Preserving and Curating Specimens

Purpose.

Entomologists preserve specimens so they can be used at a later date to provide a wealth of information regarding accurate identification, insect evolution, distributions, historical information, and host records. This information can then be used for taxonomic and phylogenetic research, biological control, vectors of plant and animal diseases, and provide insights regarding invasive or endangered species. For this reason entomologists have developed methods to preserve specimens in a manner that is stable, functional, allows researchers to observe important characters, and conserves space.

What is a "good" specimen?

The identification of insect specimens relies on the ability to observe structures. If these structures are damaged or missing, they can't be observed. Specimens obscured by debris, missing antennae, antennal segments, wings, parts of wings, scales on their wings, legs, parts of legs, head or abdomen, or are smashed would be considered "damaged". Pristine and intact specimens are preferred, but this is often easier said than done. Some specimens are rare and hard to come by while others are extremely common. A damaged rare specimen is still valuable while a damaged common species is not. Some ways to avoid damaged specimens: (1) properly store them before curation, (2) rehydrate specimens if they seem too dry when pinning, (3) handle specimens, especially butterflies and moths with great care, and (4) collect extra specimens and select the best for your collection.

1. PRESERVATION STRATEGIES

After death, insect bodies are susceptible to fungus and other insects. If not properly cared for, these factors can destroy specimens. The following are some methods that can be used to maintain specimens until you are ready to curate them (pin or point) for your collection.

a) Freezer – All of the insects you collect over the semester can be stored in the freezer until you are ready to work with them. Butterflies and moths should NOT get wet, but sometimes during the thawing process they become covered with condensation. To prevent this, place them on a piece of folded paper towel before sticking them in the freezer.

b) Alcohol – All specimens *except* for butterflies and moths can be stored in alcohol. This method may be easier for small specimens, but may cause some larger insects (i.e. crickets, grasshoppers) to become overly soft and difficult to curate later.

c) Dried – Occasionally students find dead insects that are in good condition, but already dehydrated. These specimens can be stored in a container as is, stored in the freezer, or in an alcohol vial.

d) Fungal problems – If specimens are allow to sit in a warm humid environment, mold can become a major problem. Mold can be killed by placing the specimens in alcohol for a couple of days. If butterflies or moths become moldy, spray them lightly with Lysol and then allow them to dry out.

e) Beetle problems – If you are storing your collection at room temperature and begin noticing dark dust below some of your specimens, you probably have a dermestid beetle problem. Act immediately; these beetles can quickly destroy a collection. Place your collection in the freezer for 3-4 days to kill the beetles and then place moth balls in the collection to prevent future problems. Note: you cannot place moth balls directly on foam, it will melt, wrap the moth balls in paper towels and then pin them into place.

2. CURATION TECHNIQUES

There are specific methods used to curate insect specimens so that they can be preserved, stored, moved, and observed. Because insects vary greatly in size and sclerotization, there are several different techniques.

a) Pinning

This method is used on hard bodied specimens that range from medium to large in size. This technique will be used on the majority of specimens in student collections. The idea is to leave one side (left) of the insect undamaged, place the pin in a position where it will not break the specimen, and position the body and limbs in a way so they don't become damaged if the specimen is moved (fig 1, 2).

How:

- Pins should go through the right side of the body through the meso- or metahoracic (2^{nd} or $3^{rd)}$ segments, but the location of the pin varies slightly between orders (fig. 3):
  - -Hemiptera (true bugs, cicadas, etc.) right side through the scutellum
  - -Coleoptera (beetles) right side through the elytra
  - -Orthoptera (grasshoppers, crickets, etc.) right side through the pronotum
  - -Lepidoptera (butterflies and moths) in **center** of thorax
- The pin should be perpendicular to the body
- Abdomen should be straight, drooping abdomens are more likely to break. To prevent this problem, prop the abdomen up with pins or a paper 'hammock' while the specimen is drying.

