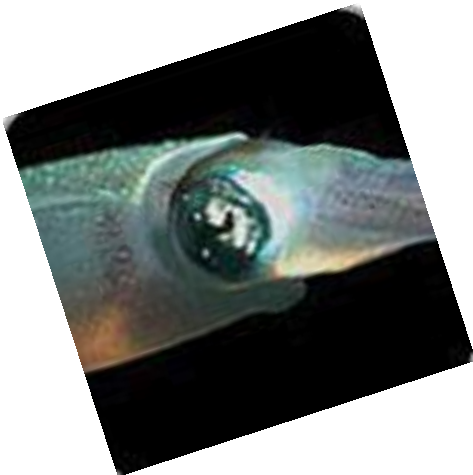


Carolina Biological Supply Company

**SQUID INK-QUIRY:
Inquiry-Based Invertebrate Anatomy
Through Squid Dissection**



Objectives

- **Learn ways to incorporate inquiry methods in dissection laboratories**
- **Motivate, stimulate, and engage students while teaching animal diversity**

Squid Dissection BioKit®



Catalog no. 221485

- **15 double-injected squid**
- **15 hand lenses**
- **Petri dishes (for examining dissected tissue)**
- ***Dissection and Anatomy of the Squid* lab manual**
- ***Squid Anatomy* poster**
- **Teacher's manual with reproducible student guide**

Carolina Dissection Materials



Please use:

- **Safety equipment (aprons, gloves, and safety glasses)**
- **Dissection tray**
- **Dissection kit**

Squid: What Do You Know?

Think	Pair	Share
1.	1.	1.
2.	2.	2.
3.	3.	3.

Squid Classification

Human	Squid
Domain: Eukarya	Eukarya
Kingdom: Animalia	Animalia
Phylum: Chordata	Mollusca
Class: Mammalia	Cephalopoda
Order: Primates	Teuthida
Family: Homindae	Loliginidae
Genus: <i>Homo</i>	<i>Loligo</i>
Species: <i>Homo sapiens</i>	<i>Loligopealei</i>

Taxon: 3 Observable Traits

Kingdom Animalia	Phylum Mollusca
1. Eukaryote	1. Tentacles
2. Multicellular	2. Soft-bodied
3. Heterotroph	3. No external skeleton

Taxon: 3 Observable Traits

Class Cephalopoda

1.

2.

3.

Examples of Cephalopods



- **Octopus**
- **Squid**
- **Cuttlefish**
- **Chambered nautilus**
- **Chitons (polyplacophorans)**

Open Inquiry

- **Ask any 3 questions about the squid.**
- **Ask 3 questions about the squid that can be answered by conducting a dissection.**

Observable Adaptations for Survival

List 3!

1.

2.

3.

Traits Not Readily Observable

1.

2.

3.

Type of Symmetry



- **Radial or bilateral?**
- **Dorsal vs. ventral?**
- **Posterior vs. anterior?**

Explain your choices.

External Features



Fins

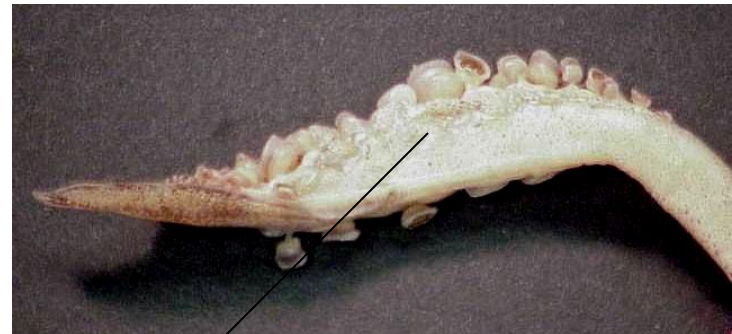
Mantle

Collar

Head

Tentacles

Dorsal view



The Head-Footed Mollusk



The squid demonstrates a high degree of cephalization.

The 2 large eyes:

- **Lens**
- **Retina**
- **Photoreceptors**

Advantages of cephalization?

Means of Locomotion



- **What obvious structures are used for locomotion?**
- **Are all the legs/tentacles alike?**
- **How are they adapted for movement?**

Means of Locomotion



- **What other purpose might the tentacles and arms serve?**
- **Other modes of moving through water?**

Propulsion

- **What observable structures might be responsible for this rapid movement through the water?**
- **Based on the orientation of the excurrent siphon and Newtonian laws of motion, describe the direction of movement.**

Take a Closer Look

- Record the number and length of each type of appendage.
- Look at the suction cups through a hand lens.



Tentacles vs. Arms

- **Which are best designed for sensory functions? Why?**
- **Which are best designed for movement? Why? Record all your responses.**

Open Wide . . .



What Type of Diet?

