca

hepatopancreas

arteries, veins and sinuses

heart

reproductive organs ovaries

reproductive organs testes

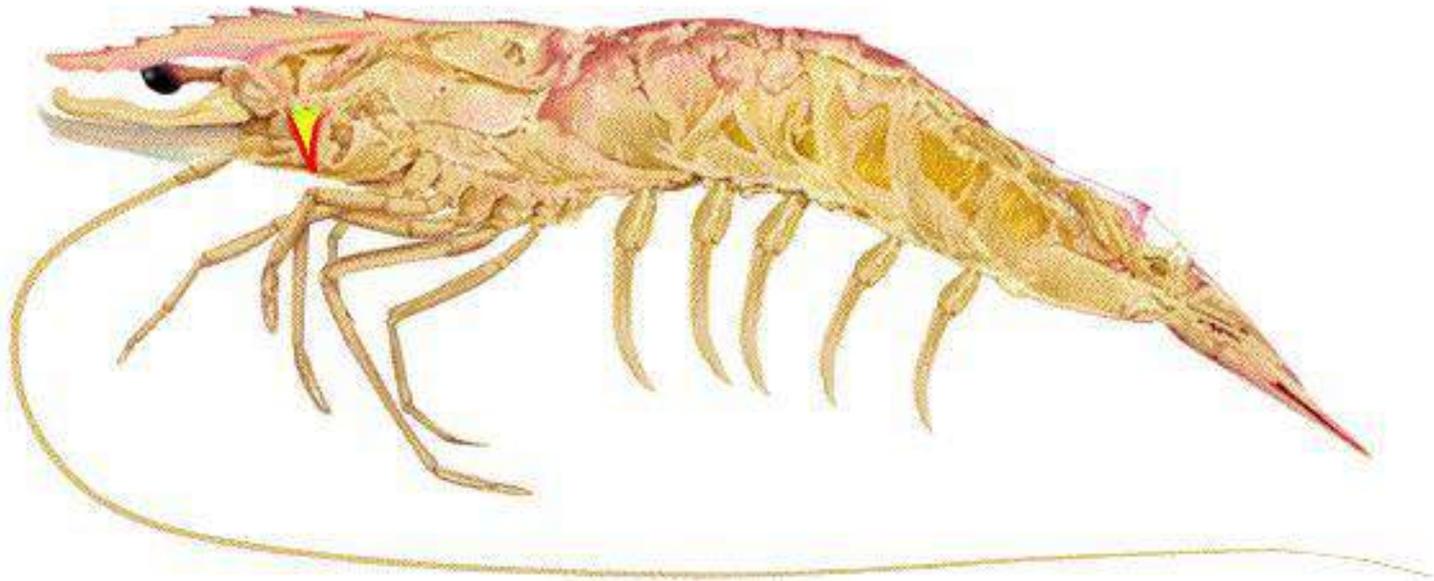
central nervous system

gills

hematopoietic tissue

antennal gland

lymphoid organ



ESTÔMAGO

| | |
|-----------------------------|-----------------------------|
| digestive system | heart |
| oral region | reproductive organs ovaries |
| stomach | reproductive organs testes |
| midgut | central nervous system |
| hindgut, anus | gills |
| midgut ceca | hematopoietic tissue |
| hepatopancreas | antennal gland |
| arteries, veins and sinuses | lymphoid organ |