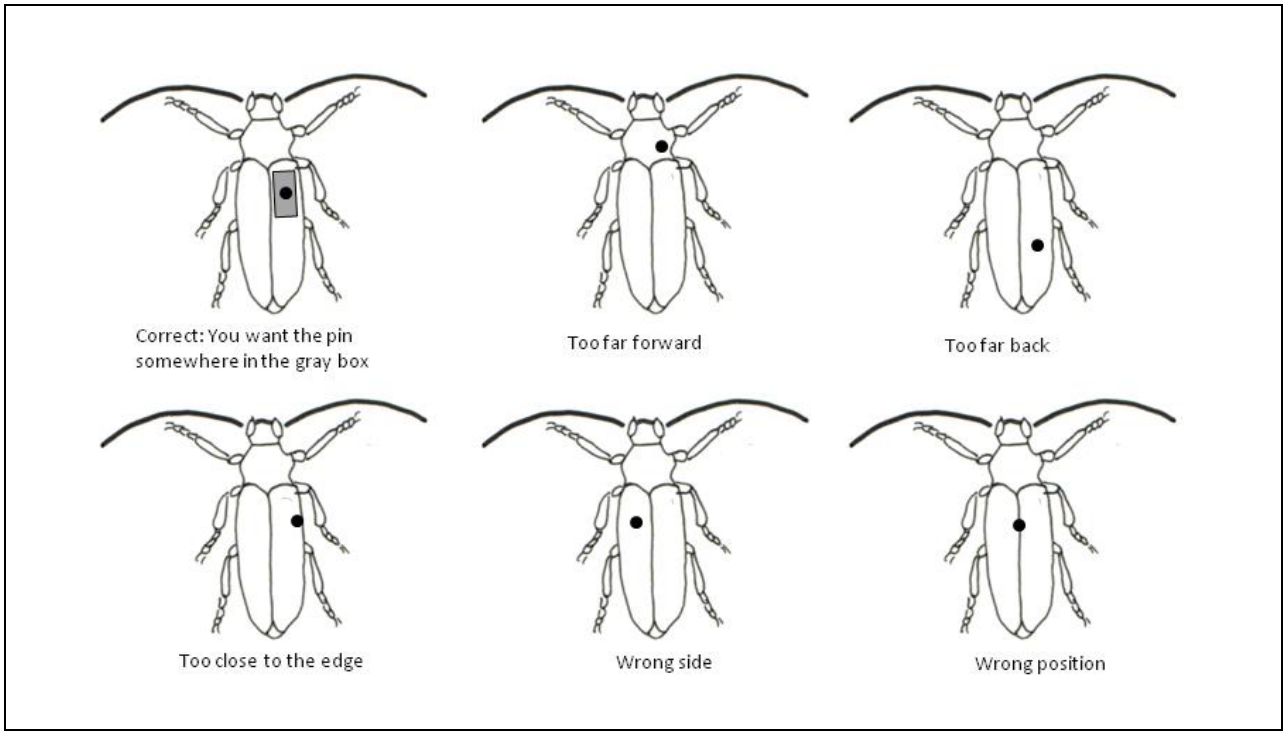


Figure 1 Diagram of the proper pin placement to reduce the likelihood of breaking or damaging the specimen.