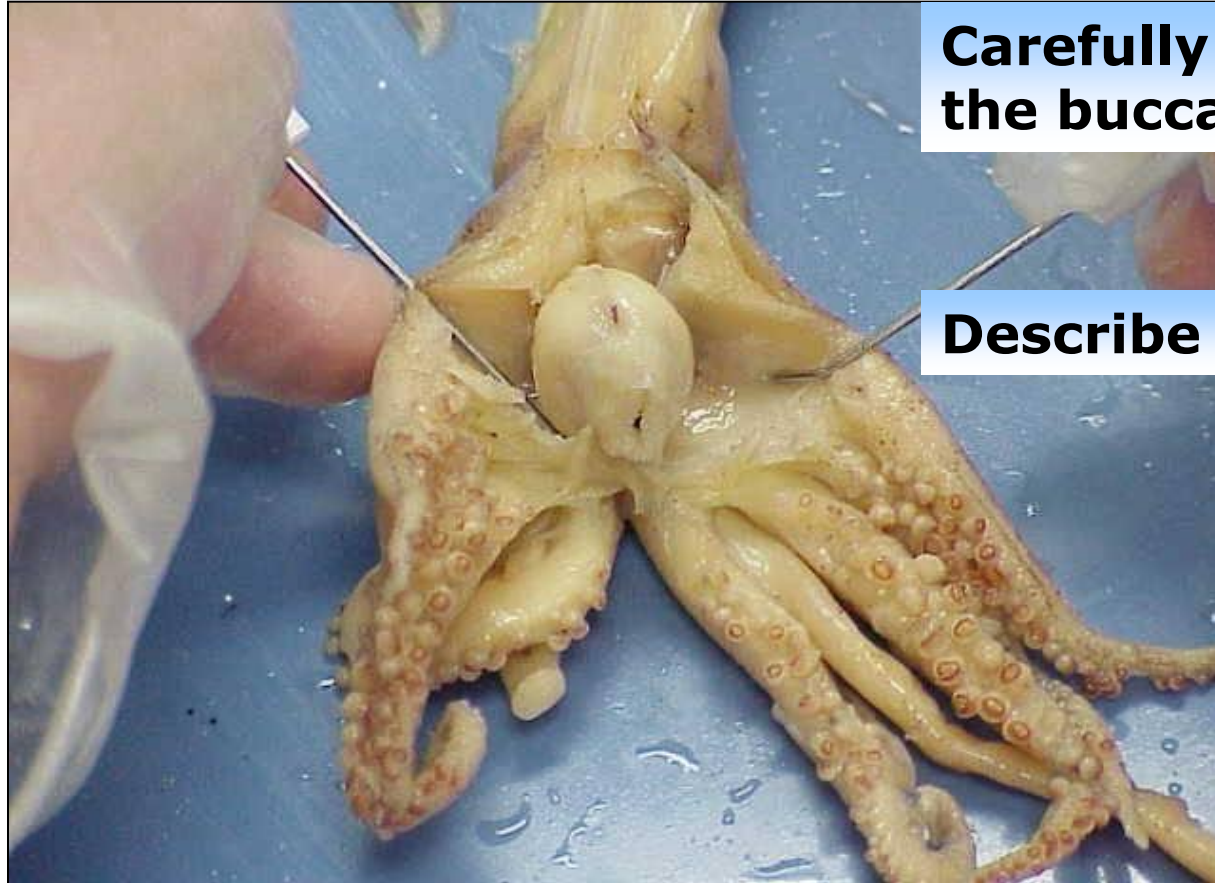
Use the probe to explore the squid's mouth.

Record your observations.

Type of consumer?



The Buccal Mass



**Carefully cut open
the buccal mass.**

Describe what you see.

Buccal Mass



**Attached to
the esophagus**

Evolutionary Relationships

How might scientists account for a beak in this marine invertebrate?