Proventrículo e esôfago

INTESTINO

PORÇÃO MÉDIA

digestive system

oral region

stomach

midgut

hindgut, anus

midgut ceca

hepatopancreas

arteries, veins and sinuses

heart

reproductive organs ovaries

reproductive organs testes

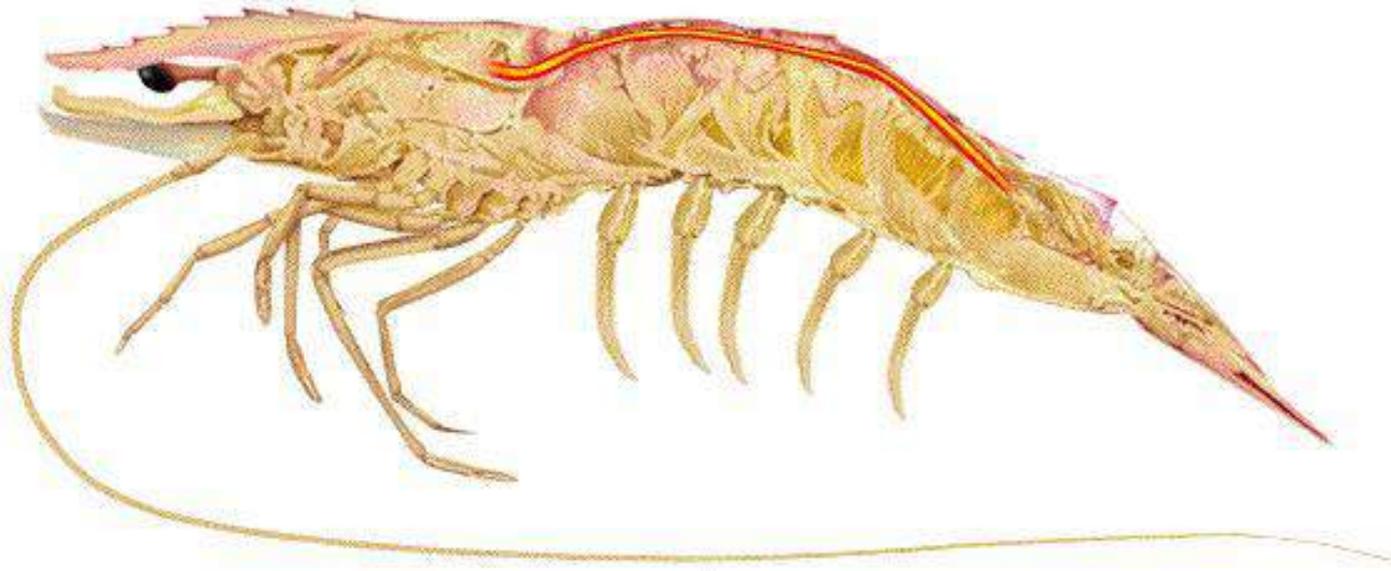
central nervous system

gills

hematopoietic tissue

antennal gland

lymphoid organ



INTESTINO PORÇÃO FINAL

digestive system

oral region

stomach

midgut

hindgut, anus

midgut ceca

hepatopancreas

arteries, veins and sinuses

heart

reproductive organs ovaries

reproductive organs testes

central nervous system

gills

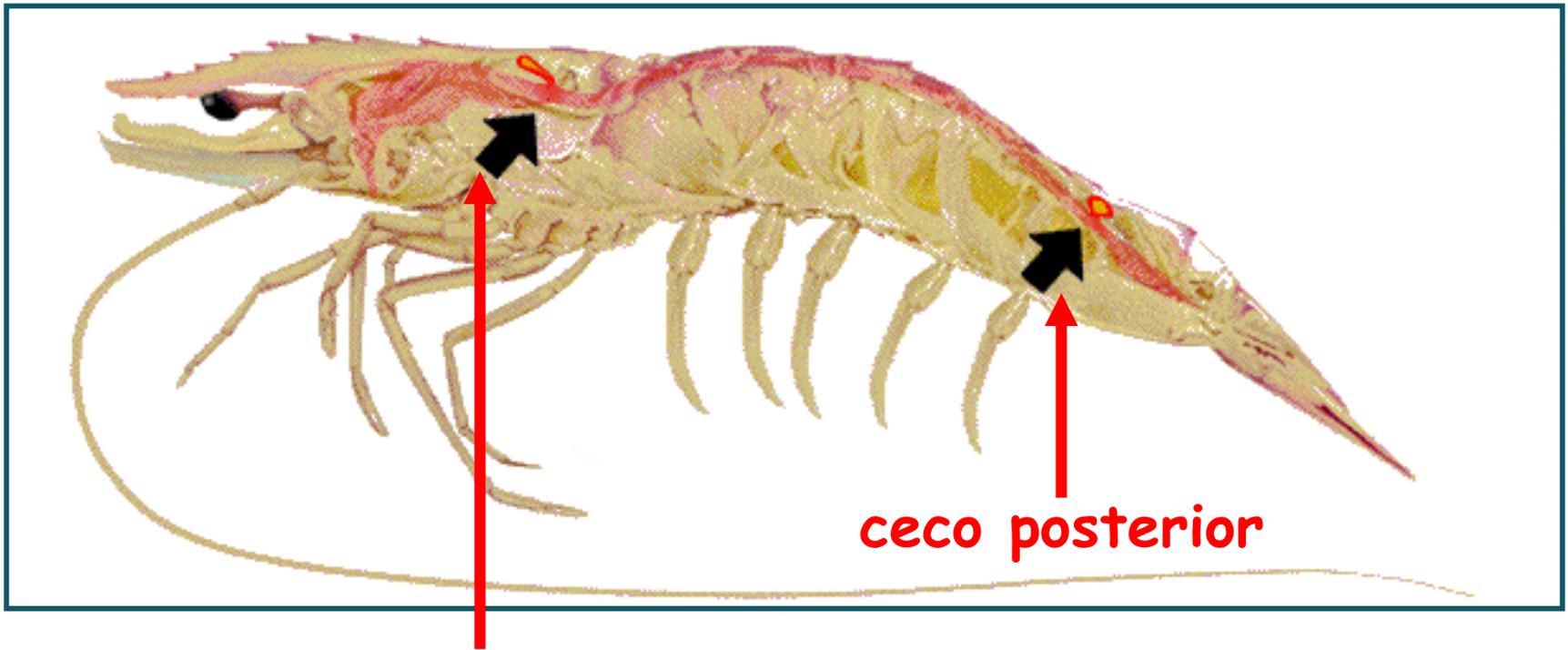
hematopoietic tissue

antennal gland

lymphoid organ



CECOS



ceco hepático anterior

ceco posterior

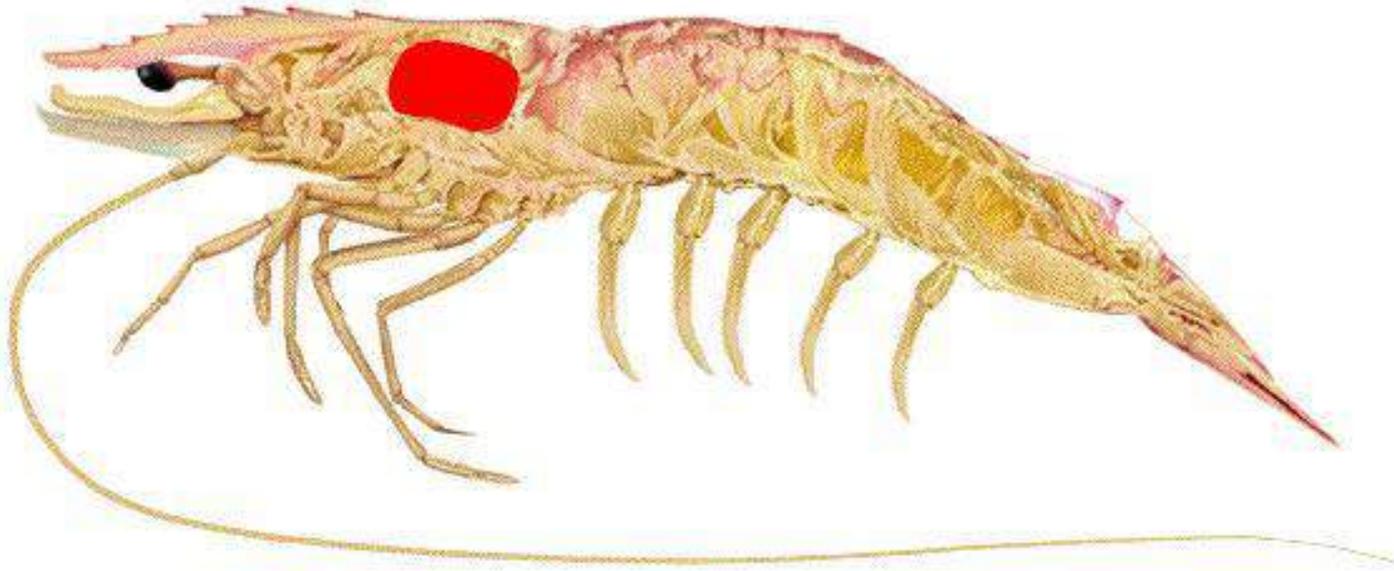
FUNÇÃO

Receber o conteúdo do intestino delgado e começar a reabsorção de água e nutrientes.

HEPATOPÂNCREAS

digestive system
oral region
stomach
midgut
hindgut, anus
midgut ceca
hepatopancreas
arteries, veins and sinuses

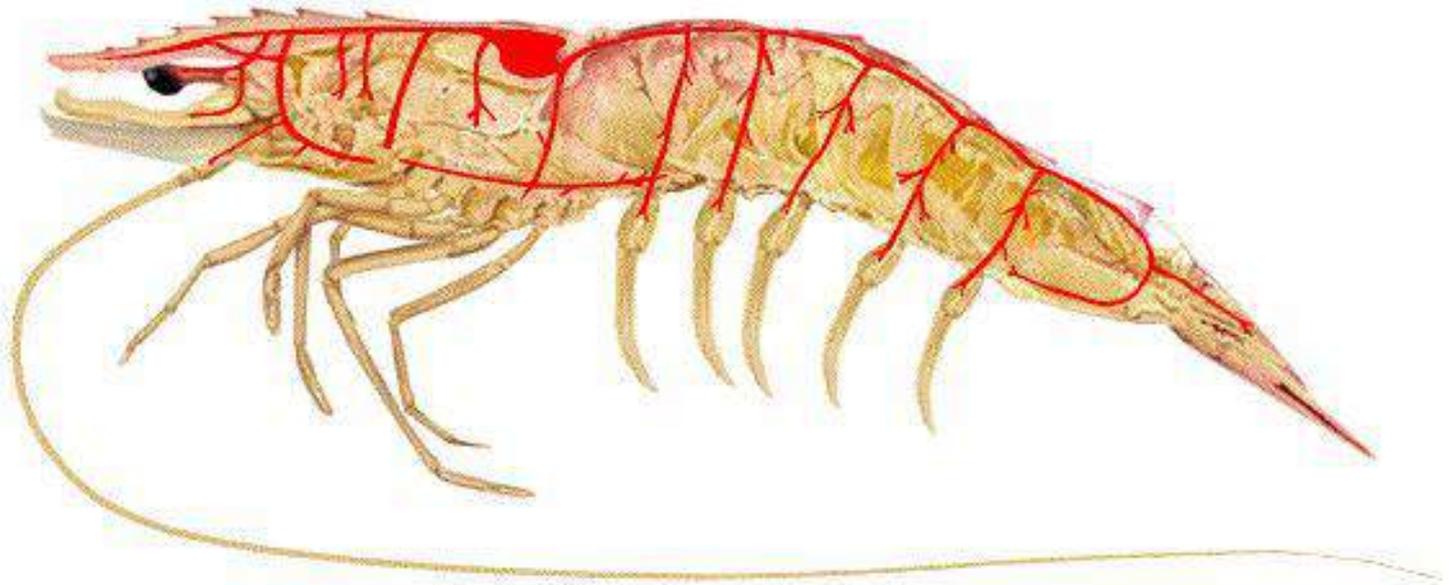
