

Grasshoppers



Powerful hind leg with prominent femur and a long narrow tibia which folds tightly against the femur.

Antennae are many times longer than wide, but shorter than femur which distinguishes them from crickets and katydids.

Main grasshopper parts:

Head

Antenna

Eye

Thorax

Pronotum (saddle-shaped part)

Tegmen (forewing)

Femur

Tibia

Abdomen

the distal end is a complicated area involved both excretion and reproduction.

- Males are typically smaller than females
- Life cycle includes eggs, 5 or 6 nymphal instars, and adults
- Nymphs are flightless, adults range from wingless to winged, and some species are strong fliers
- Winged adults have a forewing or tegmen and a larger hind wing which is often brightly colored
- Some species make a noise in flight which is called crepitation
- Grasshoppers come in a large variety of shapes and sizes

Acrididae includes most grasshoppers. There are observations of about 150 species in Texas at iNaturalist.

Tetrigidae includes pygmy grasshoppers. There are observations of 9 species in Texas at iNaturalist.

There are only about two dozen Acrididae and a single Tetrigidae listed for Milam County at present. A significant number are supported by only a single research grade observation. There are undoubtedly more species than this present in Texas and Milam County, but grasshoppers aren't nearly as popular as birds and butterflies, so we can contribute a lot!

Photographing grasshoppers as they go about their lives

Amateur identification differs from traditional scientific identification which often relies on dissection and microscopic examination of collected specimens. Genetic studies have become increasingly important, but that is way beyond the resources of an amateur. On the other hand, amateurs get to look at fresh, brightly colored grasshoppers and photograph them in situations that provide insights into how they live. A series of photos should include good dorsal and lateral views as well as a view of the distal end of the abdomen, preferably from slightly above. Although each species has its own identification secrets, the following areas often used in identification.

- Shape of body including angle of face, length of wings, etc. are reliable in most cases.
- Some species are relatively small, others are large, and nymphal stages are smaller than the adults. Size can also vary from individual to individual. Size won't identify a species, but it can point the right direction.
- Colors and patterns depend on species. Some species have a pretty consistent appearance. Others show a lot of variation in color and pattern. Some variants look like other species and can easily fool you into a bad identification if you forget to look at other characteristics.
- Appearance of male cercus, part of a cluster of sexual and sensory parts at the end of the abdomen, is frequently used for species identification by scientists. A clear photo of the distal end of the male abdomen is needed for some identifications, and females can sometimes only be identified by the males they are associated with. It helps to be able to tell males from females to know which individuals warrant extra photos. It's not too hard to tell the difference. Fortunately most species can be identified by other means.
- Rear tibia color and pattern is useful for some species. Unfortunately the tibia is normally hidden under the femur so you have to catch them with the hind leg extended. Blue, orange, and red are common colors. Some species have multiple colors which makes that feature useless for identification.

- Hind wing color, often bright, is helpful. Yellow, orange, and red can be readily seen in flight. Colors are rarely visible when at rest unless the individual has damage to the forewing.
- Behavior including crepitation during flight are useful in identifying species when you first see them so you know which to chase.
- Netting is a useful skill. A netted grasshopper can be carried into good light and positioned by rotating or tipping the net. The grasshopper usually slowly crawls to the net opening and rests on the rim while you take pictures. Close-ups become much easier. If you are right handed remember to tuck the net handle under your left arm, steady the rim with your left hand, and hold the camera with your right. Otherwise it becomes a very shaky balancing act. Scooping grasshoppers into the net like butterflies is not very effective. They too smart and too quick. Holding the top of the net against the ground about a foot from a grasshopper and then using your feet to encourage it to jump into the net works better. Apparently they interpret a moving net as something solid to be avoided and a still net as something they can escape through. Grasshoppers also become less active as temperatures drop and are easier to handle when chilled as are most arthropods.

The big three.