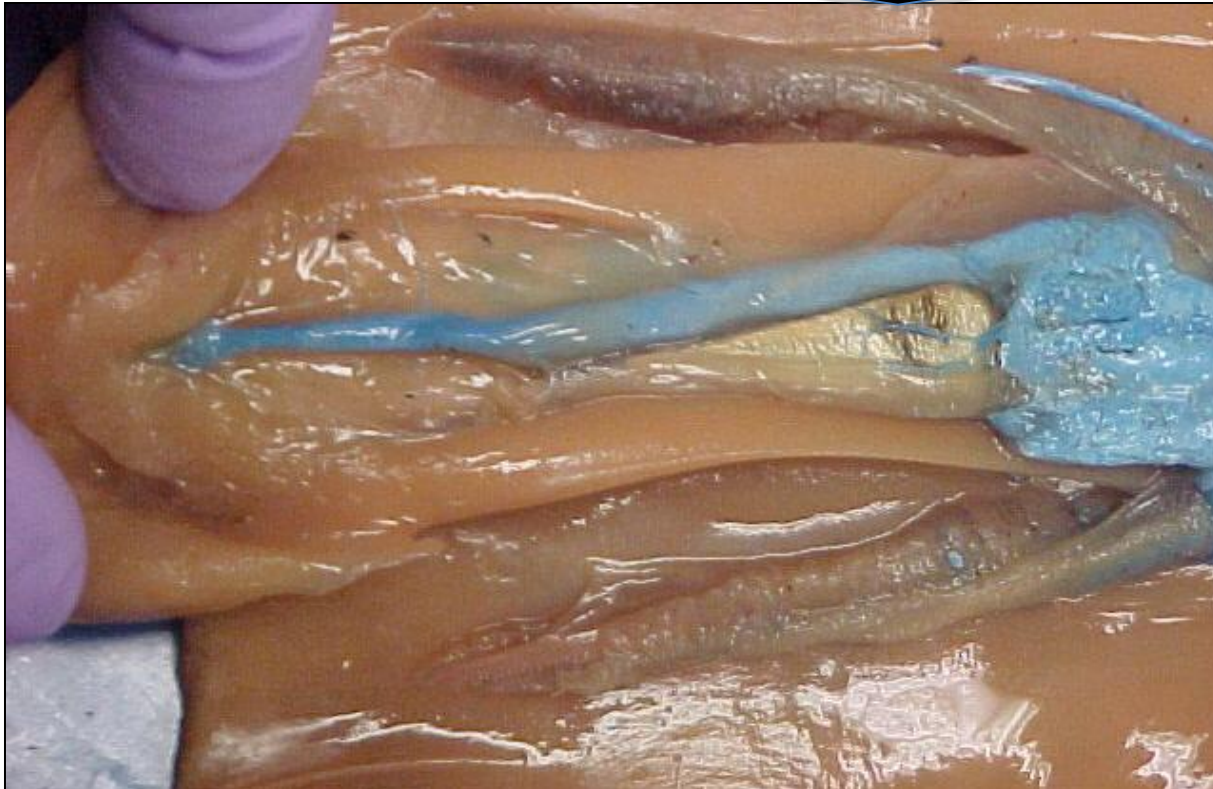
Making the Incisions



- **Ventral side up!**
- **Insert scissors into siphon.**

Inside the Siphon

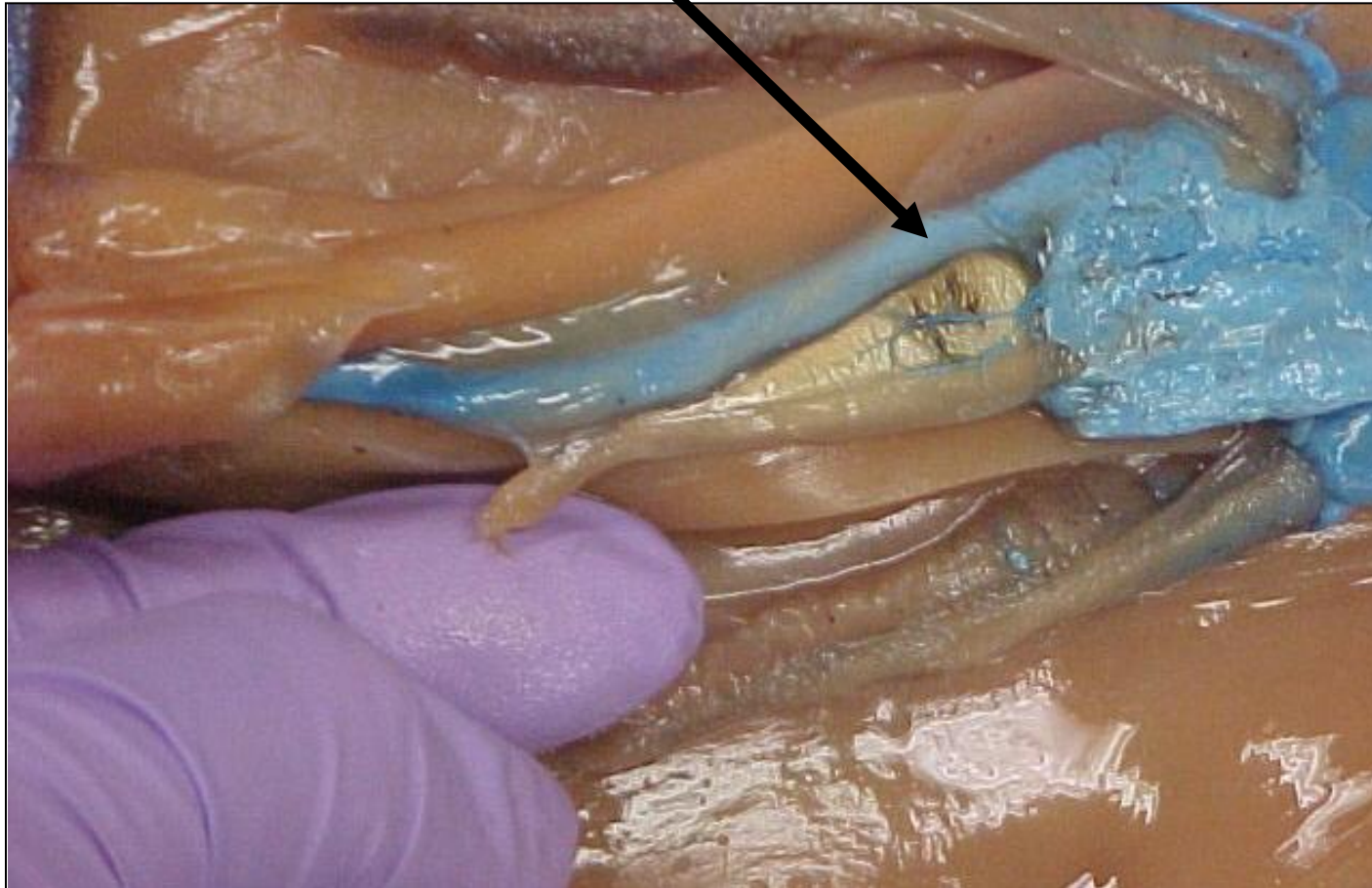
How form fits function



In Search of the “Original Ink-Jet”



