

# **HERPETOLOGY LABORATORY GUIDELINES AND PROTOCOLS**

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## GENERAL GUIDELINES

Everyone that works in the Herpetology Laboratory, whether you are helping to run trapping arrays, working on an independent project, or working on an honor's thesis, must adhere to the following protocols and guidelines. If you have questions regarding any issues in this document, you should ask Dr. Dorcas or an experienced Herpetology Laboratory student. Data you collect will likely not only be used in the project you are working on, but by other scientists conducting research in the future at Davidson or other research institutions. Consequently, everyone that works in the Herpetology Laboratory is expected to take the utmost care to ensure the completeness and accuracy of all data you collect. If you are unsure about anything, how to enter data on the computer, how to enter locality data in your field notes, how to use a piece of equipment, etc., you should ask for help immediately. Failure to adhere to the guidelines outlined in this document can result in loss of access to the Herpetology Laboratory.

### FIELD RESEARCH

**Safety** - Everyone working in the Herpetology Laboratory is expected to take all appropriate safety precautions. You should **always** take a cell phone with you into the field - for emergency use only. Cell phones are available in the Herpetology Lab. You should inform Dr. Dorcas and field companions of any allergies or medical conditions before you go into the field. Everyone working in the Herpetology Laboratory is required to complete a Laboratory Use Form and a Field Work Liability Waiver form before you begin work. Some additional safety reminders:

- Try to avoid being in the field during a lightning storm. You should take cover in an automobile or building immediately if caught in a lightning storm. Do not stand next to isolated trees or water.
- No one working in the laboratory should attempt to capture a live venomous snake. You should familiarize yourself with the venomous snakes of the area before going into the field.
- When possible, take a buddy with you in the field.
- You should always take drinking water with you in the field during hot times of year.

**Field Supplies** - Every time you go into the field you **must** take 1) a cell phone, 2) field notes, and 3) GPS unit. Depending on your purpose, you may also need to take bags for animals, snake hooks, traps, camera, walkie-talkies, etc. All supplies and equipment must be returned, clean and in proper working order, to their proper place in the Herpetology Laboratory when you return from the field. If you break a piece of equipment or if a piece of equipment is not working properly, you should report this immediately to Dr. Dorcas.

**Field Notes** - Everyone that works as part of the Herpetology Lab is required to take accurate field notes. You will be issued a Write-In-The-Rain field notebook which you should take with you every time you go into the field. In this notebook, you will record the following:

- all field sites you visit
- the dates and times that you visit them
- the people you are with
- weather conditions

- all species of amphibians and reptiles (live or dead) you observe, hear, or capture
- the number of individuals you observe/capture
- the specific localities of each amphibian and reptile observation/capture (including GPS coordinates)
- the habitat (macro and micro) in which you find each animal
- any other information that might be of importance (behavior, sex of animals, life stage, etc.)

You should always use scientific names in your field notes. You can abbreviate scientific names by using the first three letters of the genus and first three letters of the species (e.g., *Chelydra serpentina* = Cheser; *Elaphe obsoleta* = Elaobs). It is always better to record more information than you think might be necessary. You should make sure that you always write clearly and legibly – others will likely need to read and understand your field notes. If you are in the field with a partner, only one person should take field notes while you are together and the other's field notebook should indicate that the first person took all field notes. If you separate while in the field, you should both take field notes while separated. If you are conducting a laboratory project only, you should record in your notebook the dates, times, and detailed descriptions of your procedures. When your work in the Herpetology Laboratory is complete (i.e., your project is over), your field notes will remain in the Herpetology Lab for future reference by other herpetologists. You may make photocopies of your field notes to take with you if you wish.

**Localities** - It is **imperative** that localities be recorded accurately in your field notes, on animal tags, and in the appropriate databases. Always list the county first, then an accurate description of the location, **then the UTM's** (GPS coordinates - see below). Always write the locality so that someone can read it and go stand in that spot 50 years later. Never use words such as "from", "near", etc. Always use precise distances in specific directions from specific points of reference that will be there for a long time (e.g., major road intersections). See examples below for poor and good locality descriptions.

POOR - near Maple road about 1 mile from the Exxon station.

GOOD - Mecklenberg County: 3.6 road miles S of State Hwy 73 on State Hwy 115.