Let's start with these three species chosen for the following reasons:

- Large size
- Wide distribution
- Common in Milam County
- Fly with minimal noise which distinguishes them from *Chortophaga viridifasciata* which is the 2nd most commonly observed grasshopper in Texas at iNaturalist

<u>Scientific name</u>	<u>Body length</u>	<u>Claim to fame</u>
Schistocerca americana	39-55 mm/up to 2.1"	Excellent flyer
Melanoplus differentialis	28-50mm/up to 2"	Robust body
Mermiria bivittata	25-40mm/up to 1.6"	Rests with knees to side

Schistocerca americana

- 3rd most commonly observed grasshopper in Texas at iNaturalist.
- exceptionally long wings with an estimated wingspread of up to 4.5", its flight is more bird-like as it constantly adjusts its speed and direction.
- eye has dark vertical lines on a tan background; eye is nearly lima bean shaped
- dark marking directly below eye
- light tan band down the center head and back flanked by brown bands on forward part of thorax (pronotum)
- two light horizontal stripes on side of pronotum, one of those at very bottom
- forewings spotted
- colors include cream, tan, yellow, red, and black

Nymphs have eyes rounded at top and bottom, bodies with black speckles, and often a black band along the top of the thorax and abdomen.

Schistocerca americana



Schistocerca americana



2nd instar



4th instar



5th instar

Melanoplus differentialis

- Most commonly observed grasshopper in Texas at iNaturalist.
- body large and beefy.
- top of head rounded without obvious ridges.
- head lacks prominent black patch behind eye.
- markings on side of front part of thorax (pronotum) light, consisting of disconnected black lines and patches.
- side of abdomen lightly marked with black dashes and splotches.
- hind tibia has black chevron markings covering most of outside surface.
- body colors vary from yellow to tan to orange-red to purple-brown.
- wings initially slightly longer than body, shorter on aging individuals.
- cercus of male is distinctive, but not necessary for identification.

Melanoplus differentialis



female - dark tips of ovipositor visible



mating pair

Melanoplus differentialis

This is a male. The cercus is the lateral appendage near the end of the abdomen. The presence of an additional lobe along the lower edge is one of the details that helps identify this species. Every male grasshopper has a pair of these regardless of species.



Melanoplus differentialis



I'm guessing the protuberance between the two front legs makes this as a *spur-throated grasshopper*. However, this traditional identification characteristic is hidden in almost all amateur photographs. Female.

Melanoplus differentialis

Melanoplus is a large genus, and instars of the species are variable and difficult to tell apart. I'm pretty confident in the identification of these later instars because of the markings on the abdomen. The 5th instar is a male, and the cercus apparently hasn't reached its final shape yet.



4th instar



5th instar

Mermiria bivittata

- 9th most commonly observed grasshopper in Texas at iNaturalist.
- face strongly slanted
- legs often held with knees to the side
- antennae sword-shaped (ensiform)
- eye tear-drop shape
- a dark stripe begins at the back of each eye and gradually widens as it extends back to the base of the forewing
- a single light stripe near leading edge of each forewing
- rear tibia orange

I see instars that are typically light tan with darker brown speckles. The dark lateral stripes become more noticeable as the nymphs develop. Nymphs can occur in other colors.

Mermiria bivittata



female



male

Mermiria bivittata



1st instar



3rd instar



5th instar



4th instar

Nebulatettix subgracilis

This is the species that really piqued my interest in grasshoppers. My early attempts at identification failed because there were no identified observations at iNaturalist at the time. As I write this, there are 65 observations, 29 of which are mine. *Nebulatettix subgracilis* was renamed from *Encoptolophus subgracilis* in 2012 after a phylogenetic review of the group was done. Fortunately I found the phylogenetic review article on-line. A series of close-ups of the ridges on top of the head of this and other species was included. This was just what I needed because the top of the head is visible in most amateur photographs, and the ridge pattern alone is enough to identify the species. The only drawback is that photographs have to be sharp enough to see the ridges. This species is well hidden on Texas Blackland and relies heavily on this fact. When I started looking for grasshoppers, this species was the easiest to approach closely as it rarely moved until absolutely necessary.

- 29th most commonly observed grasshopper in Texas at iNaturalist.
- eye has light gray band horizontally bisecting it and the lower half of eye is usually much darker.
- dark patch behind eye which does not extend beyond the head.
- body gray with black speckling, sometimes with a rusty frosting.
- several black patches appear on forewings and hind legs.
- a rusty ray usually appears along the forewing.
- rusty, asymmetric patches rarely appear on the thorax.
- antennae with black and gray mottling, sometimes with rusty tones especially toward tip.
- tibia blue with white band at the near end.
- distinctive shape of cranial ridges, adults and all instars.

Nebulatettix subgracilis



If you think this adult is hard to see, you should try looking for a wingless nymph. Female.

Nebulatettix subgracilis



The cranial ridges form a short neck with slightly tapering sides surmounting an oval shape with a truncated, open back. The oval contains a short, prominent, midline ridge. This detail is of a nymph, but this feature is remarkably consistent throughout the life cycle.