Squid's Ink Sac

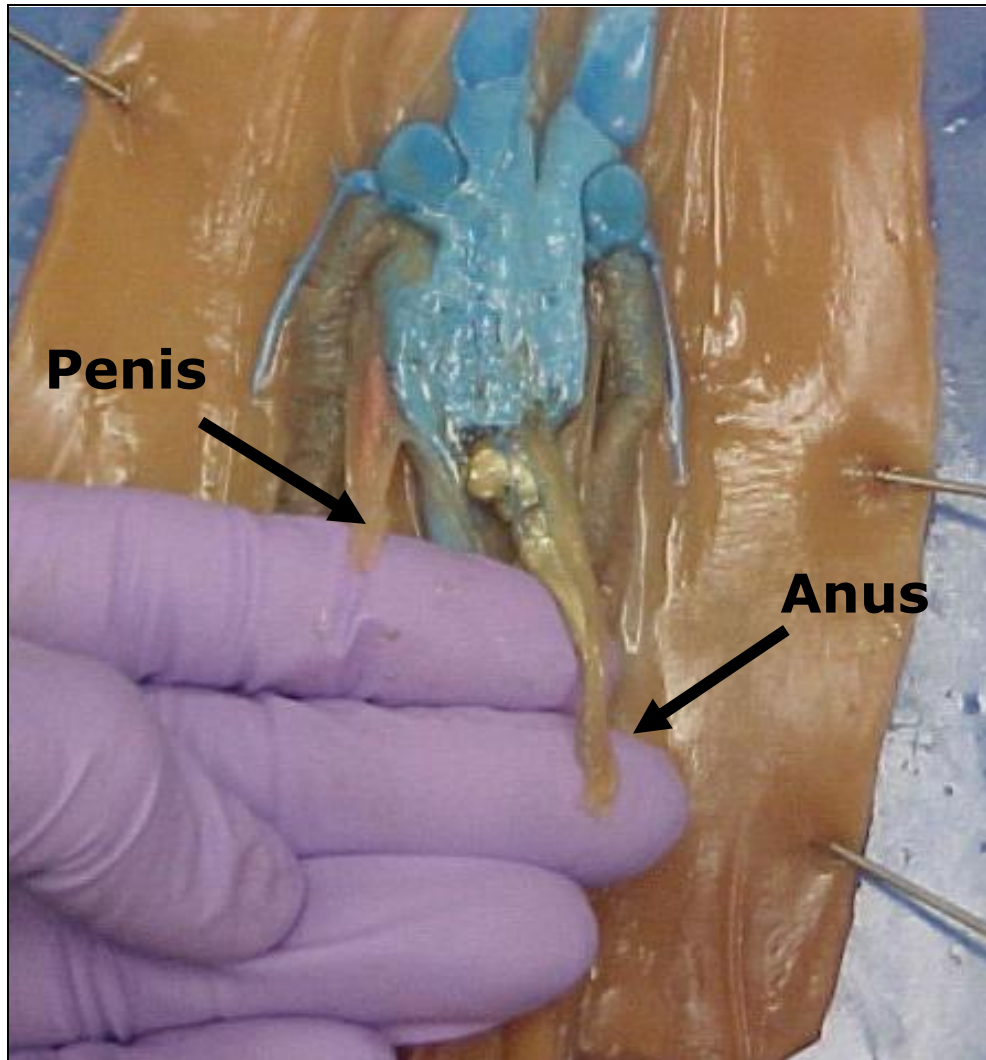


Compare to Other Groups

Based on all your observations . . .

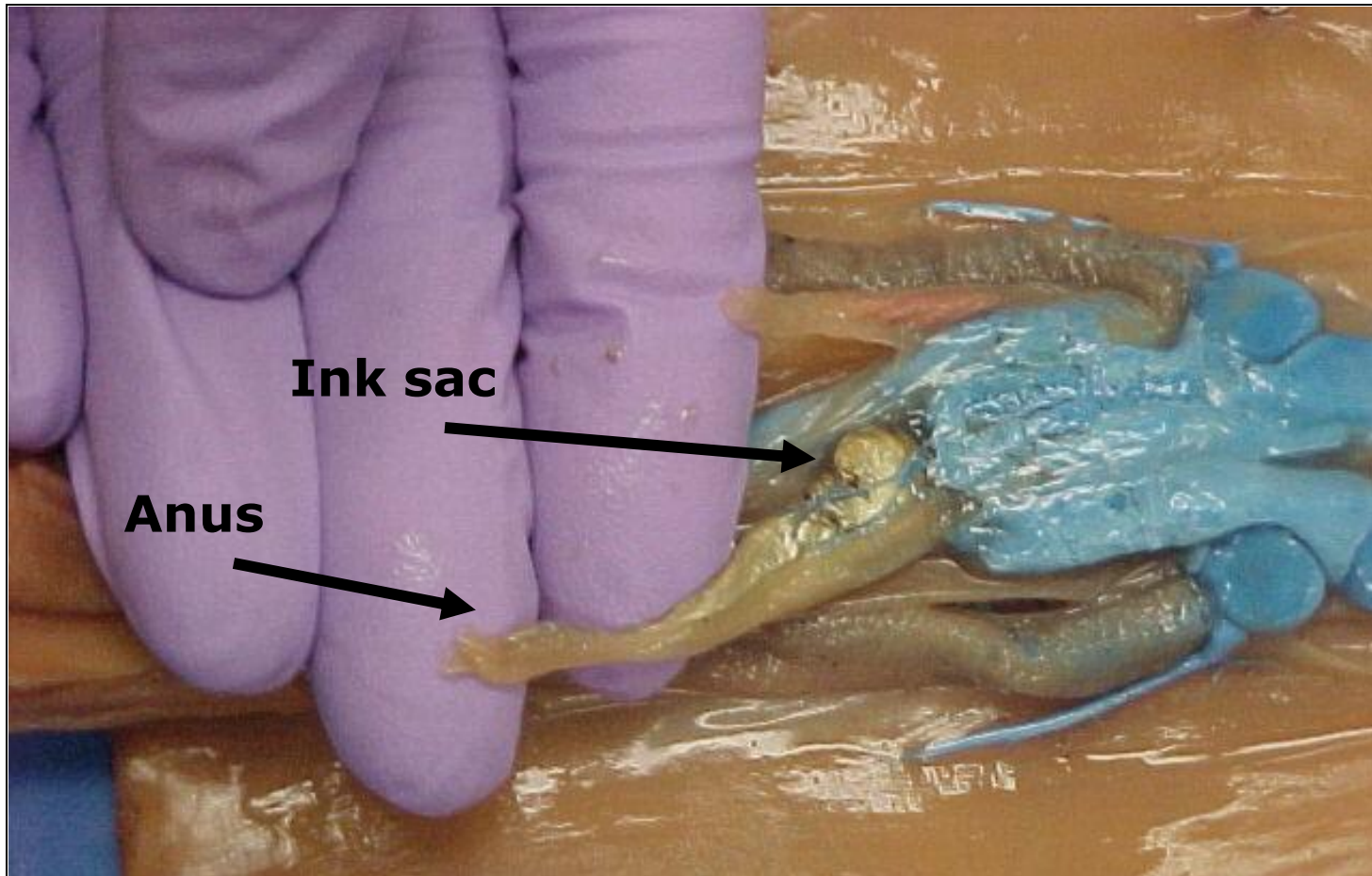
- **How do they differ?**
- **What might account for these differences?**