heart
reproductive organs ovaries
reproductive organs testes
central nervous system
gills
hematopoietic tissue
antennal gland
lymphoid organ



SISTEMA CIRCULATÓRIO

digestive system
oral region
stomach
midgut
hindgut, anus
midgut ceca
hepatopancreas
arteries, veins and sinuses

heart
reproductive organs ovaries
reproductive organs testes
central nervous system
gills
hematopoietic tissue
antennal gland
lymphoid organ



HEMOLINFA

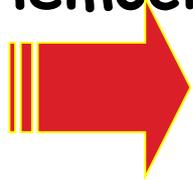
Constituída por uma fração celular (hemócitos)
uma fração humoral (plasma)

Hialinos (HH);

Grânulos pequenos (HGP);

Grânulos grandes (HGG).

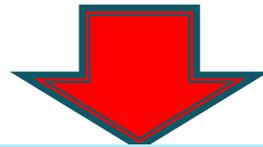
Hemócitos circulantes



metabolismo de carboidratos, transporte e armazenamento de lipoproteínas e aminoácidos, reparo de lesões e injúrias, coagulação e defesa contra invasão de micro-organismos e parasitos.

Primeira linha de defesa

- ✓ Exoesqueleto (carapaça externa rígida) - barreira físico-química protetora);
- ✓ Trato digestivo - revestido de uma capa quitinosa, ambiente ácido, enzimas.



