



Snake Skeletonizing Manual



By Ellen Kuo

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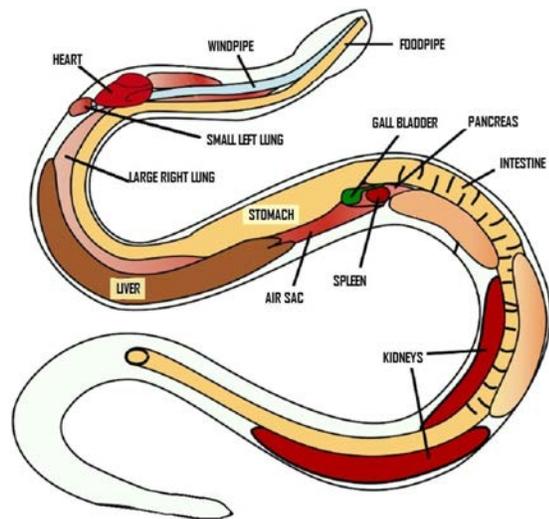
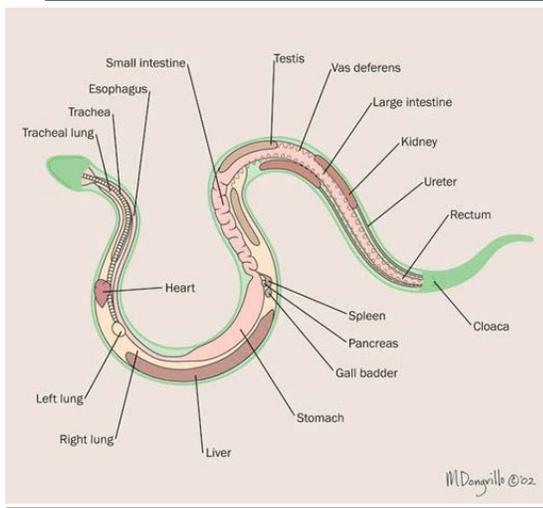
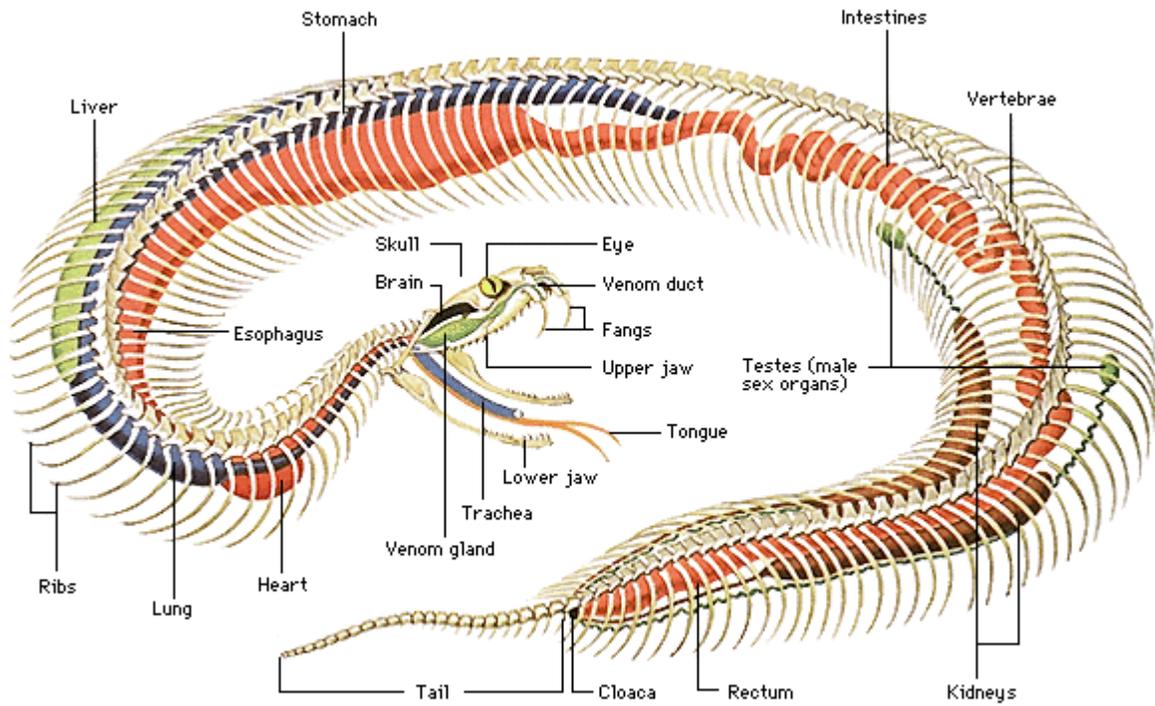
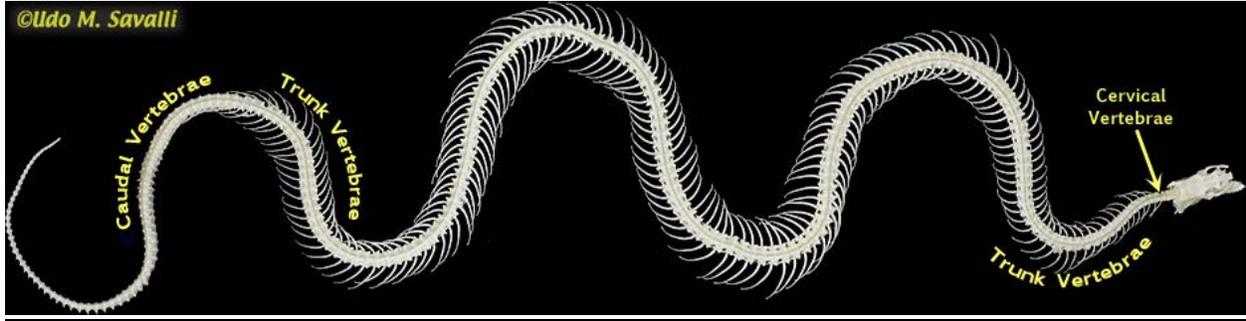
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Snake Anatomy References



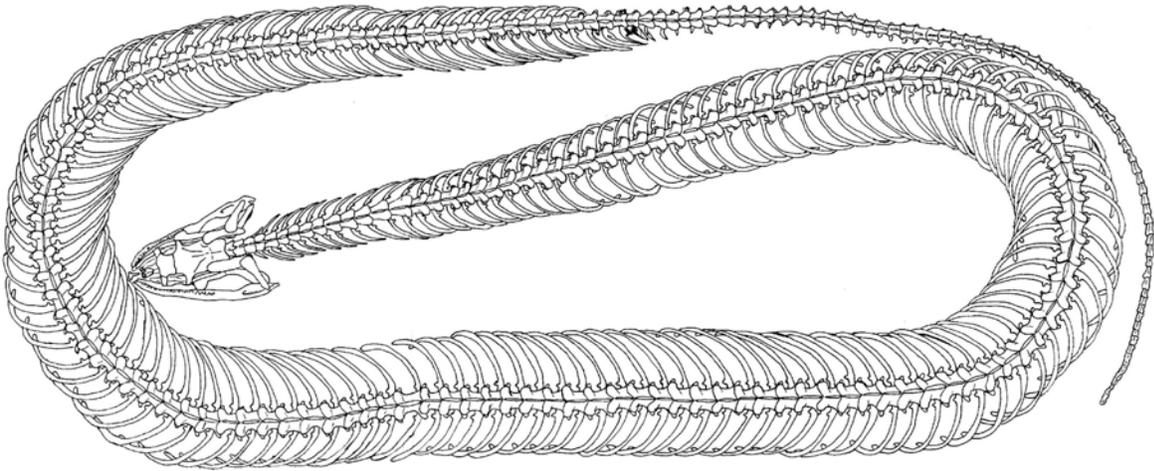


Illustration by Sara Brenner

Snake skeleton – note that the ribs go down the whole length of the body (they end at the vent, and then the tail does not have ribs).