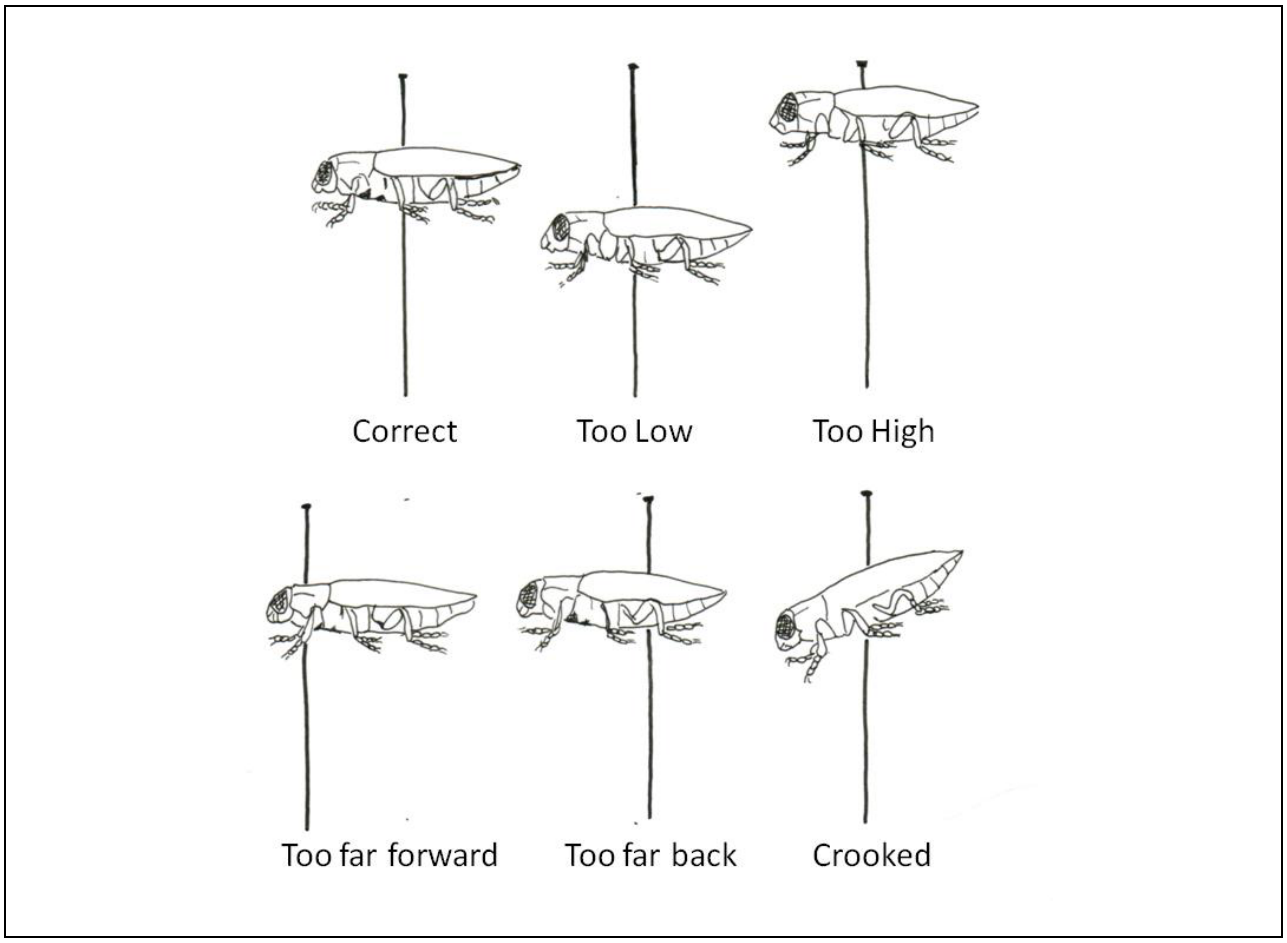


Figure 2 Diagram showing the proper placement and angle of specimens on insect pins.

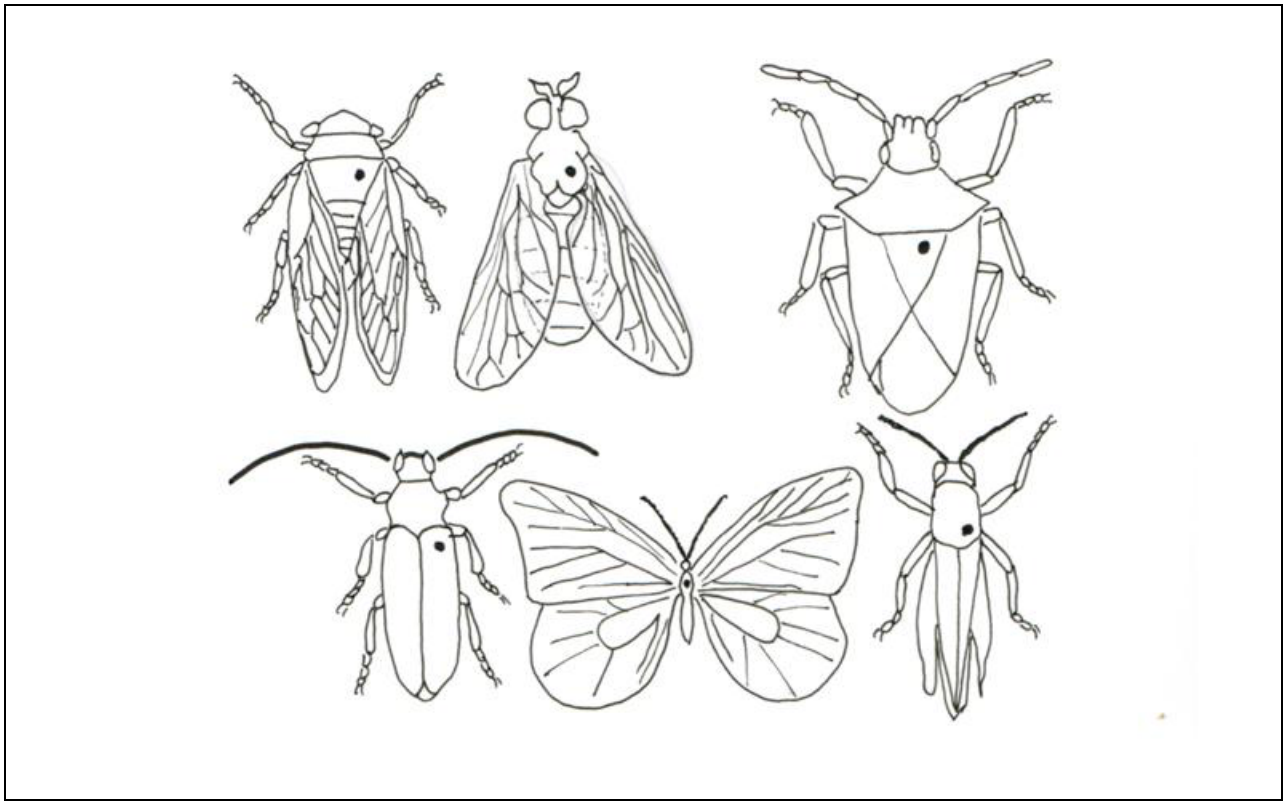


Figure 3 Diagram of pin placement for different orders of insects.

b) Spreading:

For this class, wings will only be spread on butterflies and moths. This method can be used on other orders; depending on the order in question, wings on one or both sides are spread. The purpose is to expose the venation and other structures on the wings so they can be used for idenitification purposes.

How:

- This is something easier seen than described, so there will be a demonstration in lab.
- You will need insect pins, sewing pins, paper, scissors, and a pinning board.
- The objective is spread the wings so they are flat and the posterior margin of the front pair of wings are perpendicular to the body.
- This requires patience and practice. Use broken or damaged specimens to practice and perfect your technique.