Reações imunológicas

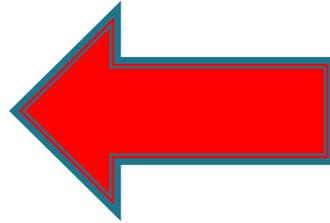
Sistema imune inato

(Não tem sistema adaptativo - infinidade de receptores e anticorpos altamente específicos e indução de células de memórias) - inviabiliza vacinas

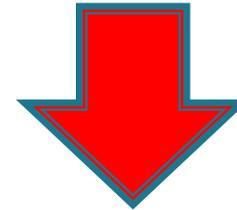
Sistemas de defesa

- ✓ Coagulação da hemolinfa;
- ✓ Melanização mediada pelo sistema profenoloxidase (proPO);
- ✓ Reconhecimento e aglutinação celular mediados pelas lectinas;
- ✓ Sistemas antibacterianos, antifúngicos e antivirais mediados pelos peptídeos antimicrobianos, RNA de interferência e por proteínas de reconhecimento padrão;
- ✓ Sistema fagocítico e de encapsulamento.

Invasão de
micro-organismo

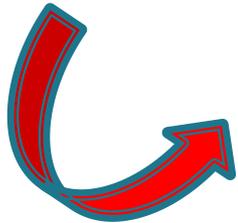


Migração dos
hemócitos

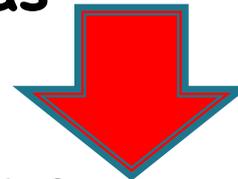


INFLAMAÇÃO

Sítios de infecção

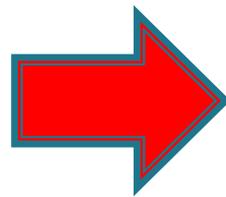


fagocitose - formação de agregados celulares densos em torno das partículas invasoras



Pode ocorrer liberação de diferentes moléculas capazes de neutralizar e degradar os agentes patógenos.

Linha de defesa



fagocitose

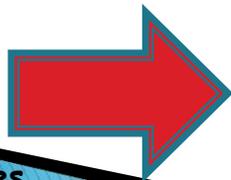
Quando há invasão massiva de micro-organismos ou partículas/patógenos de grande tamanho, não sendo possível a fagocitose, desencadeia-se a formação de cápsulas celulares e nódulos.

**Cápsulas
celulares**

Rodeiam a grande quantidade de micro-organismos e são capturados para dentro das células agregadas, semelhantes a cápsulas.

**Formação
de
nódulos**

Agregação de várias capas de hemócitos ao redor do patógeno de grande tamanho (hifas, nematóides, algumas formas de protozoários).



Disseminação e produção de septicemia.