N=3945627, E=0565432

POOR - Meck Co.: just east of Davidson

GOOD - Iredell Co.: 1.2 air miles E of the jct. U.S. Hwy 23 and Interstate 77.

N=3948997, E=0565433

**Global Positioning Systems** - When you go into the field, it is imperative that you always take one of the Garmin hand-held Global Positioning Systems so that you can record GPS coordinates for each amphibian and reptile observation/capture. The WAAS corrected units (i.e., Garmin Legends) are more accurate (most of the time) and should be used for all telemetry work and other research that requires very accurate positions. The global positioning systems can be checked out on the GPS check-out sheet in the herp lab and should be returned after use. You should not alter the GPS settings. GPS coordinates should be recorded as UTM's and must be recorded for every amphibian and reptile observation/capture. GPS coordinates are essential for

mapping of animal localities in a geographical information system (GIS), such as ArcGIS. The Garmin GPS systems are relatively easy to use, but if you are unsure of how to properly use them, please ask.

**Animal Identification** - When working in the field, it is imperative that you identify correctly to genus and species all amphibians and reptiles that you record in your field notes, datasheets, etc. To facilitate proper identification, I have provided several field guides in the laboratory. These field guides can be taken into the field if needed and should be returned when you are done. Additionally, a web site (North Carolina's Amphibians and Reptiles) is available at <http://www.bio.davidson.edu/ncherps>. This web site was developed by the Amphibian and Reptile Conservation class during the Spring of 1999 and has been updated by others since that time. Additionally, I have provided, in the Herpetology Laboratory, a list of amphibians and reptiles that are expected to be in the Davidson Area and a quick ID sheet for some of the more difficult to distinguish species. If you are not absolutely sure of the identification of the amphibians and reptiles you observe or capture, you should return them to the laboratory to receive assistance in identification.

**Animals in Field** - One of the most important aspects of the Herpetology Laboratory are the ongoing mark-recapture studies of amphibians and reptiles in the Davidson Area. All amphibians and reptiles encountered in the field must be recorded in your field notes. Correct identification of many species often requires animals to be captured (i.e., collected). Capturing amphibians and reptiles in the field, though often hard work, can be a very fun and rewarding experience. It is important that some general guidelines be followed.

Many reptiles (and some amphibians) often bite when captured. In most circumstances, these bites are of minimal consequence to the herpetologist. However, care should always be taken when capturing snapping turtles or other large turtles that can bite hard. **No** herpetology student should ever attempt to capture a venomous snake.

When capturing amphibians and reptiles, care should always be taken not to harm them. When in the field, you should house animals in containers appropriately. Snakes and turtles can usually be housed in snake or turtle bags and lizards and amphibians can be housed in plastic bags with lots of air. **No** animal should ever be left in the sun or a parked car, even for a short period of time on a cool day.

All turtles and snakes found within a 10-mile radius of Davidson College or from a current or past study site should be measured before release. All larger species of snakes (i.e., garter snake size and bigger) found on Davidson College campus should also be PIT tagged. Additionally, all larger species should be scale clipped (fifth scale up from cloaca) to indicate it has been PIT tagged and so that the tissue can be used for later genetic studies. Generally, measuring and marking necessitates returning the animal to the laboratory. Likewise, any amphibian or reptile that you cannot positively identify in the field should be returned to the laboratory for correct identification. You must be able to return each animal you bring back to the lab or have someone else return it within a few days. It is very **important** that you always record appropriate data with each animal capture/observation (see field notes section above).

## LABORATORY RESEARCH

Everyone that works in the herpetology laboratory is expected to help keep the lab clean and organized. All equipment and supplies should be returned to their proper location after use, all animal containers should be cleaned after use, and all trash, etc. should be promptly thrown away. Desktops, countertops, and sinks should be cleaned if they are dirty after you use them. Visitors to the Herpetology Laboratory are welcome for short visits, but you should be with them at all times. No person should work or study in the herpetology laboratory, unless they have permission from Dr. Dorcas.

**Laboratory Computers** - The computers in the Herpetology Laboratory are for use only by students working on herpetology projects. No unauthorized person is allowed to use the Herpetology Laboratory computers. You are encouraged to save your files within an appropriately named folder on the "D" hard drive of the laboratory computers if you are working on a project. You are responsible to back up these files to your network space or onto suitable backup media (e.g., ZIP disk). Do not ever save anything to the "C" hard drive. Do not install any programs on the Herpetology Laboratory computers without permission. You should take care to organize your folders and files on the computer carefully and name files and folders appropriately so that you can easily keep track of file versions, file locations, etc.