Nebulatettix subgracilis



A male performs a mating display during which the hind femurs are tipped forward exposing the brightly colored tibiae before returning to their normal resting position. The movement is very quick, so capturing this image was pure luck, especially since I knew nothing about tibia color or mating displays at the time.

Nebulatettix subgracilis

I observed a few lighter individuals which were tan with brown speckling and hints of greenish-yellow and red. These are possibly recently molted individuals that will eventually darken.



Nebulatettix subgracilis



1st instar



2nd instar



3rd instar



5th instar



4th instar

Melanoplus femurrubrum

This is the species that prompted me to get a macro lens. Melanoplus is a large genus which includes several rather similar species which are best identified by the shape of the male cercus and details of the subgenital plate. Most experts won't positively identify these species otherwise. All of the ones I conclusively identified on my property turned out to be this species, but at least two of the similar ones are probably present elsewhere in Milam County.

- antennae usually reddish.
- dark fern or tree-like mark at back of rounded head on many individuals.
- two dark dagger-like marks often appear near the midline of the rear most section of the pronotum.
- a black mark begins immediately behind eye and continues across two thirds of pronotum.
- a large, light check mark appears on thorax below tegmen.
- tegmen with contrasting veins and cells, and a lengthwise ray of fine dark spots and mottling.*
- legs sometimes have a reddish tinge, especially the hind femur for which this species is named.
- hind tibia red, greenish-blue, pale blue or a combination.
- body colors range from pale yellow on the underside to yellow and tan above.
- some individuals have a prominent red mark on top of head and pronotum.
- uncommon individuals are bright orange on the underside of the hind femur.
- rare individuals are bluish.
- shape of male cercus and bulbous subgenital plate positively identify the male
- female can only be identified in combination with males.**

*The veins tend to be light near the base and dark near the tip while the cells are dark near the base and light near the tip.

**When we have more knowledge about the range of individual and regional variation of this and similar species, identification will hopefully become easier.

Melanoplus femurrubrum

This is a typical female.



Melanoplus femurrubrum

This is a lightly colored male.



Melanoplus femurrubrum

Here are two examples of females with red dorsal marks. I don't know if there are males like this, but the tibia colors of both sexes are variable.



Melanoplus femurrubrum



Left: A rare bluish male. The underside of hind femur is bright orange, and the barely visible hind tibia is bluish.

Right: Details of male abdomen. The small lateral appendage is the male cercus. The large rounded end is the subgenital plate. The dip in the top edge of the subgenital plate is typical of this species. And yes, that is a hinged lid on top of the subgenital plate which covers the anal opening. Some pretty fancy engineering there!



Melanoplus femurrubrum

Here are two close-ups of the female abdomen for comparison with the male. The group of four dark-tipped parts sticking out of the end is the ovipositor. Note also the small lateral appendage in approximately the same place the male cercus would be, and don't let it confuse you about the sex of an individual. Most grasshoppers have a similar arrangement although it might not be as obvious on some species.



Melanoplus femurrubrum

These are probably 1st., 3rd., and 4th. instars of this species.



Takeaways

- Grasshoppers are numerous at times, fairly easy to find and photograph throughout their life cycle, and some species are active year round in Milam County.
- There is a surprising diversity among grasshoppers.
- Identification can range from easy to difficult.
- An amateur can make a worthwhile contribution.

Useful resources

- https://idtools.org/id/grasshoppers/factsheet_index.php

Good introductory information including labeled diagrams and a glossary. Nice fact sheets for many species, but missing some species so keys are not as useful as they could be. Information on instars included.

- <http://www.uwyo.edu/entomology/grasshoppers/field-guide/>

A website which concentrates on Wyoming grasshoppers, many of which are found in Texas.

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3941475/>

Phylogenetic review of *Encoptolophus* genus and some related species. Well illustrated and shows what a scientific paper looks like.

- <https://bugguide.net/>

- <https://www.inaturalist.org/>

BugGuide and iNaturalist are a good places to see what is out there. Observations can be filtered in various ways including by location or species. You can submit images for identification at BugGuide. If you make an observation on iNaturalist, you may get feedback from a curator or other member fairly quickly. I find iNaturalist a little easier to use and to be more active. Photos on both sites aren't always the best quality. Misidentified images appear to be more common on iNaturalist, but it's easier to review the photos of a particular species. Neither website has everything, so it's worth using both for reference.