Illustration by Sara Brenner

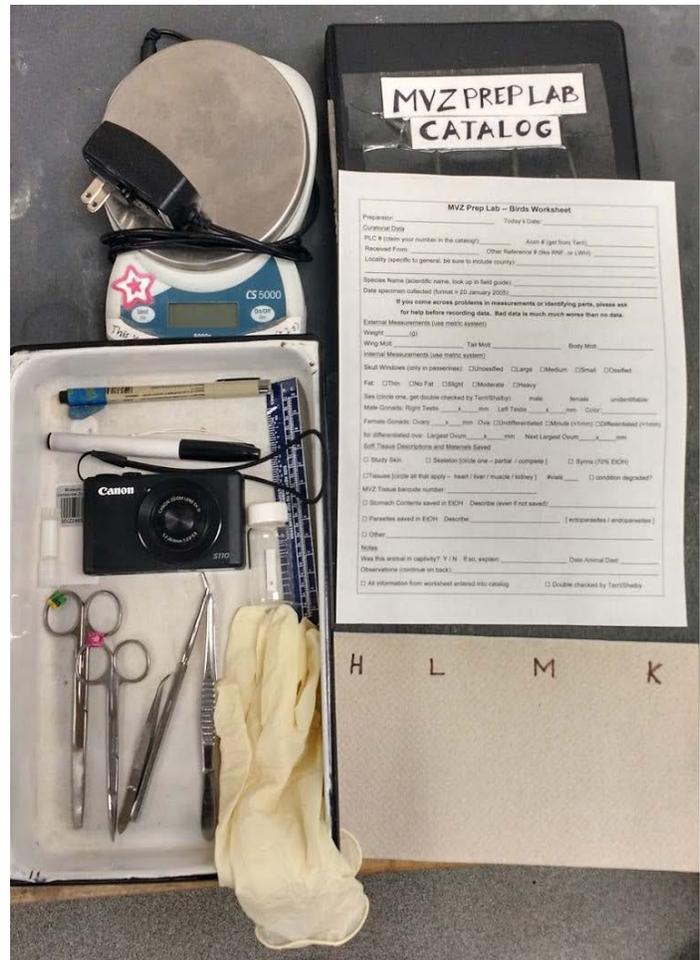
Most snake skulls consist of many small, delicate bones that are unfused. The lower jaw is not fused at the center, allowing the snake to use its lower jaws like arms to slowly feed in prey. Snakes have very sharp, delicate teeth, and lots, and lots, *and lots* of them — typically on several different jaw bones! Avoid disturbing the teeth.

Station Setup

Materials

- Snake
- Original data
- Skeleton tag
- Gloves
- Worksheet
- Micron pen
- Forceps
- Scissors (large and small)
- Tray (optional)
- Camera*
- Ruler and/or measuring tape
- Tissue vial
- Vial pen*
- MVZ barcode (for tissue vial)
- Paper towel labeled with H, L, M, K
- Prep Lab Catalog*
- Extra paper towels (optional)
- Scale*
- Herp field guide (for local animals)*
- Probe
- Biohazard bin*

*shared materials with the rest of the class



Before you start cutting

- Set up your station with all of the listed materials (or access to them)
- Identify the genus and species of your specimen, double checking with the class coordinator to make sure it is correct. Use the field guides for any local reptiles or look it up online for exotic species from the pet trade. Record the genus and species on your worksheet.
 - Often the original data will list a species, but DO NOT assume that this is correct. **Always** double check the ID and the spelling.
- Fill out the top of your worksheet:
 - Accn #, received from, and other Reference # (if there is one) should be on your original data, if not, check in with Terri or the class coordinator.
 - Write the other reference # exactly as it is on the original data (i.e. Admit #213).
 - If “received from” is unclear, ask Terri or the class coordinator, **don’t guess**.
 - Locality (specific to general). Include the county and state. **NO abbreviations**
 - If a state is written, we assume the specimen is from the United States so there is no need to write the country. If isn’t from the USA, record the country as well.
 - Do not record the postal/zip code.
 - Use the prep lab computer to **double check** that the address exists and is spelled correctly, and to look up county if that information isn’t given.
 - If there is no locality (check with Terri or the class coordinator), write “No Data” *in pencil* on your worksheet and in the catalog.
 - Make sure your locality is **where the specimen was found**, not the finder’s contact info!
 - Date specimen collected
 - Date collected is written Day Month Year with no abbreviations or punctuation (i.e. 23 February 2011).
 - If we received the specimen from a rehabilitation facility or if it is a wild caught animal from a pet store, the date collected is the day it was taken from the wild. DO NOT mix this up with the date of death or with the date it was donated to us from another facility. If no other date is given, then and only then may you use the date of death. **NEVER use the date of donation**.
 - If you have both a “date collected” and a date of death, record the date of death in the “date of death” section at the bottom of the worksheet.
 - If there is no date information at all (double check with Terri or the class coordinator), write “No Data” *in pencil* on your worksheet and in the catalog.
- Claim your unique PLC number
 - In the Prep Lab Catalog, write the next available number in the margin. To claim this number, you must include all of the following, in the proper format:
 - Locality
 - Date *collected*
 - Genus (and species, if known)
 - Write your claimed PLC# and Accn # on **all** pieces of the

2017 MVE Prep Lab Catalog (21)

213 Delan Harding Road, Browns Valley,
Yuba County, California
28 July 2010

4076 0 Rallus limicola

original data (donation sheets) as well as your worksheet, tags, and vials.

Miscellaneous data

ACCN: 15094 PLC 3116

Museum of Vertebrate Zoology
University of California Berkeley

Dead Animal Salvage Slip
(Please see back for instructions)

Today's Date/Date of Donation: 4/14/12

Here is the information we need: **We don't use date of donation**

What was found: bird - orange-crowned warbler? **check species**
(be sure to note bird, mammal, reptile, or amphibian and species if known)

Where it was found: East side Granite Mts, below utility line, San Bernardino Co., Calif. 34.79152, -115.61613, 3866' WGS 1984 datum, error: ± 15 ft.
(exact location, including place, city, country, state -- see back for details)

Date it was found: 25 April 2011 **Date of Collection**
(please write out the month, and note the day and year)

Who found it: Karen Klitz & Joyce Gross
1622 62nd St, Berkeley
510-655-7892 kklitz@berkeley.edu
(name, address, phone number, and email)

Circumstance of acquisition: found dead on ground below utility wires (trash). Kept on ice for few days, then frozen in home freezer *fresh!*
(e.g. dead on road, hit window, any other comments)

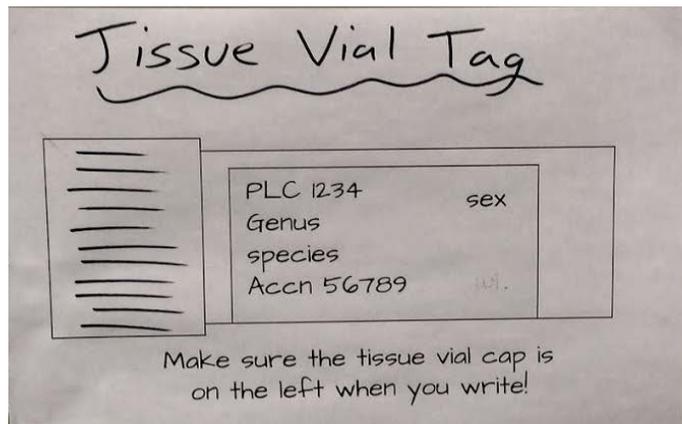
** Please fill out donor's contact information on the corresponding Accession Donation Form **

Date of Collection — Karen Klitz
April 25, 2011
East side Granite Mts.
(below utility line)
San Bernardino Co., Calif
34.79152
115.61613
3866'
WGS 1984 datum
error: ± 15 ft.