**Databases** - The databases kept on amphibian and reptiles are vital to the success of current and future research in the Herpetology Laboratory. Consequently, it is imperative that you understand how they work and how to add data to them when necessary without corrupting the database files. Before you begin using the databases, you **must** receive instructions on their proper use from Dr. Dorcas. **Every** amphibian and reptile observation should be recorded in your field notes and, if not recorded as part of another database(s), then entered into the "Observation Database" as soon as possible. Generally, it's best to record all of your observations into the observation database when you return to the lab from the field each day. Under no circumstances should you wait more than one week to record your animal observations in the observation database.

**Tissues** – As part of the mark recapture studies, we are also collecting tissues from some animals. Tissue is collected from all turtles by removing a couple of millimeters of tail tip. Snake tissues are usually a scale clip. Larger tissue samples should be taken from dead animals (i.e., DOR animals) before they are put in the freezer. Snake tissues are assigned a "Tissue number" that is recorded in the Snake Database. Turtles are not assigned a tissue number, but all turtle tissues should be identified by their code written on the tissue vial. All tissue vials should have: species, date, number or code. All are stored in an organized way in the ultra cold freezers.

**Reprints** - To help research students have quick access to my reprint collection, Dr. Dorcas has located it in the file cabinets in the Herpetology Laboratory. All reprints are organized by author's last name. Before you use any reprints, you **must** get permission from Dr. Dorcas and have him show you how to file the reprints. After use, you **must** return them properly to their correct folder. Do **not** remove reprints from the Herpetology Laboratory without my permission.

To assist with searching for herpetological reprints, I have provided an Endnote database

file called "Dorcas Reprints" on each laboratory computer. This bibliographic database can be easily searched using the "search" feature in Endnote. Every article listed in this database should be either in the file cabinets or in a journal or book in my office. The "notes" field should indicate where the article is located. I have also included an Endnote file called "Herpetology Reprints" on each lab computer. "Herpetology Reprints" contains an exhaustive list of articles, notes, and books on herpetology, most of which I don't have, but can be obtained from the library or through interlibrary loan. Because both of these databases are incomplete, it is imperative that you do not rely on them for your entire literature search. You should use *Biological Abstracts* and other databases in the library to find articles related to your project not recorded in the databases mentioned above. Davidson librarians are very willing and able to help you with these searches (note: Mr. Frank Molinek, the Davidson Science Librarian, specializes in bibliographic searches of science databases).

**Animals in Lab** - If you bring an animal into the laboratory, it is **your** responsibility to make sure that it is housed properly in the lab, appropriately tagged, measured and marked if appropriate, its holding container kept clean, and released within a few days of capture. All animals should be released as close as possible to their capture site. All animals brought into the laboratory, whether dead or alive, must have an animal tag filled out **completely, including UTM's**. All dead reptiles and amphibians found anywhere in North Carolina should be returned to the laboratory and put in the freezer for later transport to the North Carolina Museum of Natural Sciences. All animals put in freezer must have an animal tag filled out completely including county, specific locality, and GPS coordinates. Generally, all live amphibians brought into the laboratory should be housed in a plastic container (e.g., Ziploc) with a moist paper towel, and tagged appropriately. All reptiles should be housed in appropriate containers. Turtles should be housed in bins with about one inch of water. Place the lid of a bin under one end of containers holding box turtles so that these turtles have access to a dry area. Turtles should be housed in bins in which you are sure they cannot escape.

Snakes should be kept securely in snake bags without holes and then put into a bin. A lid should then be placed on the bin and duct taped to hold it on. Small snakes can be housed in the small, plastic containers with a wet paper towel, but make sure that the lids are secure and that the holes are not too big. Always check snake bags for holes before you use them each time. Very small snakes should be housed in the same manner as lizards. Lizards should be housed in plastic containers (not bags) with small holes in the lid. You should put a damp paper towel in containers housing small reptiles. Do not put turtles in snake bags because they will tear them up with their claws. **NOTE:** It is imperative that live animals, especially snakes, are housed securely in the laboratory to prevent escape. Turtles can sometimes climb out of bins. Snakes are amazingly strong and especially good at squeezing through tiny holes.