1. Do not touch butterflies or moths with your fingers, it will damage the specimen. Instead use forceps or a butterfly fork.
2. Select the groove on the pinning board that best fits the body of the specimen. It shouldn't be too tight or too loose. (fig. 4)
3. Cut strips of paper to act as straps and have sewing and insect pins ready to use.
4. Position the forewing so that the hind margin of the wing is at a 90° angle to the body. Repeat on the other side. (fig. 5, A-C) Pins go through the paper, but never through the wings
5. Position the hindwings so that they are in a natural position just behind the forewings. (fig. 5, D-E)
6. Cover the wings with a piece of paper to reduce the likelihood of damage. (fig. 5, F)
7. Allow the specimen to dry 5-10 days. This will depend on the size and the humidity.

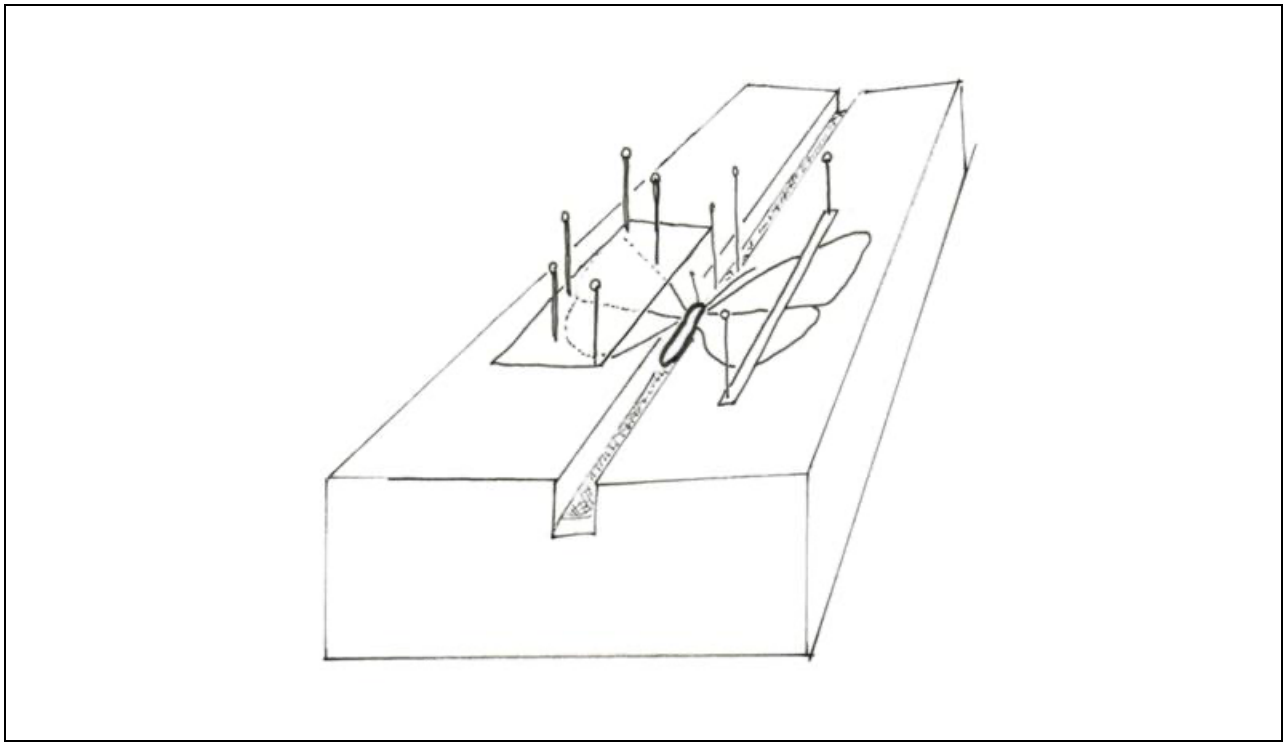


Figure 4 An illustration of a butterfly specimen on a spreading board.