CORAÇÃO

digestive system

oral region

stomach

midgut

hindgut, anus

midgut ceca

hepatopancreas

arteries, veins and sinuses

heart

reproductive organs ovaries

reproductive organs testes

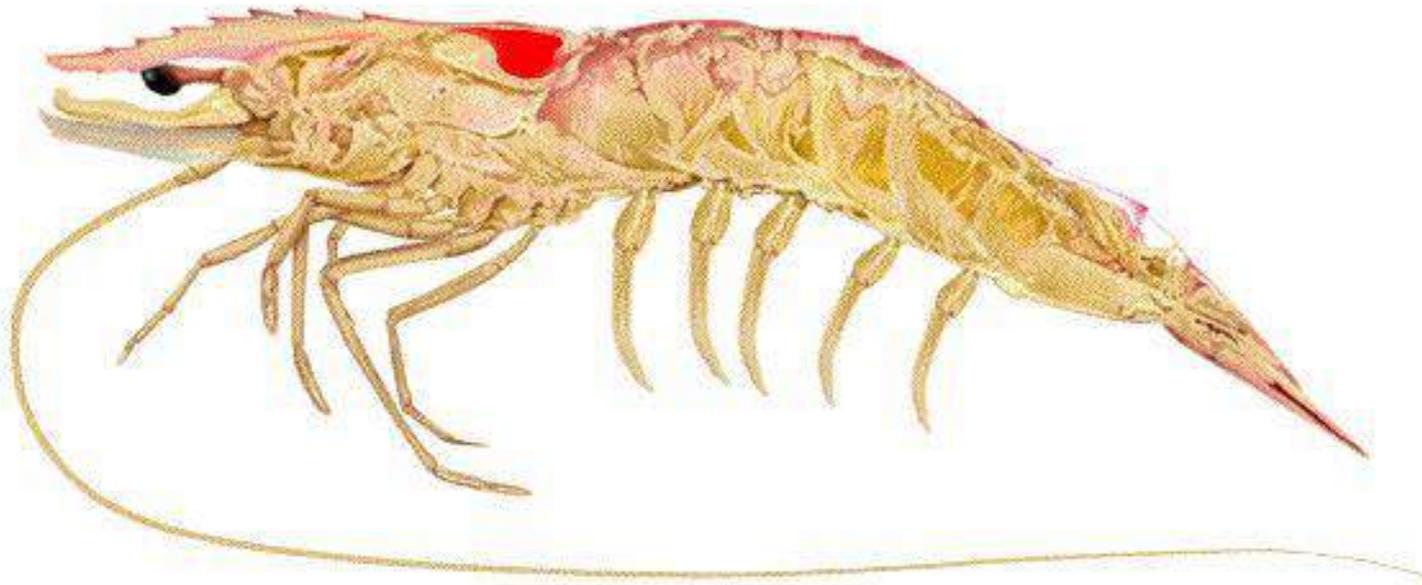
central nervous system

gills

hematopoietic tissue

antennal gland

lymphoid organ



SISTEMA REPRODUTIVO FÊMEA

digestive system

oral region

stomach

midgut

hindgut, anus

midgut ceca

hepatopancreas

arteries, veins and sinuses

heart

reproductive organs ovaries

reproductive organs testes

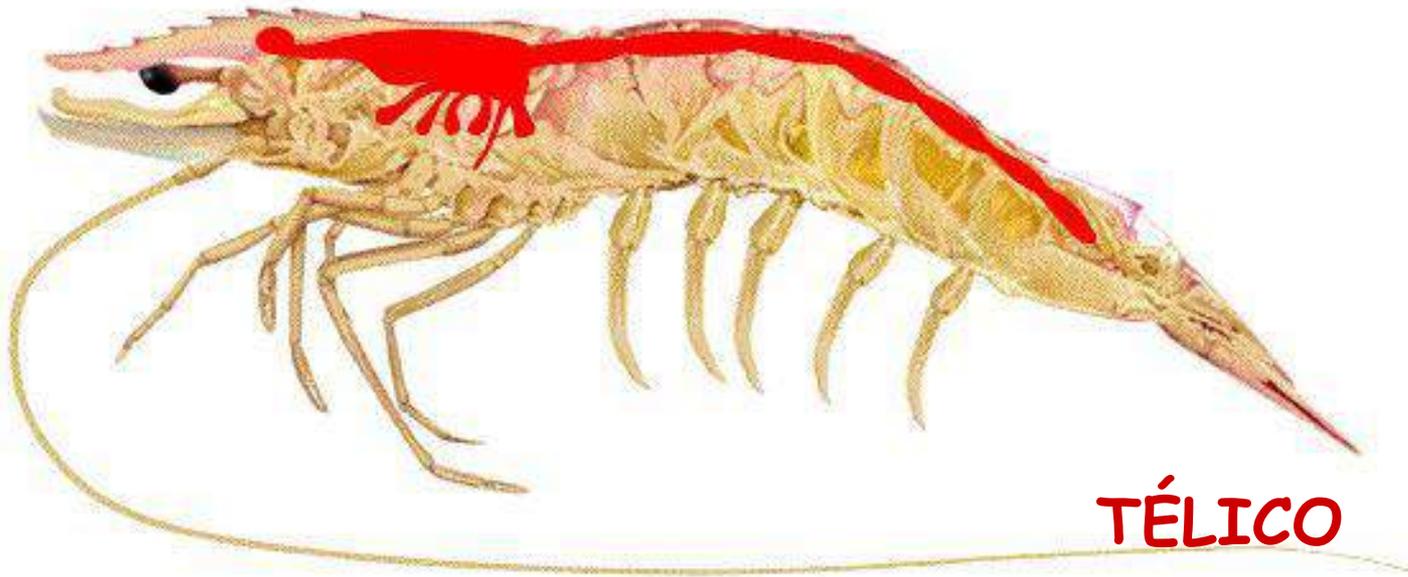
central nervous system

gills

hematopoietic tissue

antennal gland

lymphoid organ