## Turtle Studies

Turtles offer a number of advantages for detailed, long-term studies in addition to short-term (semester-length) projects. Turtles are easy to capture, long lived, easy to mark and measure, easy to maintain in captivity, and fun to work with. The success of current and future turtle projects is dependent on accurate data collection by all personnel involved in turtle studies and by herpetology students not directly involved in projects involving turtles.

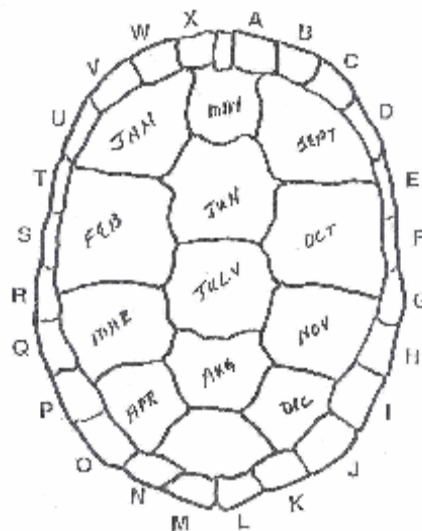
All turtles found within a 10-mile radius of Davidson College or at a past or current study location must be measured and marked. Many turtles can be found crossing roads or in the woods, but most of our turtles are captured using traps. All Herpetology Laboratory students must learn how to properly mark and measure turtles from either Dr. Dorcas or an experienced Herpetology Laboratory student approved by Dr. Dorcas. Reading these instructions is **not** adequate training for marking turtles.

**Setting Aquatic Turtle Traps** - Turtle traps should be positioned so that part of the back end of the each trap is about 6-10 inches above water. Trap front ends should be in deeper water, so aquatic turtles can easily swim into the trap openings. Traps should also be prevented from rolling into deep water by tying a rope to the traps and attaching them at shore with a stake or by tying them to a tree. Another option is to stake the traps to the bottom of the pond with a stick. Generally, we use slightly opened cans of sardines to bait turtle traps. Traps should be rebaited with fresh sardines every 4 days of a trapping session.

**Checking Turtle Traps** - Turtle traps can be checked every day but must be checked at least every two days. Release fish captured in the traps. Use care when handling mud turtles and snapping turtles, as they frequently bite. Do not hold mud turtles by the front half of shell (they bite). Lift snapping turtles by grabbing the back end of the carapace. You may also want to grab a leg. Do not lift large snappers by the tail because you can damage their vertebrae. All turtles that have been measured within the past month should have a white dot on their carapace in the appropriate scute indicating the month they were captured. These can be released upon capture but their code should be recorded in a field book and later entered in the turtle data book.

**Turtle Codes** - We use the marginal scutes as a coding system when marking turtles (Fig. 1). Most Emydid turtles and snapping turtles have 12 marginal scutes on each side. Kinosternids generally have 11 on each side. However, some turtles have more or less. Marginal scutes should **always** be counted on both sides before marking any turtle.

When marking turtles or reading turtle codes, the top marginal scutes (on either side of



Marking scheme for Emydid turtles and snappers - *Chysemys picta*, *Terrapene carolina*, *Trachemys scripta*, *Pseudemys sp.* and *Chelydra serpentina*. Do not use this marking scheme for *Kinosternon* or *Sternotherus*.

the nuchal) will always be A and X. The most posterior two along the midline are always L and M (or K and L if it is a mud or musk turtle, *Kinosternon* or *Sternotherus*). See diagram for Emydid and snapping turtles. Reading the codes this way will eliminate any problems associated with turtles having abnormal numbers of marginal scutes. All turtles that have not been measured and marked within the past month should be returned to the laboratory for processing. Several specimens of the same species can be placed in a single small cloth bag (not snake bag). The cloth bags should then be placed in one of the large canvas bags. Turtles from different localities should never be placed in the same bag. Snapping turtles should always be kept in a separate canvas bag from other turtles and only one should be placed in each bag or bin. All bags should be securely tied at the top with draw strings. Always keep track of how many turtles you have placed in the bags so you can be sure none have escaped.