PLC and Accn written on all original data — PLC 3116
ACCN: 15094

include coordinates in locality

- Prepare your specimen tag and tissue vial using the guides below.
 - Skeleton tag: PLC #, sex, Accn #
 - On your tissue vial: PLC #, genus, species, Accn #, sex
 - Write small and leave space near the bottom of the label

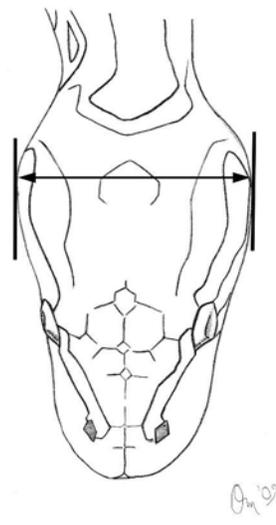


- Weigh your snake:
 - **Always weigh** your specimen.
 - If original data has weight written, you can make note of it in observations
 - Don't forget to zero the scale if you are using a tray or paper towel
 - Make sure you are using grams (not milligrams or another measurement)



- Measure your snake:

<p>Total Length</p>	<p>The length from the tip of its snout to the tip of the tail</p> <ul style="list-style-type: none"> - Try to get your snake as straight as possible without stretching it out - Make sure the tail lines up with the 0 marker of the measuring tape and then see where the tip of the nose reaches to. 	
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<p>Tail Length</p>	<p>the length from the vent to the end of the tail</p> <ul style="list-style-type: none"> - the rest of the snake posterior to the vent is all tail - tail length varies depending on sex and species 	 <p>The diagram shows a snake's tail with a horizontal line indicating the measurement from the vent (marked with a black arrow) to the tip. The photograph shows a person's hands holding a snake's tail with tweezers, with a white arrow pointing to the vent area. A text box at the bottom of the photo reads: "End of Vent - where you being your measurement".</p>
<p>Widest part of head</p>	<p>place ruler under head and move it down until you reach the widest part</p>	 <p>The diagram shows a top-down view of a snake's head with a horizontal line and arrows indicating the measurement across the widest part of the head.</p>

- Take photos
 - **DO NOT** wear dirty gloves while handling the camera
 - **NOTE:** Take a close-up photo of the PLC side of the tag before taking pictures of the specimen in case the tag is unclear in the following photos
 - You need the trifecta in every photo: tag, specimen, and ruler!
 - Try to get all three in focus for all photos
 - Make sure the correct side of the **ruler** is showing (the side with mm on it)
 - Emphasis on ruler and not a measuring tape
 - Make sure your specimen is laying on the table and as straightened out as much as possible with the ruler next to it (NOT covering the ruler)
 - Checklist of pictures to take:
 - Close up of the skeleton tag
 - This indicates that all following photos belong to this particular specimen
 - Dorsal (back)
 - Make sure that you do not “cut off” any part of the animal in the framing of the photo
 - Ventral (chest)
 - Make sure that you do not “cut off” any part of the animal in the framing of the photo
 - Lateral (side)
 - Make sure you do not “cut off” any part of the animal in the framing of the photo
 - Head profile (side of face)
 - Want to observe lip scales
 - Tail (ventral side)
 - Widest part of head (dorsal)
 - NOT laying on top of ruler
 - Injuries, other observations or abnormalities, any identifying markings, etc.

Initially Determining the Sex

- Probing the specimen’s vent:
 - Male snakes have hemipenes that are inverted inside their tails. If your snake is not rotten, you may be able to probe the tail and guess the sex of your snake. This is not the way to officially determine the sex of your snake, but this knowledge will aid you in your search for the gonads when you open the snake.
 - Using a blunt probe that is small enough to fit in half the tail’s width, find the vent of your snake



- Gently probe the tail in the posterior direction (towards the tail) of the animal



probe slides in a fair bit = male



probe only enters a little = female

You are ready to start skinning!

You MUST check in with Terri or the class coordinator before you start cutting

- On the ventral side of your specimen use your fingers or forceps to pinch up the skin above the rib cage, lifting it away from the body. Make a small cut in the raised skin.



- Continue your incision in the skin down to the top of the vent, lifting up with your scissors as you cut. **Do not cut into the body cavity.**
- Use your forceps and scissors to peel the skin away from the body. Clear the skin from the muscle all the way around the sides of the animal to the spine. Clear the skin to the spine from the neck of the animal all the way down to the vent.



- If you do cut into the body cavity, ask Terri or the class coordinator for advice on how to proceed.
- Peel the skin off the body using forceps, a probe, and/or your fingers. Once the ventral side of the body is cleared of skin, you can continue to skin the rest of the body.



- Once you have cleared all the skin away from the sides of the animal, find a spot to clear the muscle all the way around to the other side of the back, past the spine. You only need to do this at one spot, and then you can stick your fingers through that hole and pull the body away from the skin all the way down the rest of the spine. **Do not attempt to pull the skin off the head**, it is tightly attached and there are delicate bones that can be easily damaged.

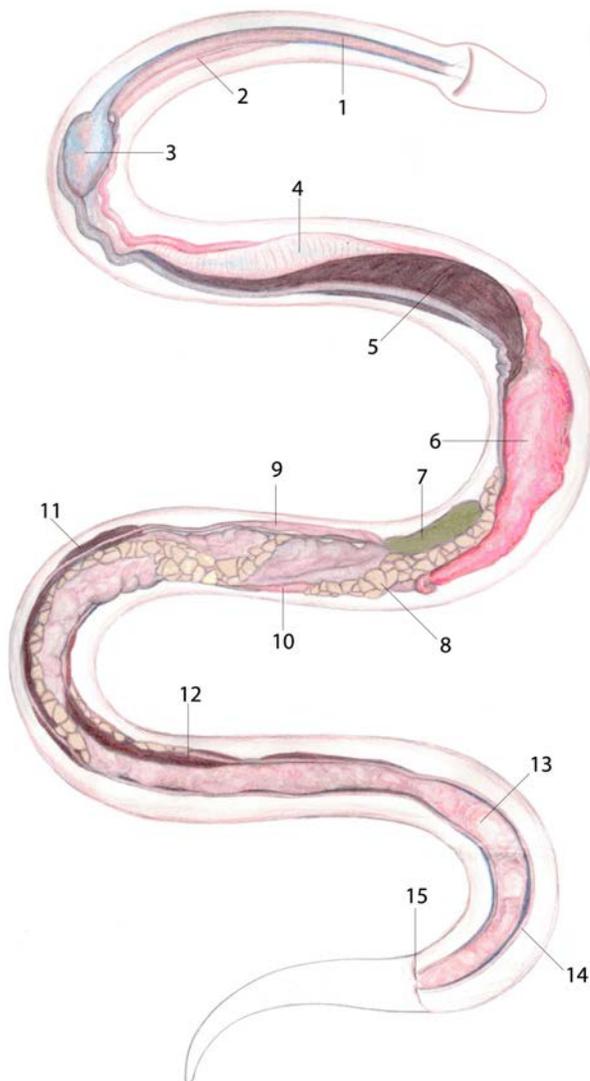


- Because it is time consuming, and your specimen's DNA is degrading, you can clear the skin away from the head and tail AFTER you take samples and measure reproductive traits.

Opening the body cavity and sexing

Check with Terri or the class coordinator before opening and have them sex your specimen

- Lift the membrane covering the body cavity up and make an incision between the ribs. Do not cut through the ribs, or through any of the organs below the membrane!
- **BEFORE PROCEEDING** ask Terri or the class coordinator to help you identify the sex of your snake.
 - Sexing may not be possible if the carcass is rotten or very young.
 - Be careful with specimens that are extremely fatty. The gonads are often nestled within the fat bodies.
 - The gonads do not sit symmetrically in the body and typically you'll find the right set anterior to the left set.
 - Gonads will always be anterior to the kidneys.
 - First find the kidneys and then slowly work your way up towards the head. You shouldn't have to go far!
 - Do not be fooled by adrenal glands!!
 - As in other vertebrates, adrenal glands are closely associated with the kidneys and sex organs.
 - Measure the length and width of the sex organs – both testes in the male, two largest ova in the female.



The paired organs are staggered – they do not lie symmetrically on either side of the spine in the body. Sometimes one of the pair is vestigial or missing (this is true for lungs and sometimes ovaries).

“Follow the tubes”

To figure out what organs are where in your snake, at the neck, find the trachea and esophagus and follow them down. At the vent, find the colon and follow it up.