SISTEMA REPRODUTIVO MACHO

digestive system

oral region

stomach

midgut

hindgut, anus

midgut ceca

hepatopancreas

arteries, veins and sinuses

heart

reproductive organs ovaries

reproductive organs testes

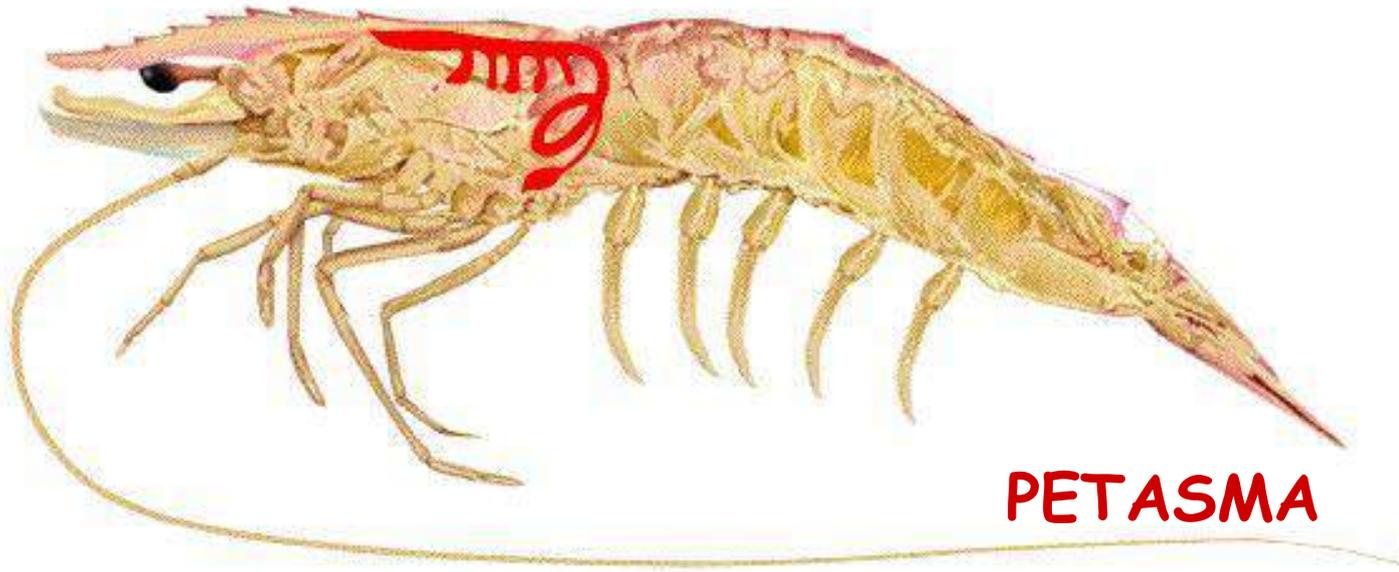
central nervous system

gills

hematopoietic tissue

antennal gland

lymphoid organ

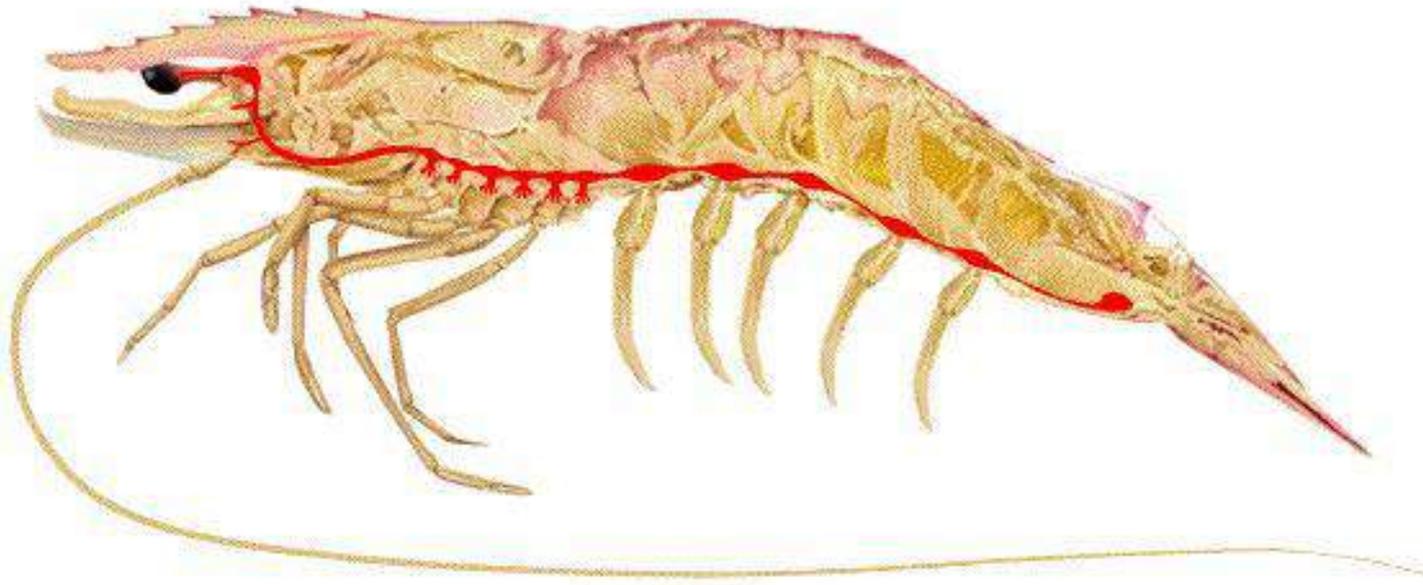


PETASMA

SISTEMA NERVOSO CENTRAL

digestive system
oral region
stomach
midgut
hindgut, anus
midgut ceca
hepatopancreas
arteries, veins and sinuses

heart
reproductive organs ovaries
reproductive organs testes
central nervous system
gills
hematopoietic tissue
antennal gland
lymphoid organ