Gender Determination



Male mantle cavity

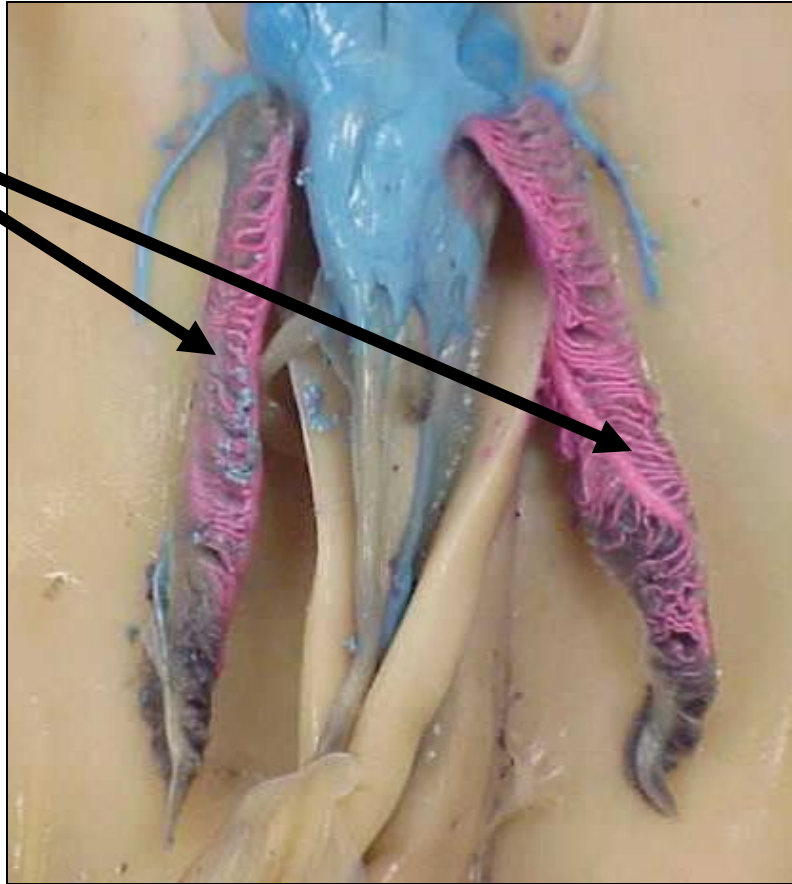
Anus and Ink Sac



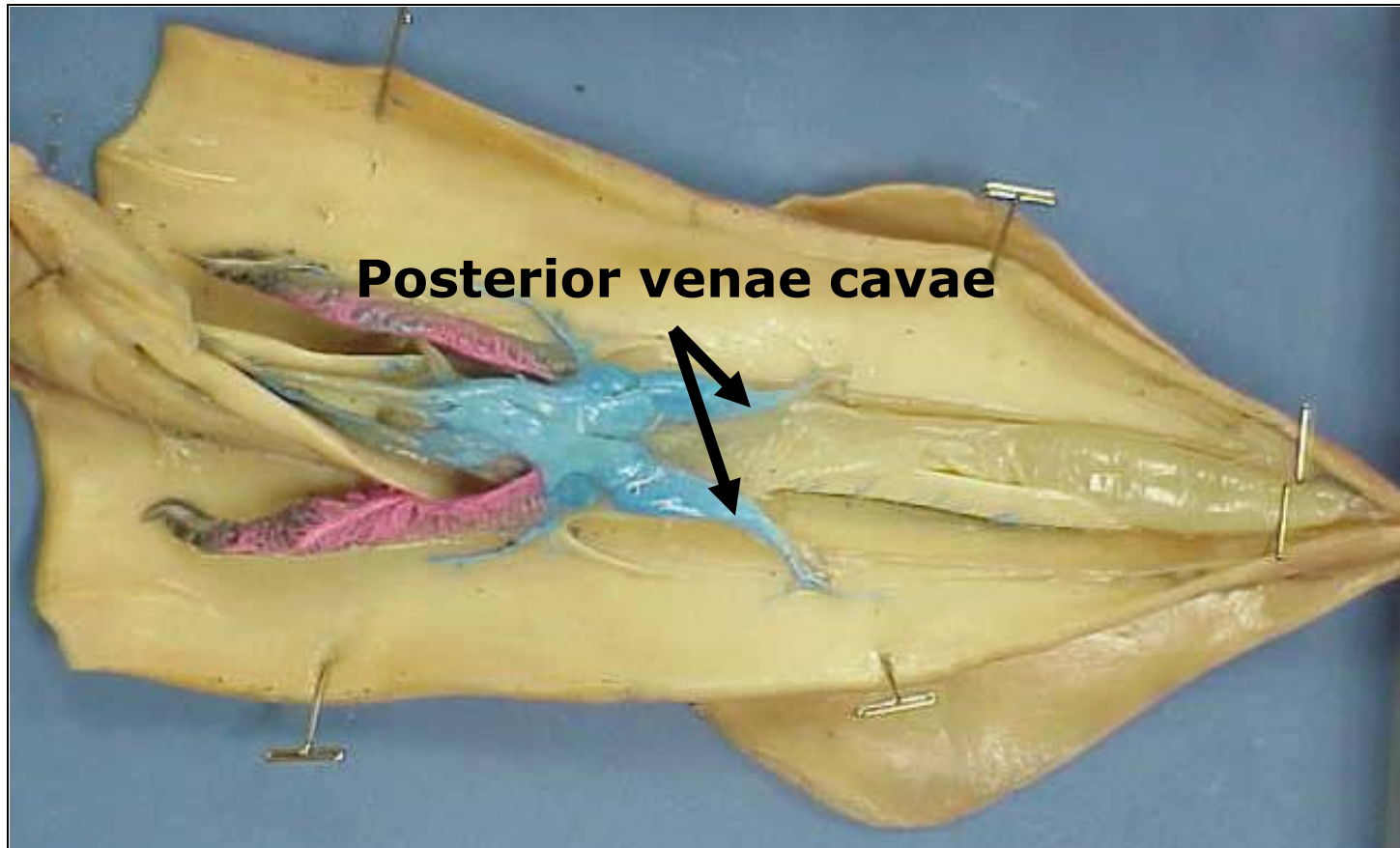
Observing Internal Anatomy

Locate the gills.