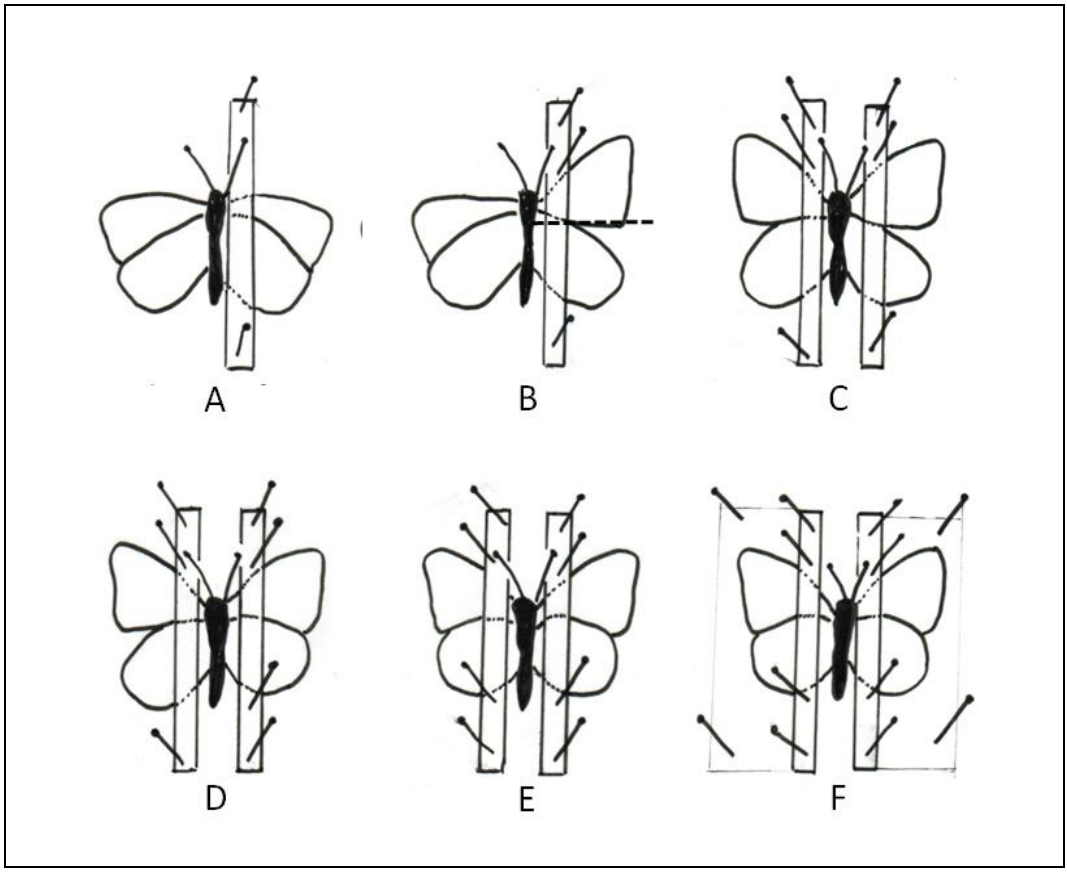


Figure 5 Diagram illustrating the proper method to spread moth or butterfly wings.

c) Pointing

This is a method used for hard bodied specimens that are too small to pin (see section a). Instead specimens are glued onto a triangular piece of paper, and then the pin is placed through the paper.

How:

- A point punch and cardstock or index cards will be made available in lab so students can make their own points. A point punch is used to make standard sized points.
- The insect pin is placed through the larger part of the point so that it is 8mm-10mm from the head of the pin and then the specimen is glued to the smaller tip of the point. The right side of the specimen should be glued to the point, the left side should remain undisturbed (fig. 6, 7).
- Do NOT use superglue, instead use while Elmer's glue. It is helpful to place a drop of glue on a scrap of paper and allow the glue to dry and become tacky before attempting to point a specimen.

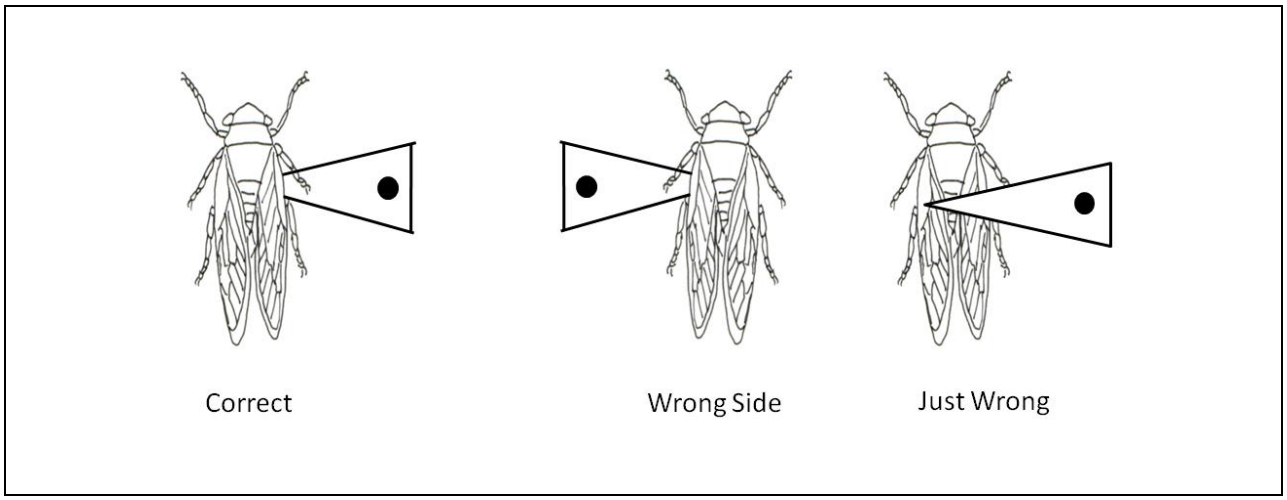


Figure 6 Diagram showing the proper placement of points on pointed specimens.