BRÂNQUIAS

digestive system

oral region

stomach

midgut

hindgut, anus

midgut ceca

hepatopancreas

arteries, veins and sinuses

heart

reproductive organs ovaries

reproductive organs testes

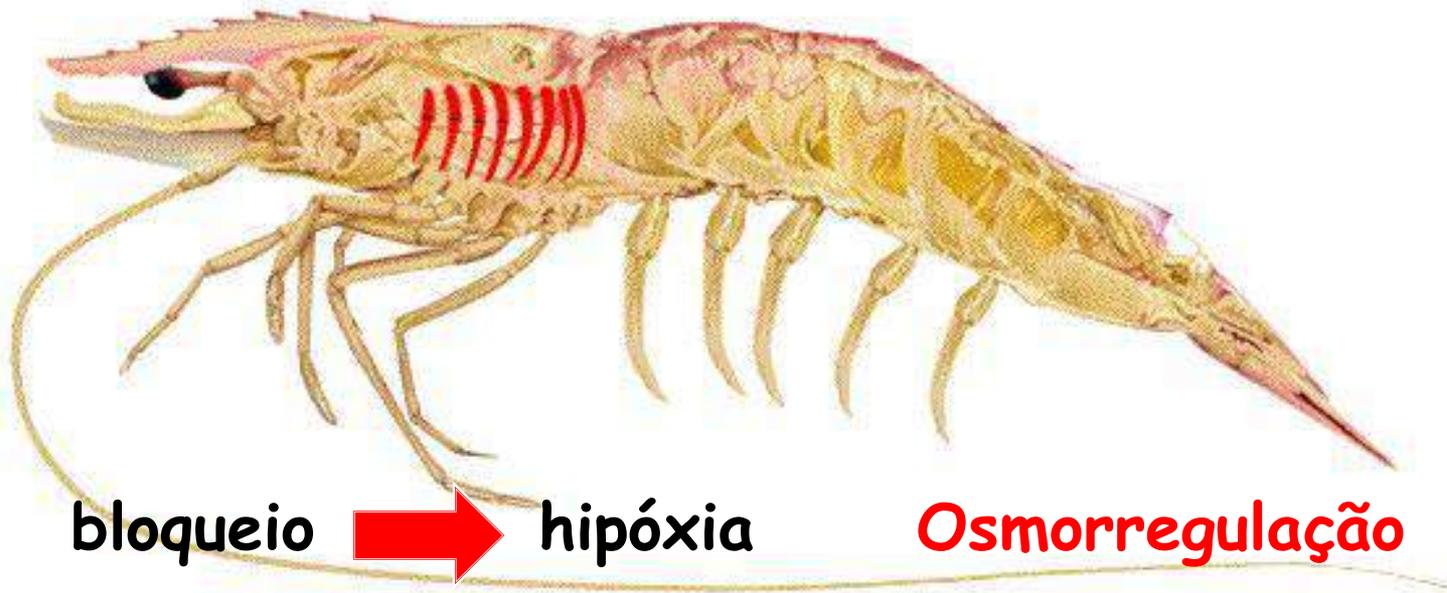
central nervous system

gills

hematopoietic tissue

antennal gland

lymphoid organ



ÓRGÃO HEMATOPOIÉTICO

digestive system

oral region

stomach

midgut

hindgut, anus

midgut ceca

hepatopancreas

arteries, veins and sinuses

heart

reproductive organs ovaries

reproductive organs testes

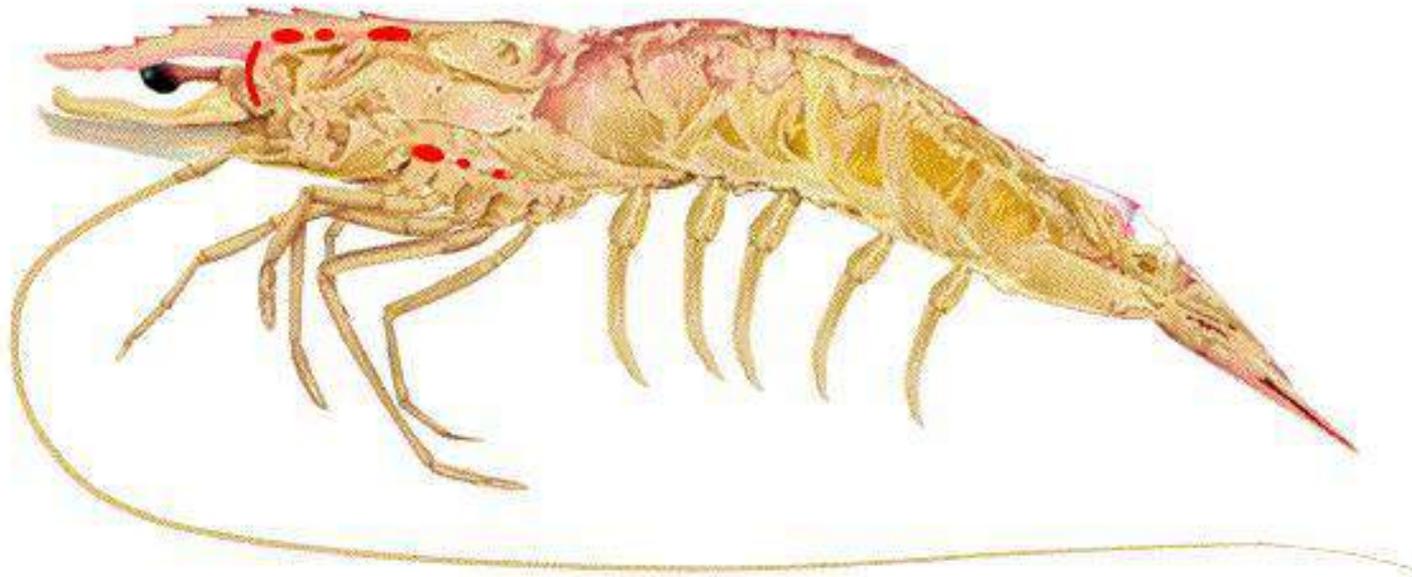
central nervous system

gills

hematopoietic tissue

antennal gland

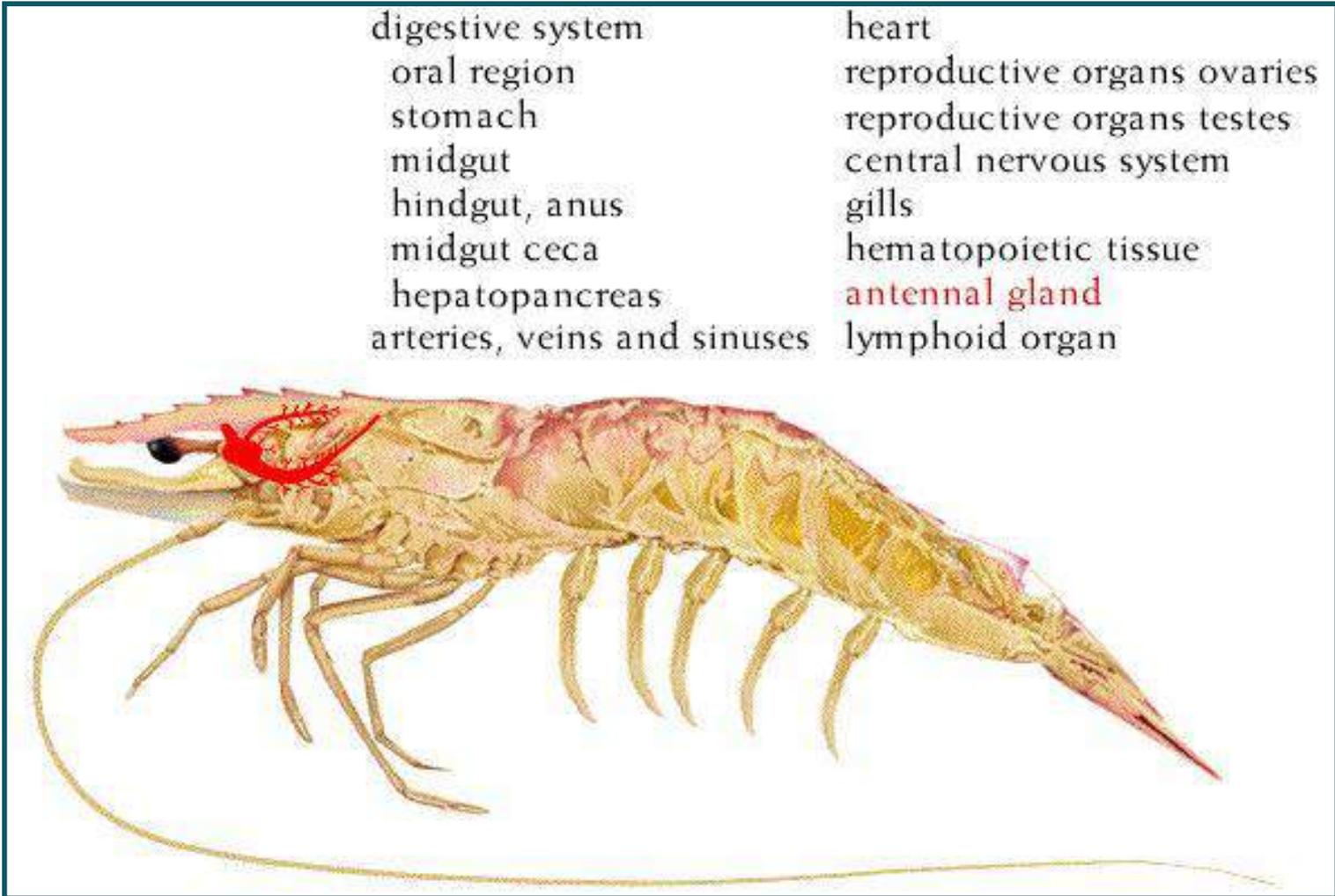