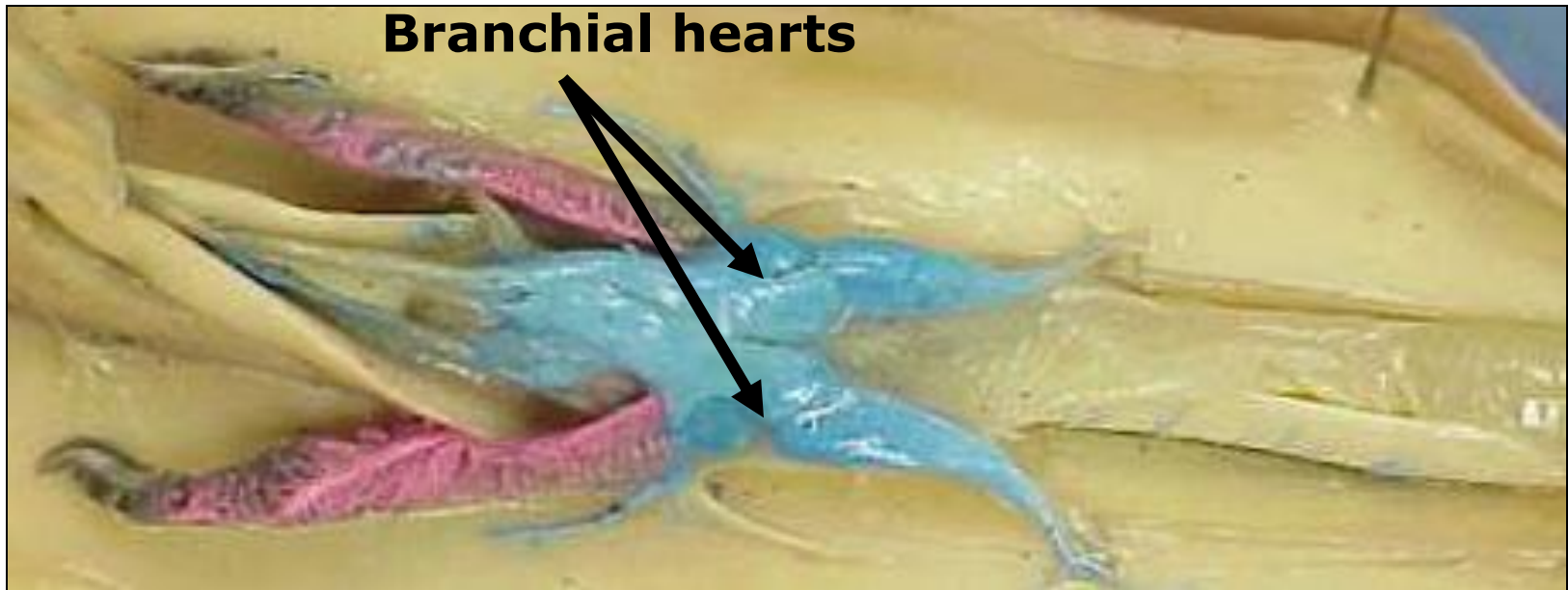
Describe their appearance.



Circulation: Open or Closed System?