**Turtles in the Lab** - Proper care should always be taken in the laboratory to assure turtles are housed properly and marked and measured carefully. When you first bring a turtle into the laboratory, you must fill out an animal tag for each bin in which you place turtles (on the animal tag, indicate how many individuals are in each bin) and tape it on the bin. You may abbreviate scientific name of species by writing first three letters of genus and first three letters of species (i.e. *Kinosternon subrubrum* would be Kinsub). House all turtles in bins containing about an inch of water. Several individuals of the same species may be housed in the same bin. However, specimens from different localities should never be housed together. The water in these bins will need to be changed frequently (most likely, once a day). The large bins with locking lids should be used for all adult snapping turtles.

**Data Collection** - All turtles brought to lab should be marked and measured. Females may need to be x-rayed for eggs depending on the study. Before measuring or marking turtles, you must be properly trained by either Dr. Dorcas or an experienced Herpetology Laboratory student designated by Dr. Dorcas.

**1. Some hints for turtle sex determination.**

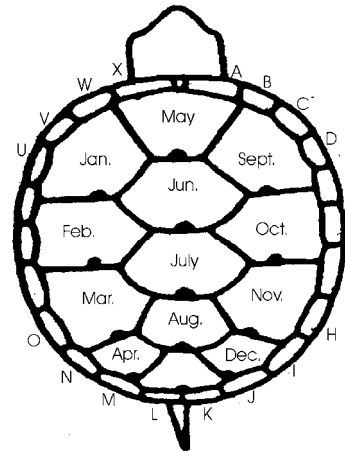
*Box turtles:* Females have a flat plastron, duller colors, and a more domed shape carapace. Males have a more concave plastron, brighter colors, and a more oblong shaped carapace.

*Mud turtles:* Males have larger and longer tails.

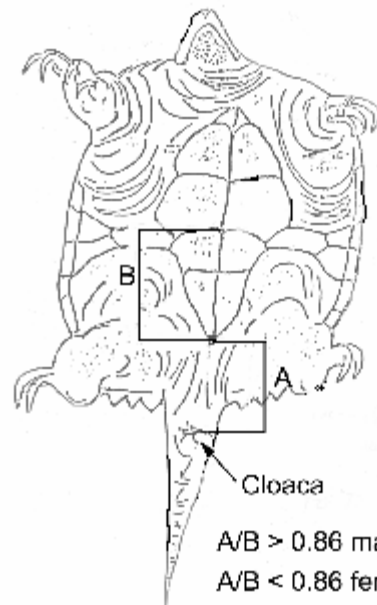
*Painted turtles:* Males have longer fingernails on forefeet and the tail is longer.

*Snapping turtles:* See formula in pocket of turtle data book.

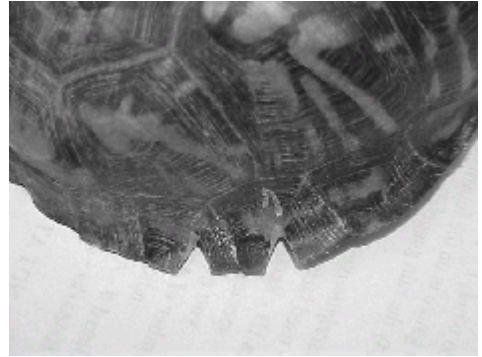
Kinosternon and Sternotherus



Marking scheme for *Kinosternon* and *Sternotherus*



**2. Age** - Turtles are aged in a similar way as trees. You can count the rings (annuli) on the scutes of their plastron and carapace. Look at several different scutes because some of them may be clearer, and easier to read, than others. Use the confidence scale to indicate how confident you are in your age estimate (0 = not able to age turtle...3 = very confident). It is likely that you will not be able to age mature painted turtles, snapping turtles, and some mud turtles because the annuli become worn and faded with time. If you can not determine the age, record "0" for the confidence and "old" for the age. You should always get a "blind" opinion from another person on the age of each turtle.



The marked marginal scutes of a box turtle.

**3. Marking:** See description of how to read codes above. Most turtles are marked by filing notches into their marginal scutes. Adult snapping turtles and other large turtles (adult *Trachemys* and *Pseudemys*) can be marked with an electric drill. The keratin that builds up on the file may need to be cleaned periodically with the wire brush. Use nail clippers to mark very small turtles.

Before you mark a turtle, you must choose a code from the code sheet. Cross off the code on the appropriate code sheet and write down the current date immediately after crossing out the code turtle.