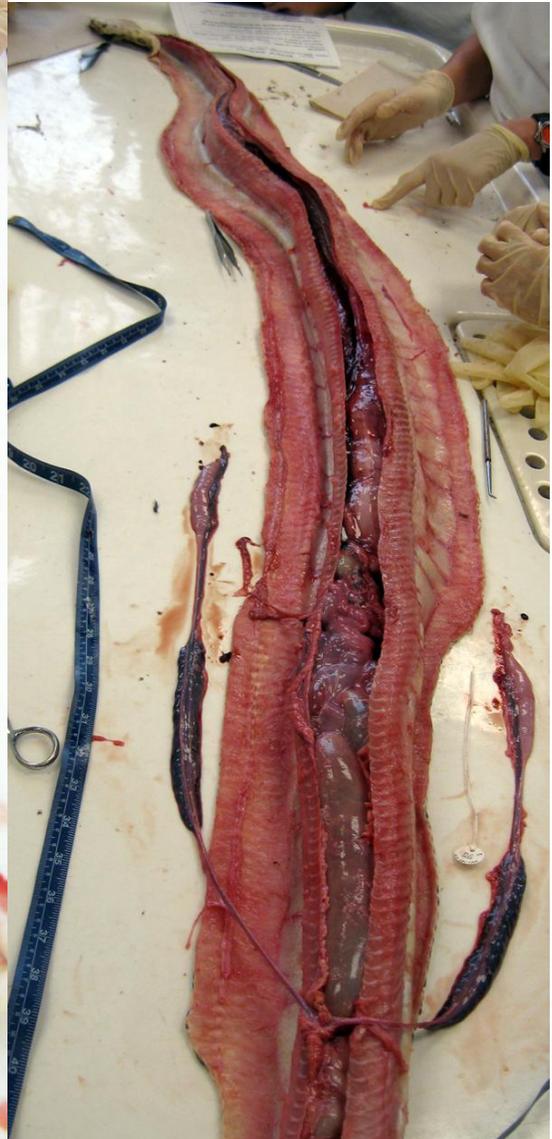
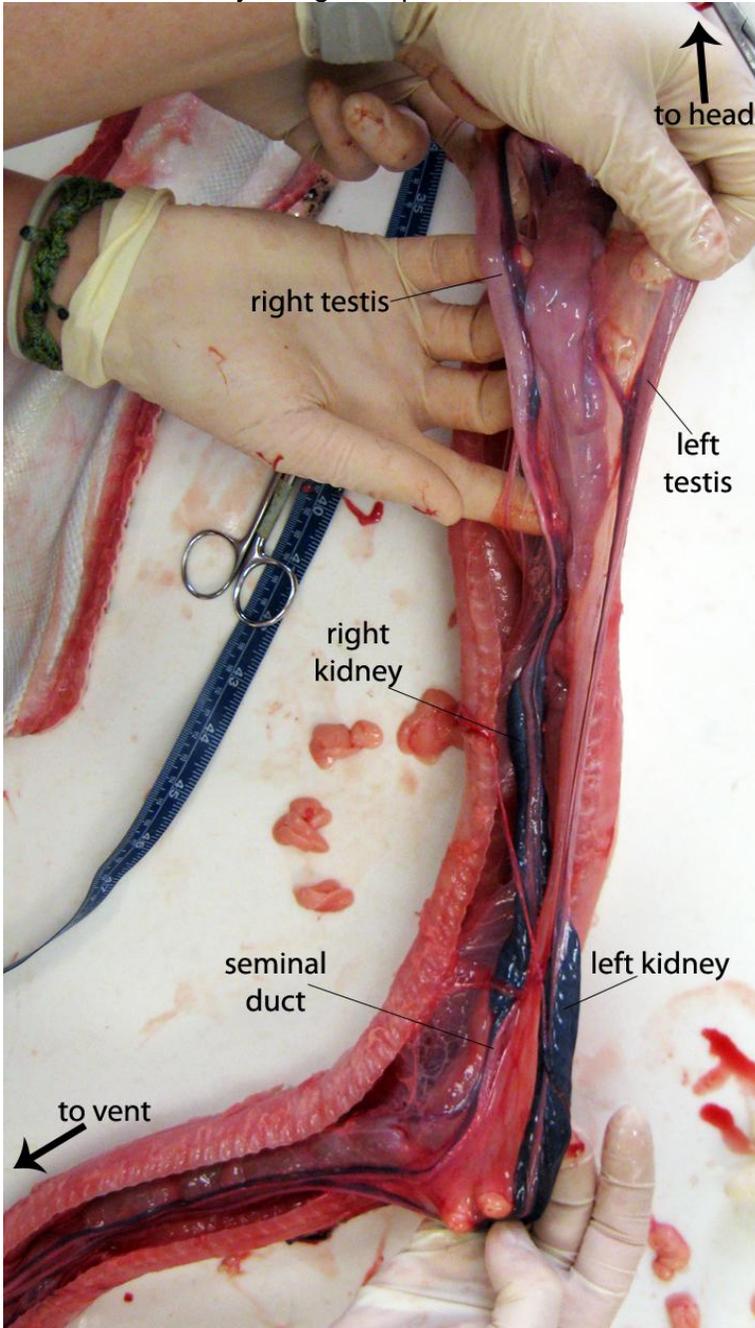
- | | |
|----------------|------------------|
| 1. trachea | 9. right testis |
| 2. esophagus | 10. left testis |
| 3. heart | 11. right kidney |
| 4. lung | 12. left kidney |
| 5. liver | 13. colon |
| 6. stomach | 14. seminal duct |
| 7. gallbladder | 15. vent |
| 8. fat bodies | |

illustration by Juliana Olsson

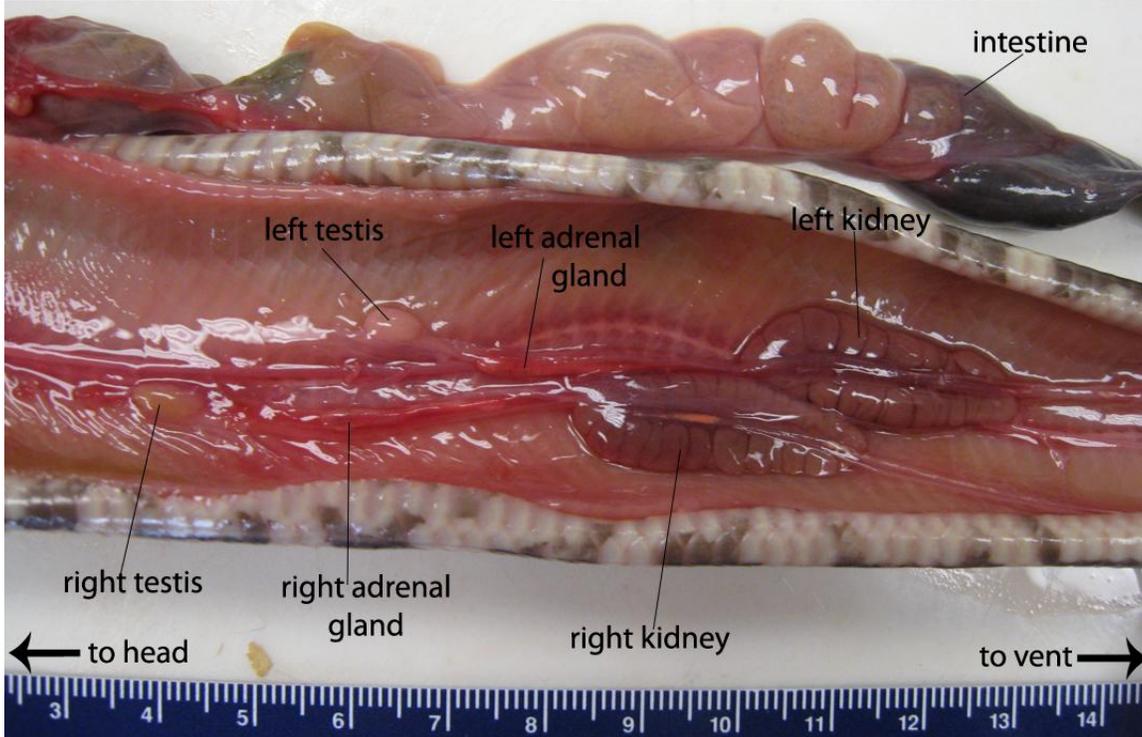
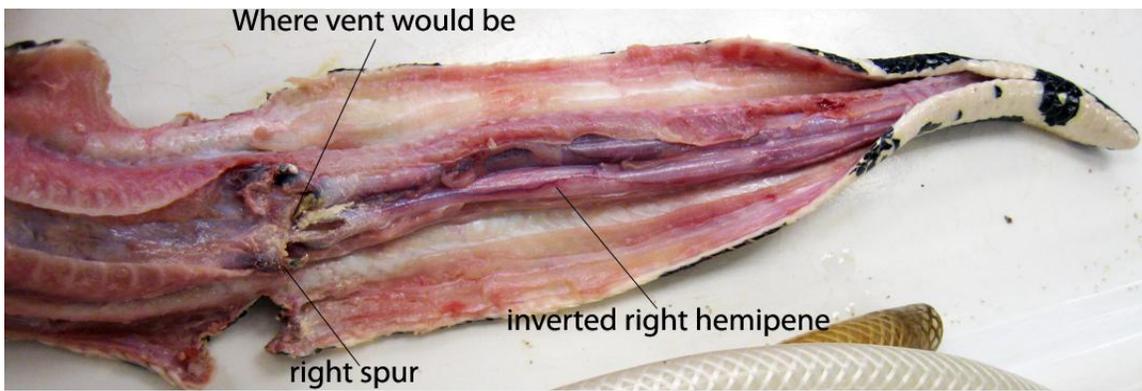
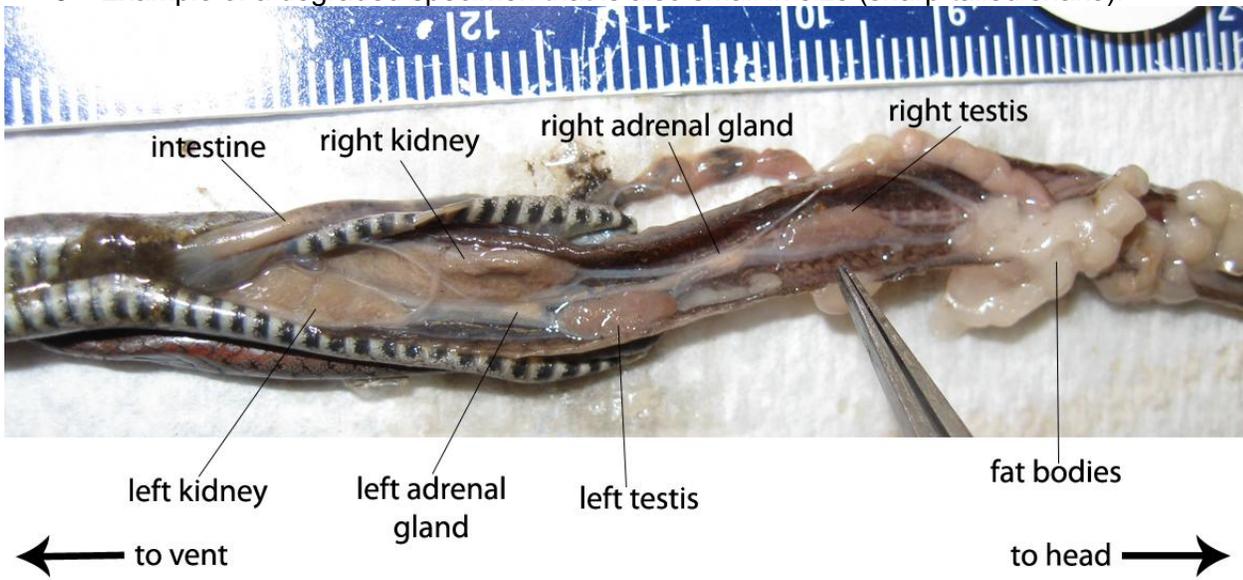
MALES:

Adult Males

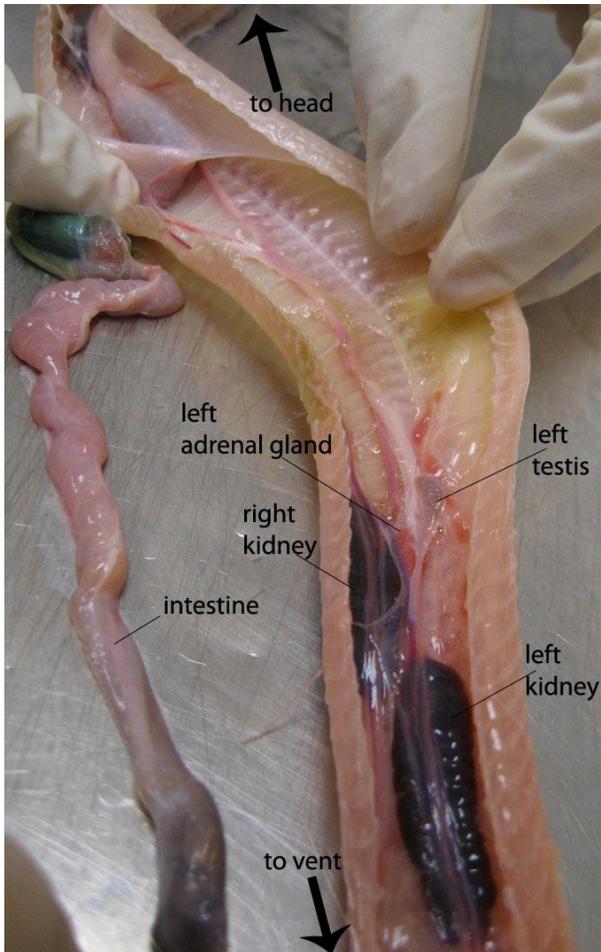
- Males have paired oblong testes that lie anterior to the kidneys. Sometimes the testes look like they have bumps in them (not always solid and smooth in texture). Look to see if you can find the sperm ducts or the oviducts to help determine the sex in difficult cases. The sperm ducts will lie more centrally along the spine, to the inside of the testes.



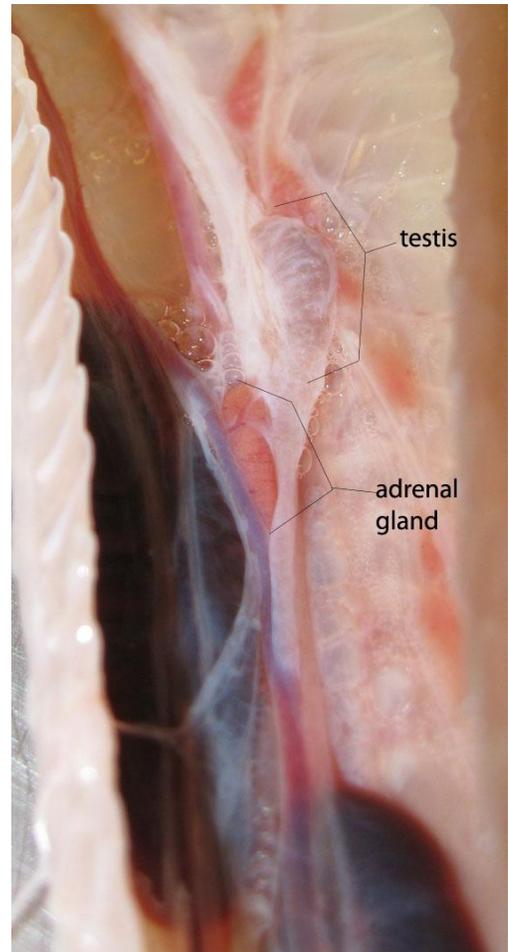
- Example of a degraded specimen that is also small in size (sharp-tailed snake):