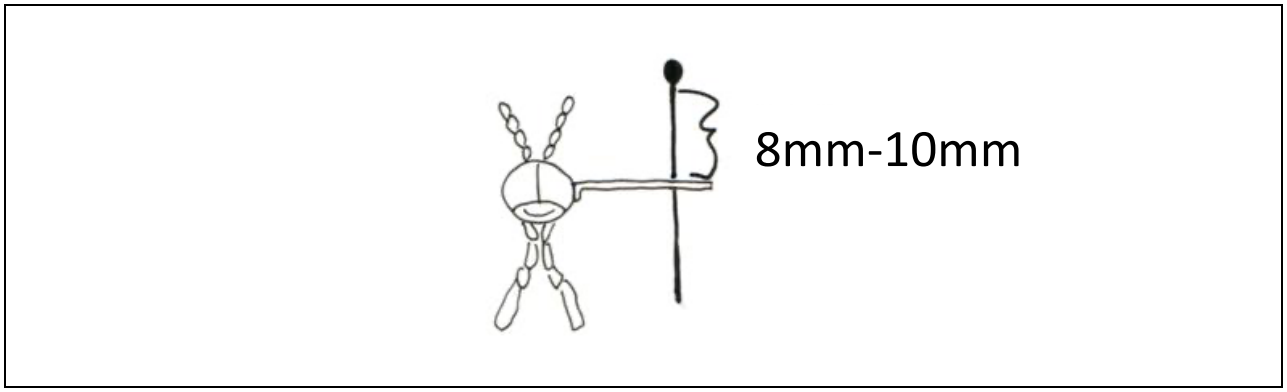


Figure 7 Diagrams showing the proper method for attaching insect specimens to points.

d) Vials

This method is used to preserve soft-bodied specimens of all sizes. There are a few small hard-bodied orders (i.e. fleas, lice) that are also placed in vials (see table 1). Generally, these are specimens that would shrivel up if pinned or pointed making it difficult to observe important characters.

How:

- Vials may contain multiple individuals from the same speices, collected in the same location at the same time.
- The vial should be filled to the top with alcohol in order to limit the movement of the specimens and reduce the possibility of damage.
- Vials are filled with alcohol (70-100% ethanol).

3. LABELS

Labels are important because they are the means by which collectors attach relevant data to individual specimens. This information should allow others to find the location where the specimen was collected, determine when it was collected, the person who collected it, relevant ecological information, and the identity of the specimen.

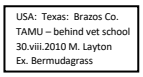
a) Locality label format

Entomologists use a specific format to ensure that relevent pieces of information are found on the labels and that observers can easily find information on a label.

- Line 1: Country: State: County
- Line 2: Specific locality
- Line 3: Date (day, month, year), Collector name(s)
- Line 4: (optional): Additional information on habitat, host, diet, collection method, etc.

Example:

USA: Texas: Brazos Co.
TAMU – behind vet school
30.viii.2010 M. Layton
Ex. Bermudagrass



Actual Size

b) Specifics

- Specific locality – information that helps to find a collection site. This could be the distance and direction from a city or town (i.e. 5 mi SE of College Station), latitude and longitude, a town plus a landmark, etc. Things that are not helpful, "my parent's house", "my car", "gas station", etc., these do not provide usable information to the observer.
- Date – should be written with the day first, the month second (in lower case roman numerals), and the complete year. Because we use a standard format, entomologists know that 3.viii.2010 refers to August 3rd, 2010 and not March 8th, 2010. We also use the full year because pinned insect specimens go back as far as 1702, so '10 could be 1710, 1810, 1910, or 2010.
- Fourth line – this can provide information that can be used in future ecological, distribution, or host range surveys or provide other collectors clues as to where a species might be found or how it might be captured. For this reason, there are some tidbits of information that are useful and others that are not. Comments such as "flying around campus", "in my boyfriend/girlfriend's car", "walking on the sidewalk", or "insect net" are not helpful because they are extremely general or due to a random circumstance. Comments such as "Ex. ('collected from') Blue-winged teal", "Ex. pitfall trap", "Ex. leaf litter", "Ex. deer carcass", etc. are helpful because they information that can be valuable to other researchers as well as indicate where or how the same species could be collected again.

c) Size

Conserving space in insect collections is very important; specimens with oversized labels waste space. Labels may seem too small to a lot of beginning entomologists, but it's easier to look at the information under a microscope than find additional space to store specimens. For this reason it's important to use 4 point font, trim off excess paper, and prevent labels from becoming too long.

Texas: Brazos Co.
TAMU Campus
22.ix.2009 M. Layton
Malaise trap

Correct

Texas: Brazos Co.
TAMU Campus
22.ix.2009 M. Layton
Malaise trap

Incorrect – too much excess white space

Texas: Brazos Co.
TAMU Campus
Fields behind Vet. School
22.ix.2009 M. Layton
Malaise trap

Correct

Texas: Brazos Co.
TAMU Campus - Fields behind Vet. School
22.ix.2009 M. Layton
Malaise trap

Incorrect – too long

d) Making labels

Labels can be made using Microsoft Word.