After marking a turtle or reading a code, you should always have somebody else double-check your code. If you make a mistake marking, **you must notify Dr. Dorcas before correcting the code.** You can often correct it by adding a 4th letter to the code. Write the new code in the data book and then cross it out and date it as usual.

**4. Mass:** A top-loading balance is available in the laboratory to weigh most turtles to the nearest 0.1g. Large snappers can be weighed with the large Pesola spring scales. When weighing large turtles using the spring scales, never hold them at a height where they could fall and hurt themselves. Always hold them over a table or counter.

**5. Measuring dimensions:** Several dimensions of the turtle's shell must be measured. Use large calipers to measure carapace length (along the straight midline of the carapace), plastron length (along a straight midline of the plastron), maximum shell width, and maximum shell depth. Take all measurements to the nearest 1 mm. Measure the carapace length of painted turtles from the tip of the nuchal to the back of the carapace. Take the same measurements to the nearest 1 mm using electronic calipers when measuring mud turtles and box turtles. For recaptures, comparisons with previous measurements will help to verify accuracy of current measurements. When measuring mud turtle plastron length always measure along a center midline. This means that you may include portions of the anal scutes that extend posteriorly in the length measurements. Also, for any turtle with a hinged plastron (i.e. box turtles, mud turtles), be sure to measure the plastron length when the plastron is flat. You may need to pull the anterior end up slightly or you may need to measure the anterior and posterior ends separately and then take the sum.

**6. Photographs:** Use a digital camera to photograph the carapace and plastron of each turtle. A piece of paper with the turtle code, species, and date should be beside each turtle when photographed. Check the image quality on the computer and name the images following the format of the other images (e.g., Tercar-CIK-10-10-03-CAR). Then copy them into the

appropriate species section within “D:\HERP DATA\turtle images” on the Herpetology Lab computer.

**7. Comments section:** There are various things that should be noted in the Comments section of the data sheets. Always count marginal scutes and compare with carapace figures in turtle data notebook of turtle data book (Painted turtles, sliders, snapping turtles, and box turtles usually have 12 marginal scutes on each side; musk and mud turtles have 11). If the number of marginals is abnormal, then record the number. Look for any other unusual characteristics (i.e. shell abnormalities, split or joined scutes, stubby tail, missing appendages or toes, etc. that may later be helpful during identification). You should also check the container for any food items present in feces. Note any of these observations in the comments section. Also, you should record in this section whether or not you can feel eggs. You can check for eggs by sticking your pinky fingers in the region just anterior to the hind legs of female turtles and feel for round, hard surfaces.



## Snake Studies

There will be many opportunities to work with snakes while participating in herpetological studies. North Carolina has 37 snake species, many of which you will encounter while in the field. Snakes are great to work with because 1) They are abundant around the Davidson area, 2) most are generally well tempered, 3) they are easy to keep in a laboratory setting, and 4) they provide valuable data for research that can be applied to conservation efforts.

All snakes found in the vicinity of Davidson College or found at a past or current study location must be measured and, for many species and locations, marked. Many snakes can be found crossing roads or in the woods, but sometimes coverboards or other trapping methods can be used. All Herpetology Laboratory students must learn how to properly mark and measure snakes from either Dr. Dorcas or an experienced Herpetology Laboratory student approved by Dr. Dorcas. Reading these instructions is not adequate training for marking snakes. It is also important to remember that these marking techniques are for non-venomous snakes only.

**Herpetology lab students should not attempt to capture or measure and mark any venomous species of snake.**

**SNAKES IN THE LAB-** Snakes are very easy to keep in a laboratory setting, however, it is important to remember that the snakes should only be held in the lab for 2-3 days. Small snakes should be placed in a Tupperware container with a moist paper towel inside. Large snakes should be kept in a snake bag and placed inside a green bin with a lid that is secured tightly (i.e., duct-taped). Some snakes are amazingly strong and are expert escape artists, thus special care is required to assure that they do not escape. Snakes of the same species that are found in the same location may be housed in the same bin. However, different snake species should never be housed together. You do not need to provide water or food for the snakes if they are kept for only a couple of days. When releasing the snakes, remember to let them go exactly where they were captured.