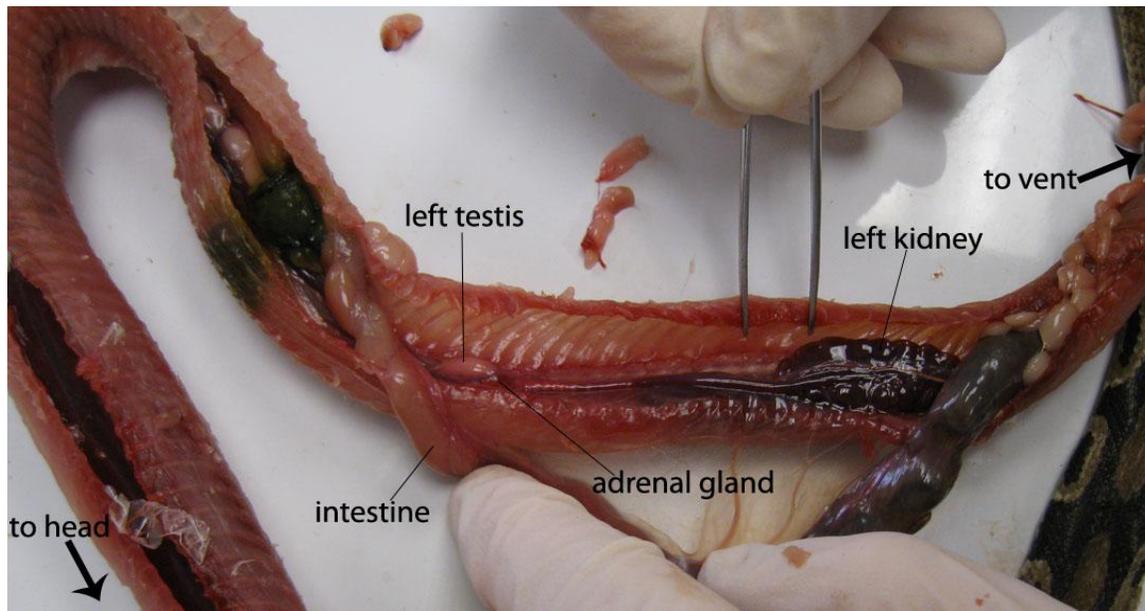
Immature Males



Example of a darker colored testis in an immature male



Close-up on the same male

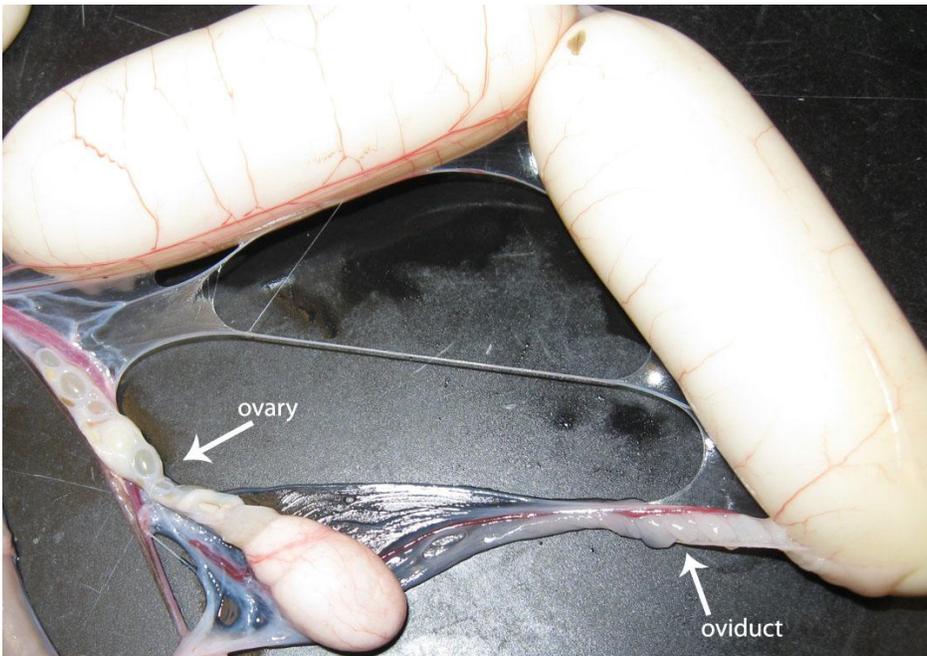


Example of a lighter colored testis in an immature male

Adult Females Continued...



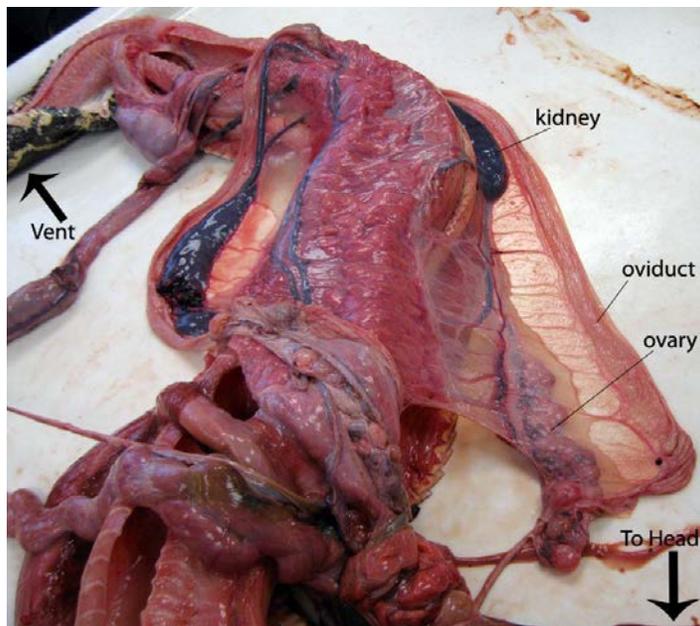
In the close-up, you can see the ovary is lying separate from the developed eggs in the oviduct.



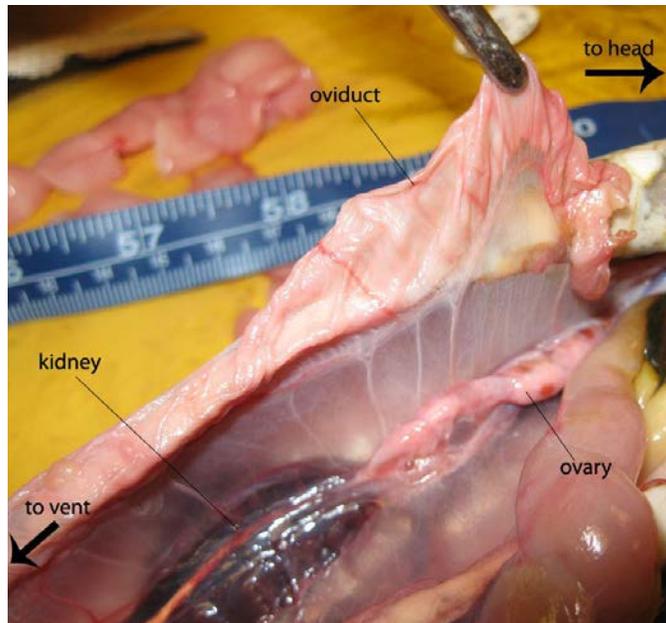
In the same specimen, when the ovary and oviducts (with eggs in them) are removed from the body, you can see the head of the oviduct leading to the ovary. You can also see an enlarged ovum in the ovary. Notice the vascularization of the oviduct.

Adult Females Continued...

- When the animal is not breeding, the ovary can be small and just look like it has a bunch of little lumps in it.
- Look to see if you can find the oviducts or the sperm ducts to help determine the sex in difficult cases. Unless things get twisted around, the oviducts should lay to the outside of the ovaries, laterally, closer to the body wall and further from the spine.

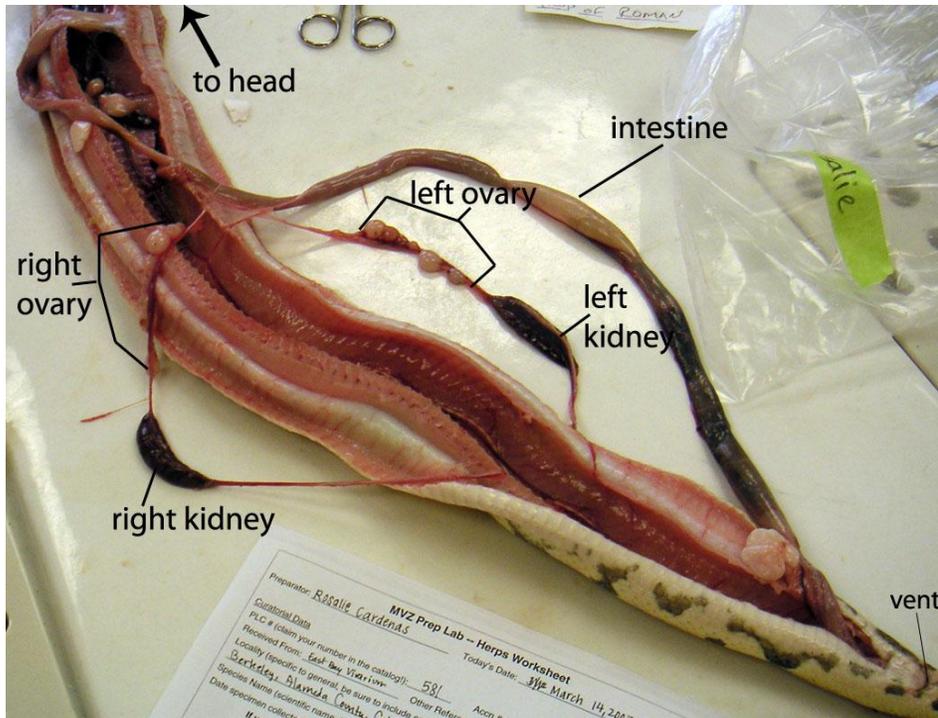


If the female has laid eggs before, her oviducts will be floppy and vascularized.