- Insert
  - Table
    - 6-8 columns
      - As many rows as needed
        - Calibri or Times New Roman, 4 pt. font

<u>****PLEASE NOTE- Locality labels DO NOT contain borders. They should be clean and cut with minimal white space showing.******</u>

f) Placement of labels on pins

Starting from the top of the pin there should be a ½" space, then the specimen, then the locality label, then the ID label, and finally another ~ ½" space at the bottom (fig. 8). In order to conserve space the label should fit under the pinned or pointed specimen (fig. 9)

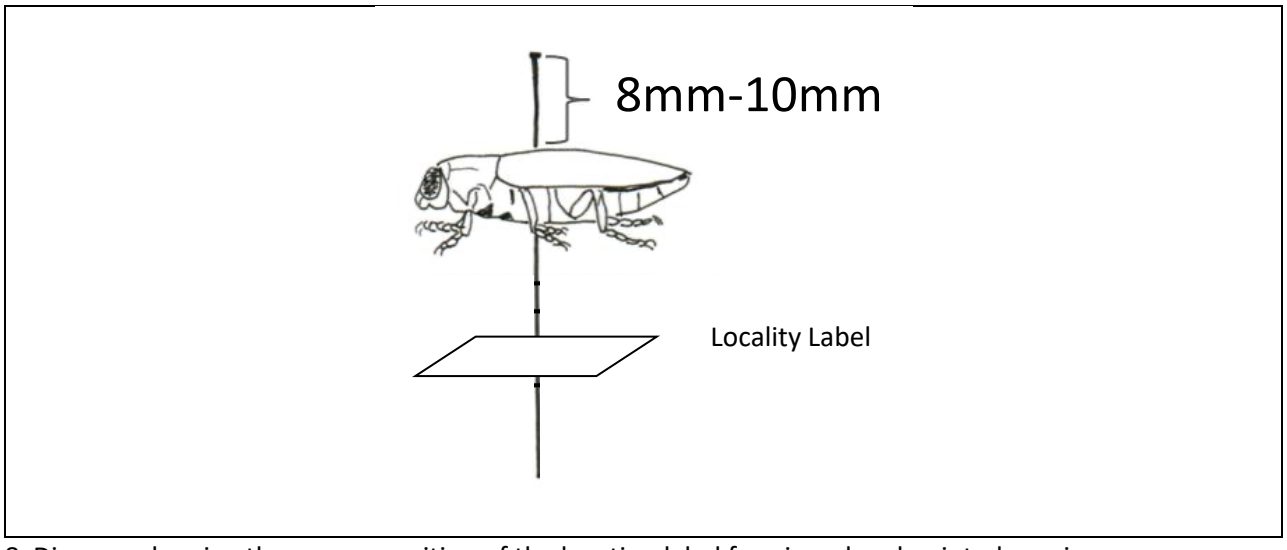


Figure 8 Diagram showing the proper position of the location label for pinned and pointed specimens.