**COLLECTING SNAKES IN THE FIELD-**Every non-venomous snake found within in the vicinity of Davidson should be brought in for measurements. Snakes are usually well tempered, but sometimes defend themselves when you try to catch them. Small snakes will musk, and will wriggle around when picked up. Large snakes, however, might try to bite when handled. The easiest way to catch a snake is to simply pick it up gently, but Dr. Dorcas or an experienced Herpetology student can show you how to use a snake hook. If you see a venomous snake, do not attempt to capture it. Call Dr. Dorcas and he will try to come and capture it (Phone # to call: 704-894-2727).

**ID TAGS:** Like all amphibians and reptiles in the herp lab, every snake that is brought in must have an ID tag filled out completely. The following sections describe what each of the sections on the tag means.

**Species:** In the column for Species, use the first three letters from the genus and species to indicate the species of snake (i.e. *Coluber constrictor*= Colcon, *Elaphe obsoleta*=Elaobs). Make sure you have correctly identified the snake species before obtaining data. Many of the smaller snake species look similar, and identification of these species can be tricky. It is important to

identify the snakes correctly, so if you are at all doubtful about the ID of a snake, ask Dr. Dorcas or an experienced Herpetology student.

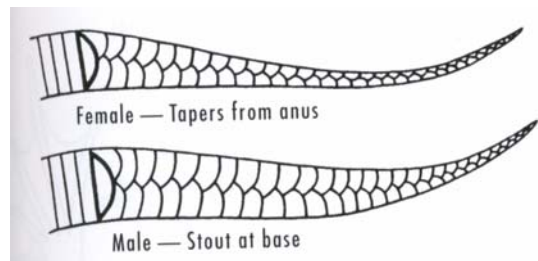
**Location:** As stated before, precise locality data is very important for all snakes. Always list the county first, then an accurate description of the location. Localities should include UTM's (See above for details of how to accurately describe localities).

**MOC:** This stands for Method of Capture. This is important because we can see how the snakes were captured. The technique used in catching the snake is what goes in this column (i.e. Hand=H, Coverboards=CB, etc.).

**SEX:** Learning how to sex a snake takes practice and can be difficult even for experienced Herpetology students. You must be trained by Dr. Dorcas or a student that he approves before sexing a snake on your own. One way to determine sex is to insert a probe into the cloaca of the snake. There are several different sizes for the probes, and practice will help to determine the best size for various snakes. Insert the probe and move the probe towards the end of the tail on either side of the midline. It is very important not to move the probe too hard or quickly. If the probe will not move into deep pockets (i.e., more than 3 scales deep) on either side of the tail, after insertion, the snake is likely a female. If the probe easily slides down to the tail, the snake is likely a male. The smaller snakes are sometimes very hard to sex.

Another method for sexing snakes is to simply look at the scales in the tail area. If the tail is relatively short and tapers quickly posterior to the cloaca, the snake is probably a female. If the tail stay thick posterior to the cloaca and is relatively long, then it's likely a male snake. Do not record the sex of a snake unless you are sure of it. If you have any questions about the sex of a snake, ask Dr. Dorcas or an experienced Herpetology student.

A third method, called "popping", is generally reserved for smaller snakes and is especially useful for juveniles and neonates. Popping involves using manual pressure to evert the hemipenes in suspected male snakes. This is accomplished by grasping the snake's tail midway between the vent and tail tip and placing your thumb on the ventral side, oriented anteriorly. With a gentle anterior rolling motion of the thumb, you can create enough pressure to make the hemipenes visible at the cloaca. Failure to evert hemipenes doesn't guarantee the snake is a female and it is best to double check with probing. Popping can be a delicate procedure and you should receive instruction from Dr. Dorcas or an experienced Herpetology student before attempting.



Failure to evert hemipenes doesn't guarantee the snake is a female and it is best to double check with probing. Popping can be a delicate procedure and you should receive instruction from Dr. Dorcas or an experienced Herpetology student before attempting.

**SVL:** We take two length measurements on snakes. The first one is Snout-Vent length or SVL. To take this measurement, lay the meter sticks on a flat surface. For large snakes, you may need to use both meter sticks. Hold the snake as straight as you can beside or on top of the meter stick(s) and stretch the snake out straight as best you can. Measure the length of the snake from the tip of the snout to the cloaca. You may need help with larger species. As always, all measurements are in mm.

**TTL:** This is the second length measurement we take on snakes and is a total length measurement: From tip of snout to tip of tail. Hold the snake out as straight as you can alongside or on top of the meter stick(s) and measure from the tip of the snout to the end of the tail. Alternatively, you may measure the distance from the vent to the tip of the tail and add it to the previously determined SVL. As always, all measurements are in mm.