lymphoid organ



GLÂNDULA ANTENAL

digestive system
oral region
stomach
midgut
hindgut, anus
midgut ceca
hepatopancreas
arteries, veins and sinuses

heart
reproductive organs ovaries
reproductive organs testes
central nervous system
gills
hematopoietic tissue
antennal gland
lymphoid organ



ÓRGÃO LINFÓIDE

digestive system

oral region

stomach

midgut

hindgut, anus

midgut ceca

hepatopancreas

arteries, veins and sinuses

heart

reproductive organs ovaries

reproductive organs testes

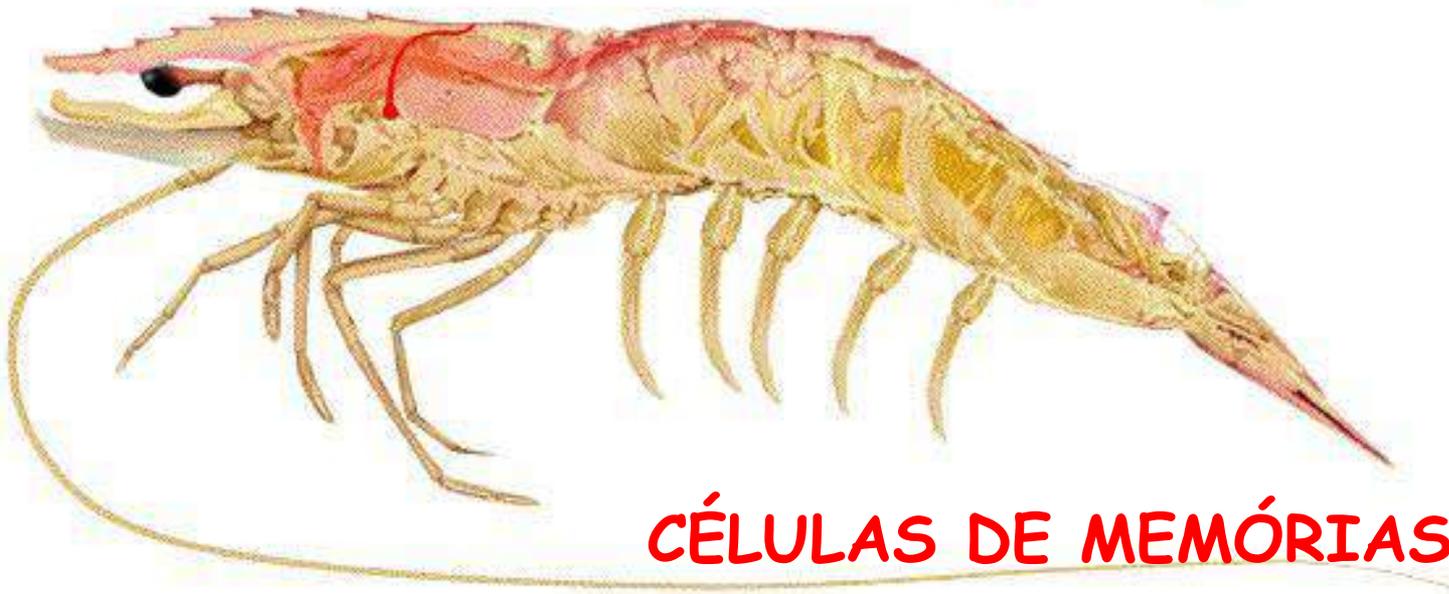
central nervous system

gills

hematopoietic tissue

antennal gland

lymphoid organ



CÉLULAS DE MEMÓRIAS