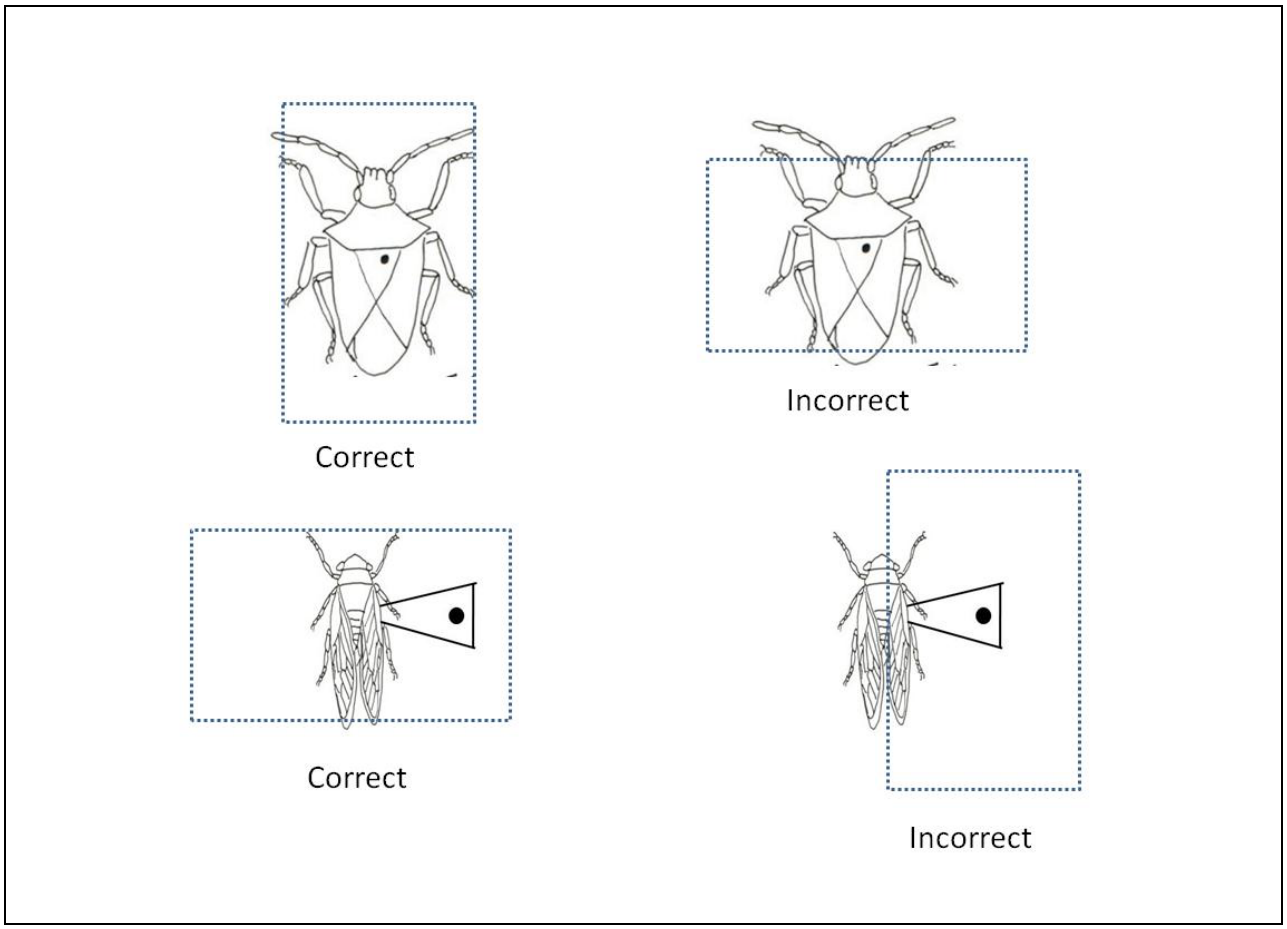


Figure 9 Diagrams showing how to position labels under pinned and pointed specimens in order to conserve space.

f) Labels in alcohol

- Labels are hand written either with indeliable ink or pencil. The label should be as tall as the interior portion of the vial and half the interior circumference (fig. 10). Location information is written on one side of the label and identification on the other side.

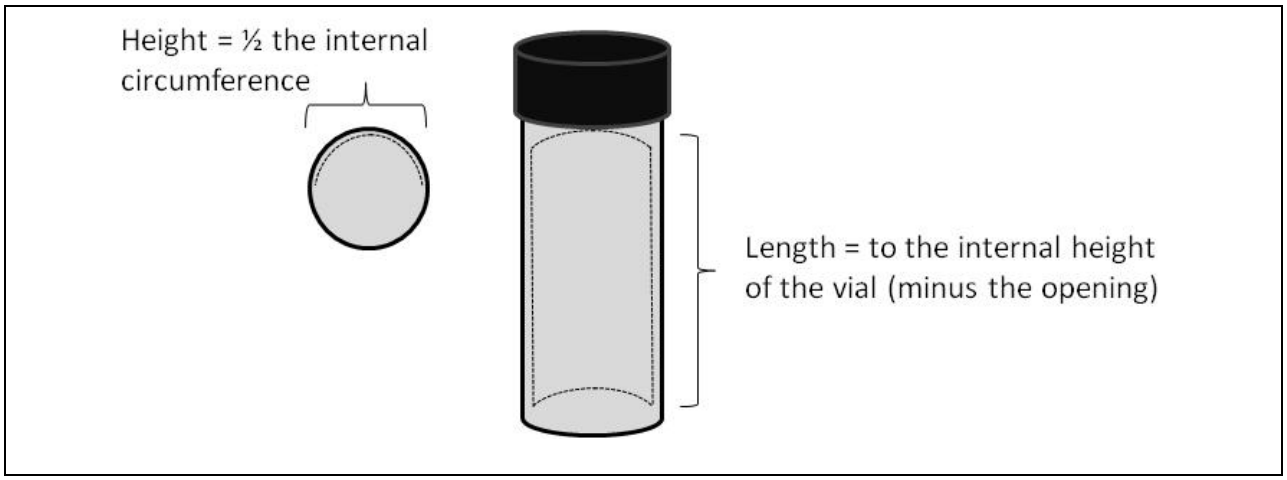


Figure 10 Diagram showing the correct dimensions for labels placed in alcohol vials

Table 1 Proper Curation Method by Order		
Method	**Taxa**	
Pinning	<u>Right Side</u> Blattodea Dermaptera Orthoptera Hemiptera Coleoptera	<u>Just right of the center</u> Odonata Mantodea Phasmatodea Neuroptera Mecoptera Diptera Hymenoptera <u>Center</u> Lepidoptera
Spreading Wings (pinned)	<u>Symmetrical</u> Odonata Mantodea Neuroptera Mecoptera Lepidoptera* Hymenoptera	<u>Asymmetrical (left wing)</u> Blattodea Orthoptera Coleoptera
Pointing	<u>Point Punch</u> Orthoptera (i.e. pygmy molecrickets) Hemiptera Coleoptera Diptera Hymenoptera	<u>2 large pts – extremely long specimens</u> Mantodea Phasmatodea
Alcohol Vials	<u>Always</u> Protura Collembola Diplura Archaeognatha Zygentoma Ephemeroptera Plecoptera Isoptera (within Blattodea) Embiidina/Embioptera Zoraptera Thysanoptera Psocodea (Psocoptera & Phthiraptera) Trichoptera Siphonaptera Strepsiptera Some Hemipterans (whiteflies, aphids, phylloxerans, scales)	