**Mass:** All small snakes should be weighed to the nearest 0.1 grams on the top-loading balance. You may need to tare the balance with a container and/or a snake bag before measuring the snake. Larger snakes may not fit on the top-loading balance. If this is the case, weigh the snake in a snake bag using the large Pesola spring scales. Remember to weigh the snake bag first and subtract that mass from the mass of the snake in the bag. The mass of the snakes is always recorded in grams. Small snakes should be weighed to the nearest 0.1 g.

**Stub Tail:** A normal snake tail gradually tapers and ends in a point. Sometimes a snake will be injured so that the end of the tail is missing, resulting in a tail which no longer tapers to a point but rather resembles the stump of a missing limb. This is referred to as a stub tail. If the snake has a stub tail, circle Y (for Yes). If not, circle N (No). Some species, such as *Carphophis amoenus*, may be confusing at first. If you are unsure, ask Dr. Dorcas or an experienced Herpetology lab student.

**Large Scars:** Some snakes may have scars from injuries. If the snake you are measuring has a prominent scar, circle Y (Yes) and record the distance the scar is located from the tip of the snout (in mm). If the snake has a recent injury (i.e., unhealed), do not report it in this section – write it in the Comments section.

**Gravid:** If the snake brought into the lab is a female, check to see whether she is gravid (i.e., pregnant). This is done by palpating the snake anterior to the cloaca and feeling for several lumpy objects (the eggs or embryos). If the snake is not gravid or is a male, circle N (No). If the snake is gravid circle Y (Yes) and record the number of ova that can be discerned on the following line (# of ova). Before you palpate a snake for the first time, it is necessary to obtain training from Dr. Dorcas or an experienced herpetology lab student.

**Food item:** Sometimes a snake will be brought back to lab soon after it recently ate a meal. If the snake has a large bulge toward the middle of its body, it is probable that it has recently eaten. Feeling the snake's belly will allow you to feel the bulge and discern the outline of a prey item in the stomach. Recording what the snake has eaten gives us valuable information about its ecology. To determine what the snake has ingested, palpating the snake's belly will force it to regurgitate its prey. At that point, the prey can be identified and recorded. Before you palpate a snake for the first time, it is necessary to obtain training from Dr. Dorcas or an experienced Herpetology lab student.

**PIT Tag:** For some snakes, we insert a PIT tag to give the snake an ID number. This is helpful because if the snake is recaptured, we can see where the snake has moved from the last capture. In general, only snakes from the Davidson College Campus receive PIT tags. Only use PIT tags on medium to large size snakes (i.e. rat snakes, black racers, corn snakes, kingsnakes,

watersnakes, etc.). If you are unsure if a snake should receive a PIT tag, ask Dr. Dorcas or an experienced lab student first. You must have training by Dr. Dorcas or a student approved by Dr. Dorcas before you can insert PIT tags. Before inserting a PIT tag, run the PIT tag sensor over the snake to make sure the snake does not already have a PIT tag. You should also make sure the PIT tag works before you insert it. The tag sensor is located in the Marking Tools drawer. After inserting the PIT tag, run the sensor over the spot where the tag was inserted and wait for the sensor to read the tag ID number. As a partial backup to PIT tags, all snakes that are PIT tagged also receive a single scale clip. We clip a square section out of the fifth ventral scale anterior to the cloacal scute. This provides evidence that the snake was PIT tagged previously. The scale clip, which should be taken from all snakes large enough and which can later be used for various molecular studies, should then be stored in the appropriate -70C freezer and given a “snake tissue number” which is recorded on the datasheet.

If the snake already has a PIT tag circle Y-RC (Yes-Recapture) on the data sheet and record the PIT tag ID number. If the snake is a new capture and will receive a PIT tag, circle Y (Yes for the presence of a PIT tag) and record the PIT tag ID number of the PIT tag that will be inserted. If the snake is a new capture and will not receive a PIT tag, circle N (No for the presence of a PIT tag).

**COMMENTS:** If there are any noticeable irregularities about the snake, write them here (i.e., juvenile, found with other snakes, transmitter implanted, etc.). Also note here if you are going to release the snake in a different location from where you captured it for some reason.