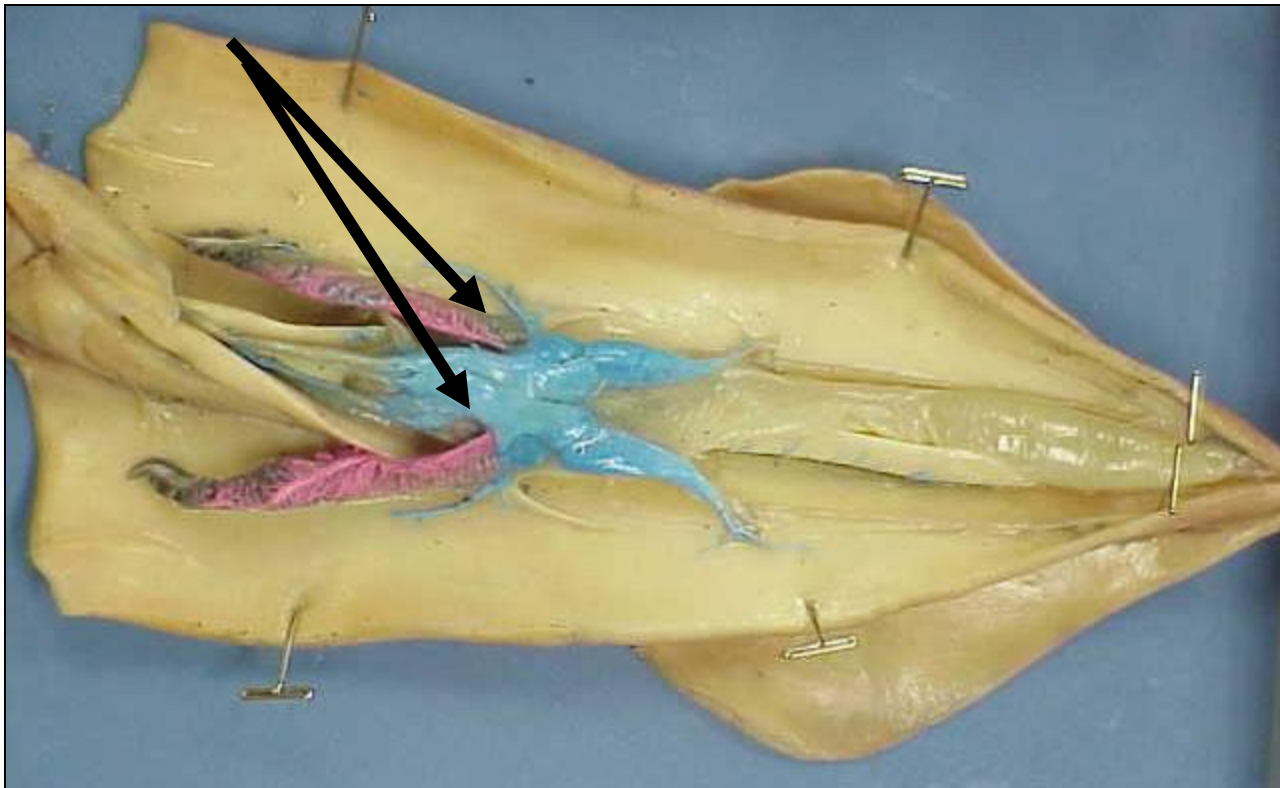


Closed Circulatory System

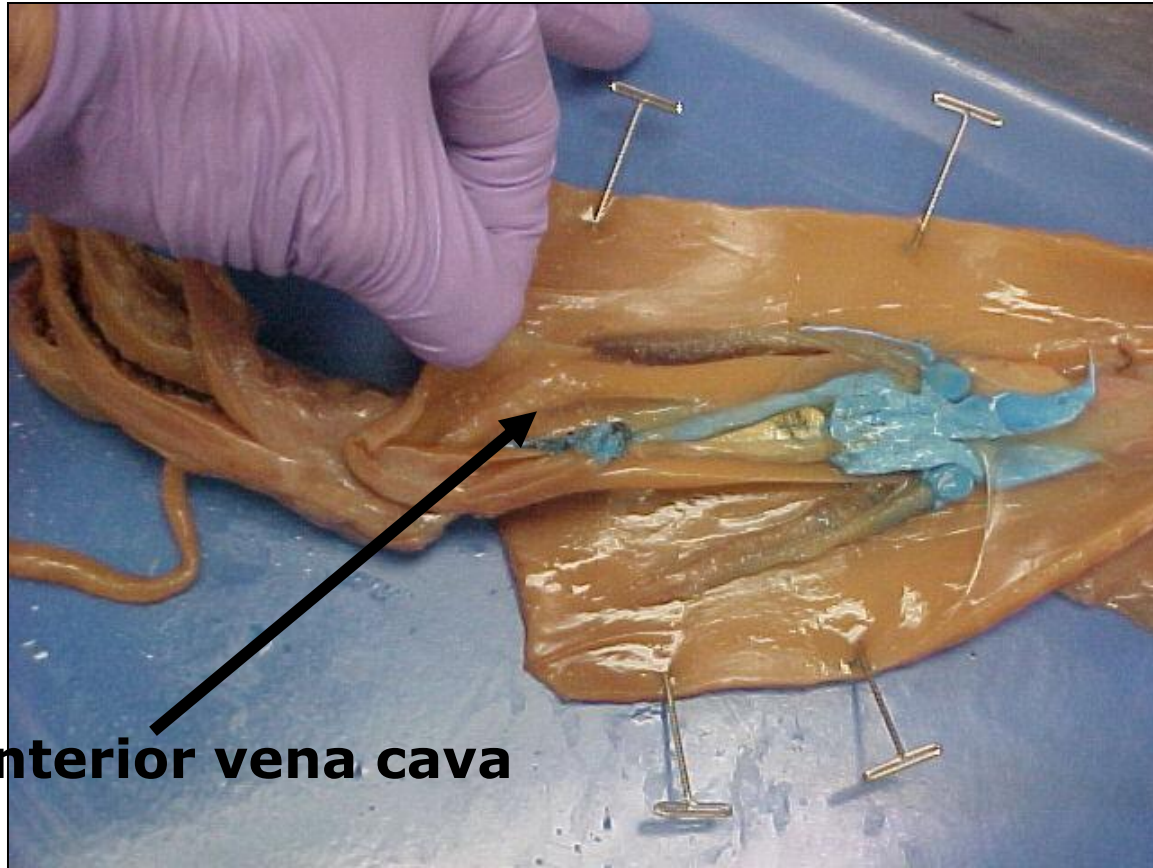


Circulatory System

Precavae



Circulatory System (single-injected squid)



Anterior vena cava

Removing the “Pen”