Both of the above cases has vascularized, floppy oviducts.

Adult Females continued...

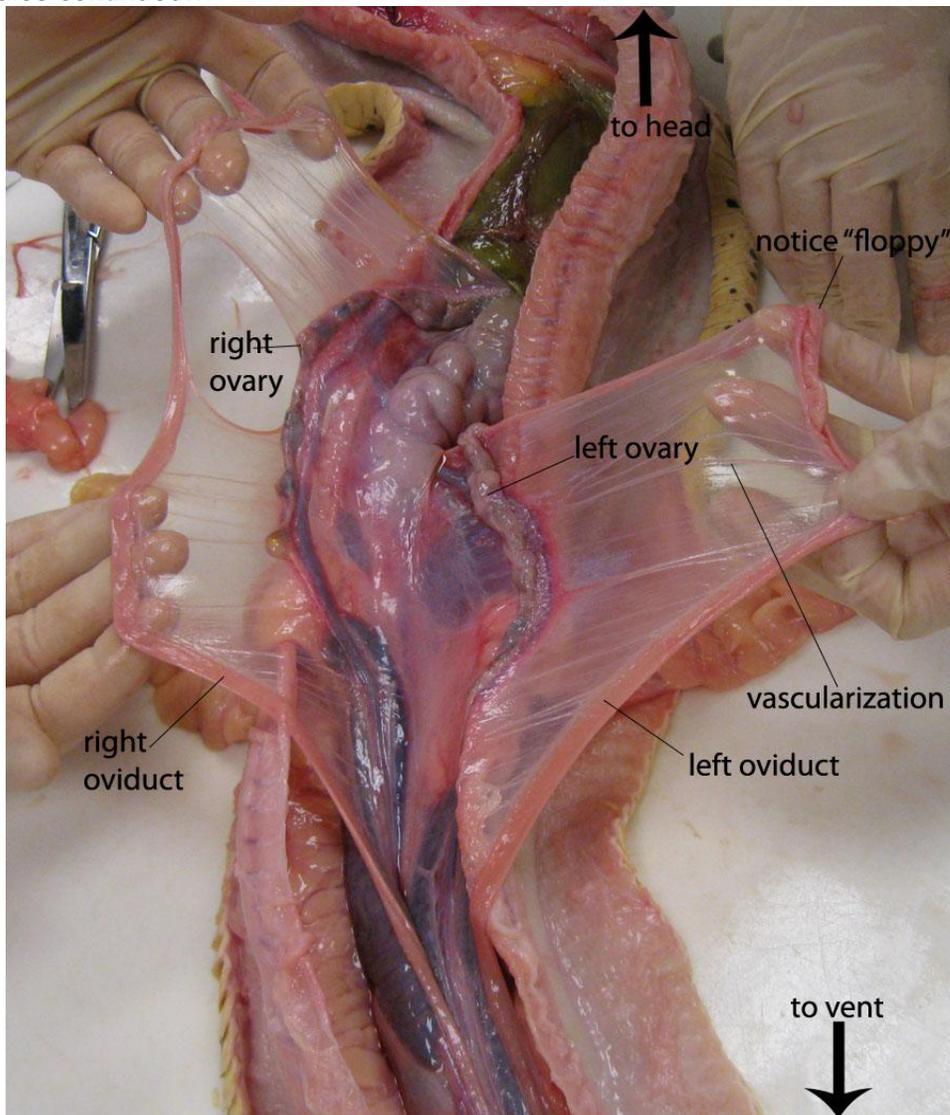


If the female is an adult, but has not laid eggs before, her oviducts may be narrow pink or white tubes – they might not be noticeable at first. You can distinguish them from seminal ducts because they will have no fine patterning within them. They are just simple tubes.



Close-up of same specimen with a narrow, unvascularized oviduct. When the gonads and kidneys were removed from the carcass, they got twisted, so the oviduct is lying under the anterior portion of the kidney and the posterior portion of the ovary.

Adult Females continued...

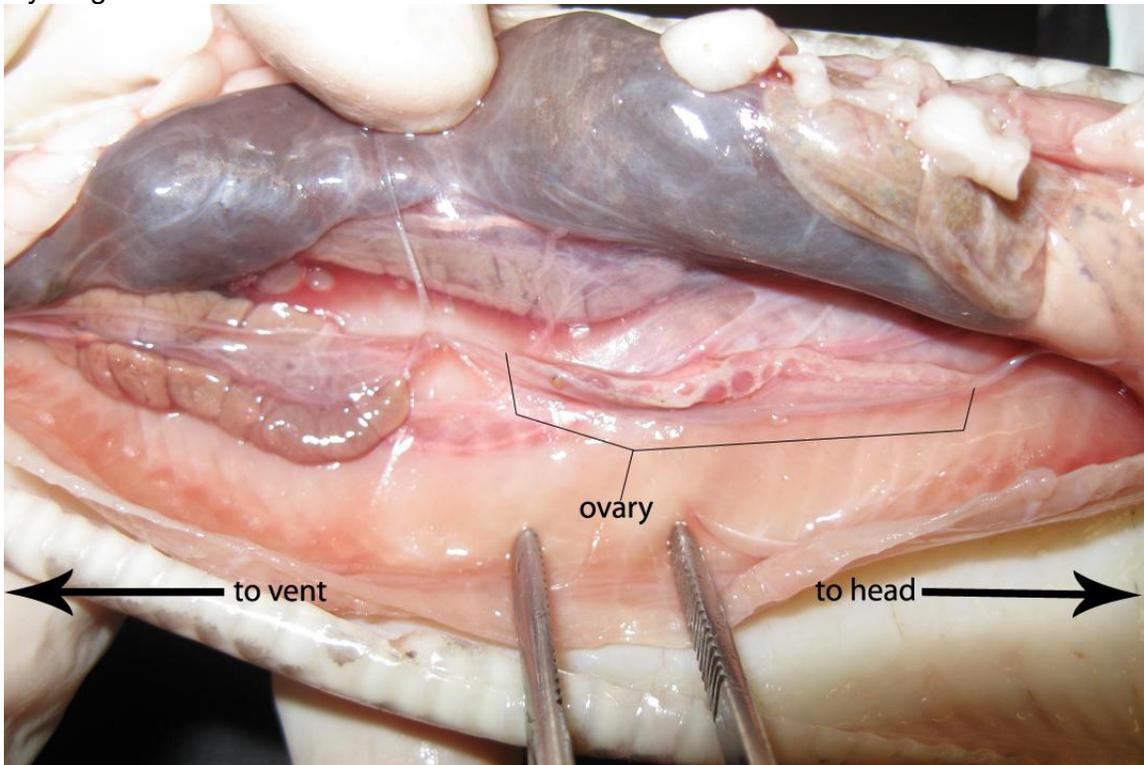


This female is an adult and has laid eggs before, but not in quite some time, so her oviduct has narrowed back down over time. Notice that there is vascularization and a slight floppiness to it.