- **Visible from mantle cavity**
- **Internal shell made of chiton**

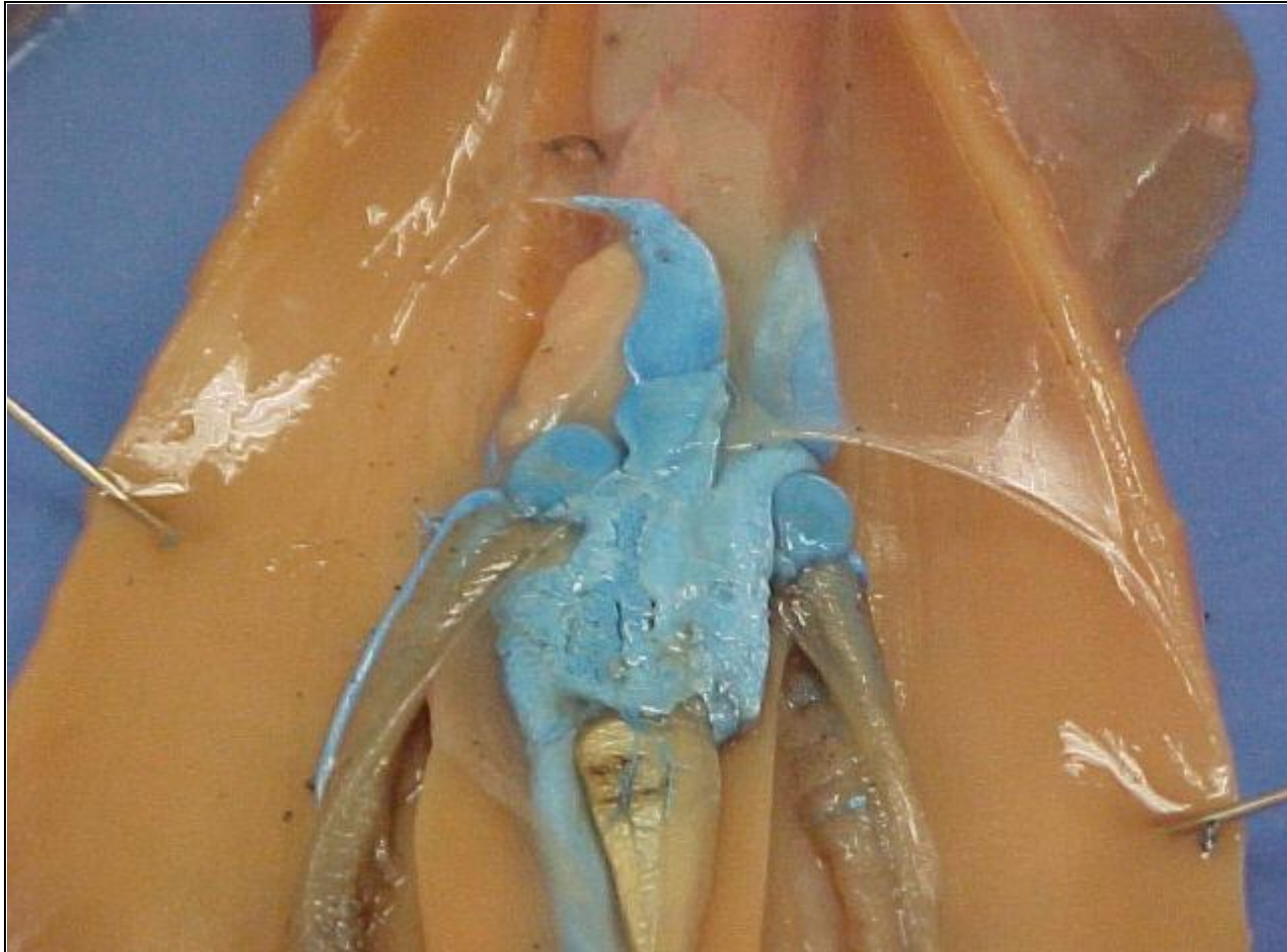
The Squid Pen and Ink



Recording the Journal Entry . . .



Membrane-Lined Coelom



Points for Discussion

- **Compare and contrast the organ systems studied in the squid with those of other invertebrates.**
- **Compare to vertebrates.**
- **Answer the questions posed throughout this inquiry.**

3 Ways Systems Compare to Vertebrates

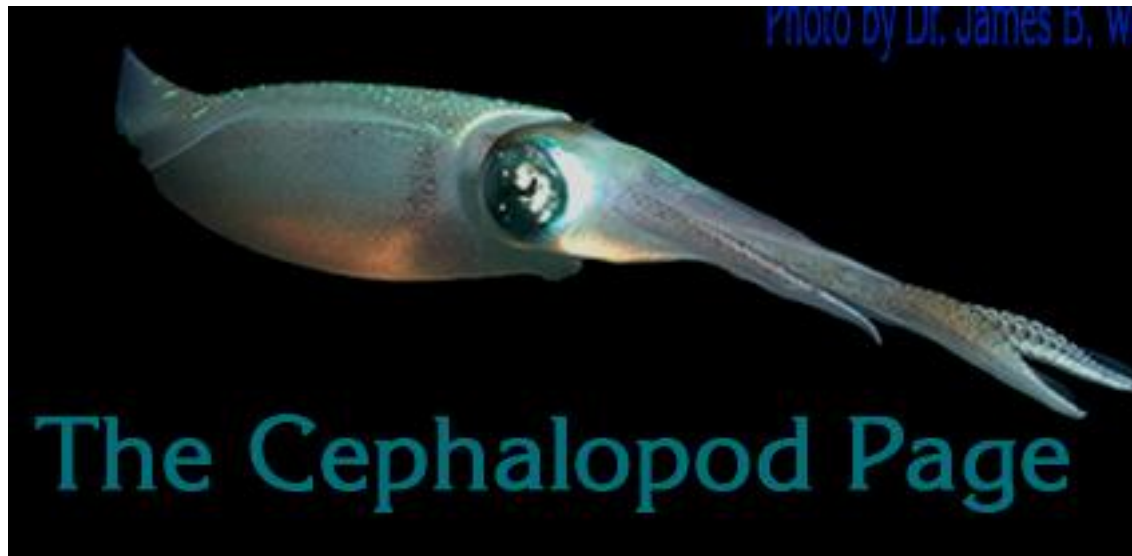
Respiration

Circulation

1.	1.
2.	2.
3.	3.

Internet Resources

- <http://www.biologycorner.com/2009/12/03/squid-dissection/>



We Can Meet Your Dissection Needs



**Top-quality specimens
and supplies**



**We Welcome the Opportunity
to Exceed Your Expectations**

Additional Resources from Carolina

Carolina™ BioLab® Virtual Lab Series

Guide students through an interactive virtual dissection, teaching internal and external features



Carolina Free Resources



Carolina offers many free resources to help support teachers.

CAROLINA®
www.carolina.com



CAROLINA®
www.carolina.com

Time to Clean Up . . .

Carolina's Perfect Solution[®] specimens

- **Return to white bucket or take home for further study**
- **All other waste in the trash bags**

Dissecting pans and instruments

- **Clean or take as gift**

Safety glasses and aprons

- **Gift from Carolina**

Evaluation forms/info cards

- **Complete, return to presenter**

Evaluations: Share Your Thoughts!

Scale = 1 to 10

10 = Outstanding

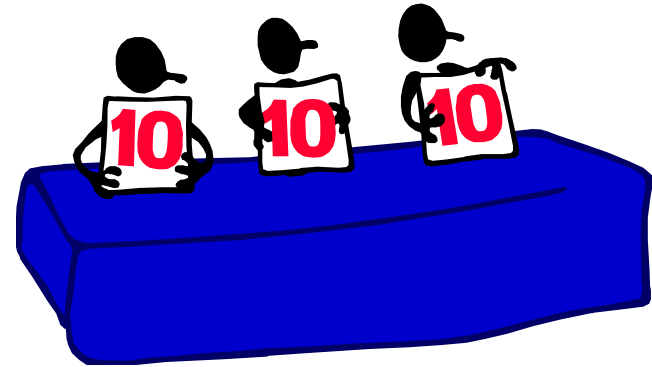
9 = Above Average

8, 7 = Average

6, 5, 4 = Below Average

3, 2, 1 = Well Below Average

Please provide comments!



Carolina Biological Supply Company

**Thank you for investing your time in
our training program.**

**For all of your classroom needs, check
out our Web site, www.carolina.com.**

Enjoy the rest of the conference!