Immature Females

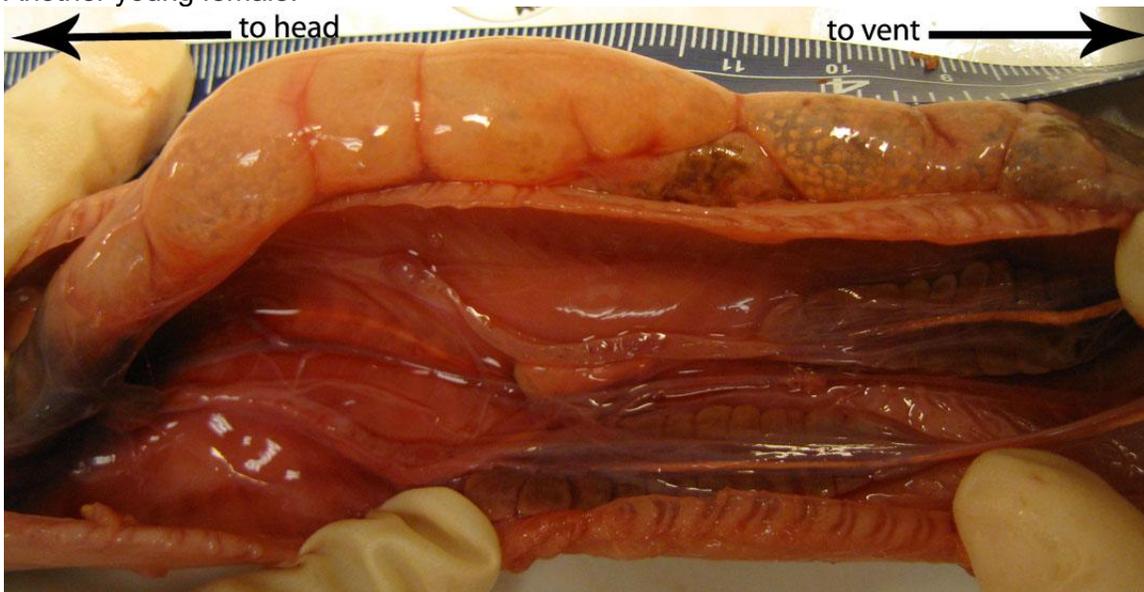
- The ovaries tend to be long, thin, and cloudy or almost see-through in immature female snakes. When comparing the sexes in immature snakes, the ovaries tend to be longer than testes, and will not have a seminal duct associated with them.
- The oviduct may not be visible at all. If the oviduct is visible, it should lay to the outside of the ovary, laterally, closer to the body wall and further from the spine. In an immature female, the oviduct will be a simple tube with no texture and hardly any color to it.

Different young female:



This female has an ovary that is more developed – you can see “bubbles” which are ova. In this photo, the adrenal gland is mostly hidden by the ovary.

Another young female:



Can you spot the ovary in this photo? It is more developed and has a few ova that you can see!
Can you see the adrenal gland?

- After determining the sex, add the appropriate symbol to the tag and tissue vial!
 - ♂ = male, ♀ = female, o? = unknown sex
- Take a picture of the gonads with your completely labeled skeleton tag and a ruler
 - *TIP – Putting the camera on macro mode can help take a better picture*

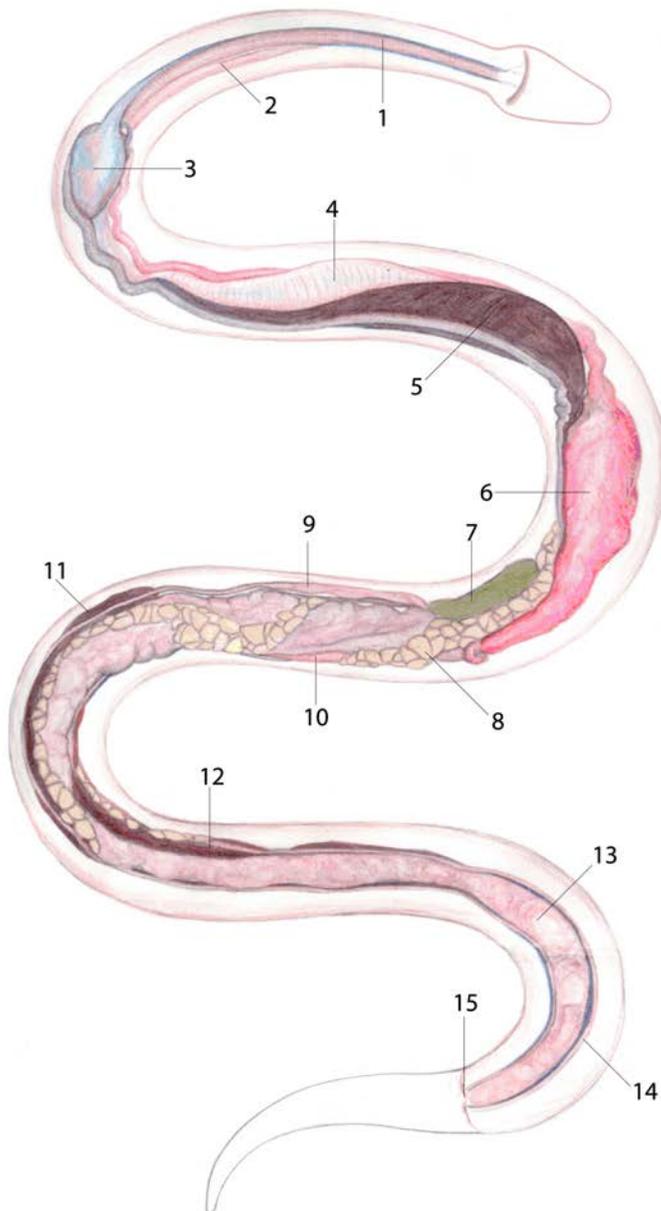


- Measure the gonads and record the measurements on your worksheet.
 - For males measure each testis
 - For females measure the two largest ova or if no ova are developed note “ova not differentiated”.
 - Remember to **take measurements in millimeters (mm)**!

Taking tissue samples

Have Terri, the class coordinator, or a UGSI supervise

- Grab a clean napkin and write HLMK (heart, liver, muscle, kidney) on it – this will help you keep track of your tissue samples. Be careful not to contaminate your tissue samples with bile, feces, or external contaminants as these could ruin the samples
- Cut into the body cavity, making sure not to cut into any organs
 - The snake body is adapted for elongation, and so snake organs are slightly different from other vertebrate organs.
- Do not overfill your vials as the tissues will expand when they freeze and you can risk breaking the tube which will render your sample useless!
- Check your stomach contents – describe them in your worksheet, and if you find anything particularly interesting, save it in 70% ethanol.
- If you find any parasites in/on your specimen, save them in 95% ethanol.



- The liver is not lobed and is very long.
- The gallbladder is not within the liver, but posterior to the stomach.
- The paired organs are staggered – they do not lie symmetrically on either side of the spine in the body. Sometimes one of the pair is vestigial or missing (this is true for lungs and sometimes ovaries).

“Follow the tubes”

To figure out what organs are where in your snake, at the neck, find the trachea and esophagus and follow them down. At the vent, find the colon and follow it up.

- | | |
|-----------------|------------------|
| 1. trachea | 9. right testis |
| 2. esophagus | 10. left testis |
| 3. heart | 11. right kidney |
| 4. lung | 12. left kidney |
| 5. liver | 13. colon |
| 6. stomach | 14. seminal duct |
| 7. gall bladder | 15. vent |
| 8. fat bodies | |

illustration by Juliana Olsson

Finishing up: Clean the Specimen!

- Clear out all remaining organs and tissue from the body cavity, and make sure to remove the tongue and trachea as well. **DO NOT** remove the eyeballs. Snakes have an ossicle ring inside each eyeball that is part of the skeleton.
- Double check that you have filled out your skeleton tag: PLC #, sex, Accn #
- Attach the specimen tag by poking one end of the string through the muscle between ribs. Poke the other string through the tag in another part of the muscle between ribs. Tie the tag loosely so that it will not dry to your snake's body.



-
- If necessary, place the specimen in the soak bucket.
 - Make sure the water is running slowly, the bucket is not covering the sink drain, and the strainer is over the drain (clear it out if water is pooling in the sink).
 - If the specimen is clean enough to bypass soak bucket (check in to make sure), tie it up *into as small a oblong as possible* and hang it up to dry
 - Make sure the tag is visible and hanging away from the body so it doesn't stick to anything as it dries
 - If your skeleton for some reason has small or broken pieces, try to tie them to the specimen if possible. If unable to tie parts to the rest of the skeleton, consult Terri or the class coordinator on how to best group the parts together.
- Enter all the information from your worksheet into the prep lab catalog. Write neatly and pay close attention to the catalog entry examples.
 - **Have Terri, the class coordinator or a UGSI check your catalog entry before you leave.**
- Paperclip your original data to your worksheet and place it into the completed worksheet basket.
 - *TIP - Before turning in your worksheet, double check that every part of the worksheet has been completely filled out!*
 - *TIP - Double check that you wrote your PLC and Accn on all original data if you haven't already done so!*
- Sign out in the daily prep lab log (next to the data basket)
 - Name of preparator(s)
 - Catalog (PLC) #
 - Accession #
 - Genus and species
 - Prep and associated parts (complete skeleton)
- Clean your workstation and wash all tools and trays

