BS”D

Greenbottle Flies (Calliphoridae: *Lucilia*) of the USA and Canada

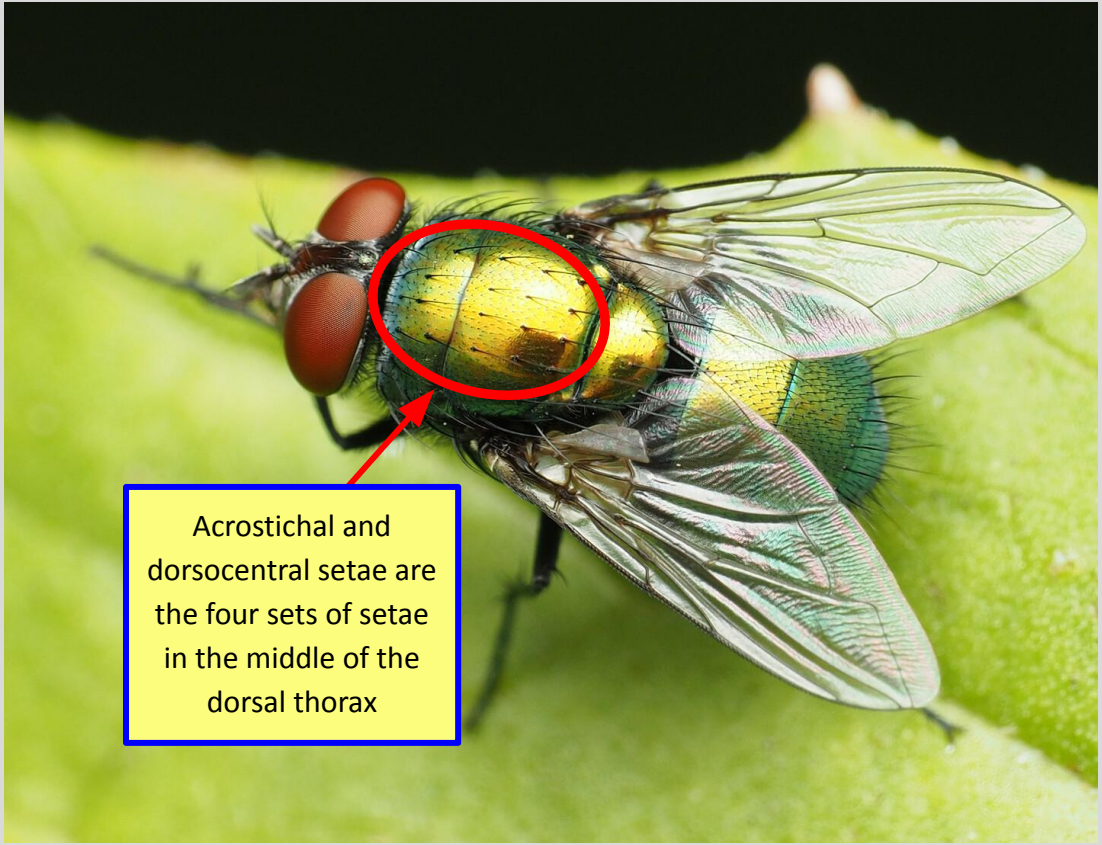
Even Dankowicz (2025)

A field guide:

Microscopic characters are not described here; see references for more help with specimens.

Get started identifying!

Lucilia



L. sericata, male © Katja Schulz, iNaturalist / CC BY

Lucilia can be distinguished from other Calliphoridae in the USA and Canada, except *Protocalliphora*, by the following combination of two characters:

- Thorax and abdomen metallic
- Middle of dorsal thorax with many large acrostichal and dorsocentral setae

Protocalliphora are never entirely green metallic like most *Lucilia*. Unlike *Protocalliphora*, *Lucilia* lack setae on the basal section of the stem vein on the inner side on the upper wing surface -- this is a microscopic feature illustrated in couplet 1 in Jones et al. (2019).

Lucilia never fold the wings over the abdomen at rest.

12 *Lucilia* species are recorded in the mainland United States and Canada. Detailed photos of the head and thorax are usually required to distinguish them.

Separating *Lucilia* from similar genera in other families

Unlike similar genera in other families, *Lucilia* exhibit the following characteristics:

- Posterior head generally somewhat concave
- Top of head sometimes metallic, but front, back, and sides of head never metallic
- At least two pairs of post-sutural acrostichal setae

Head not extensively metallic; at least 2 pairs of post-sutural acrostichals ⇒ *Lucilia*

Lucilia female © Thomas Shahan, iNaturalist / CC-BY-NC

Green metallic frons and posterior head, and only one pair of post-sutural acrostichals ⇒ not *Lucilia*

Neomyia sp. © Michael Knapp, iNaturalist / CC BY

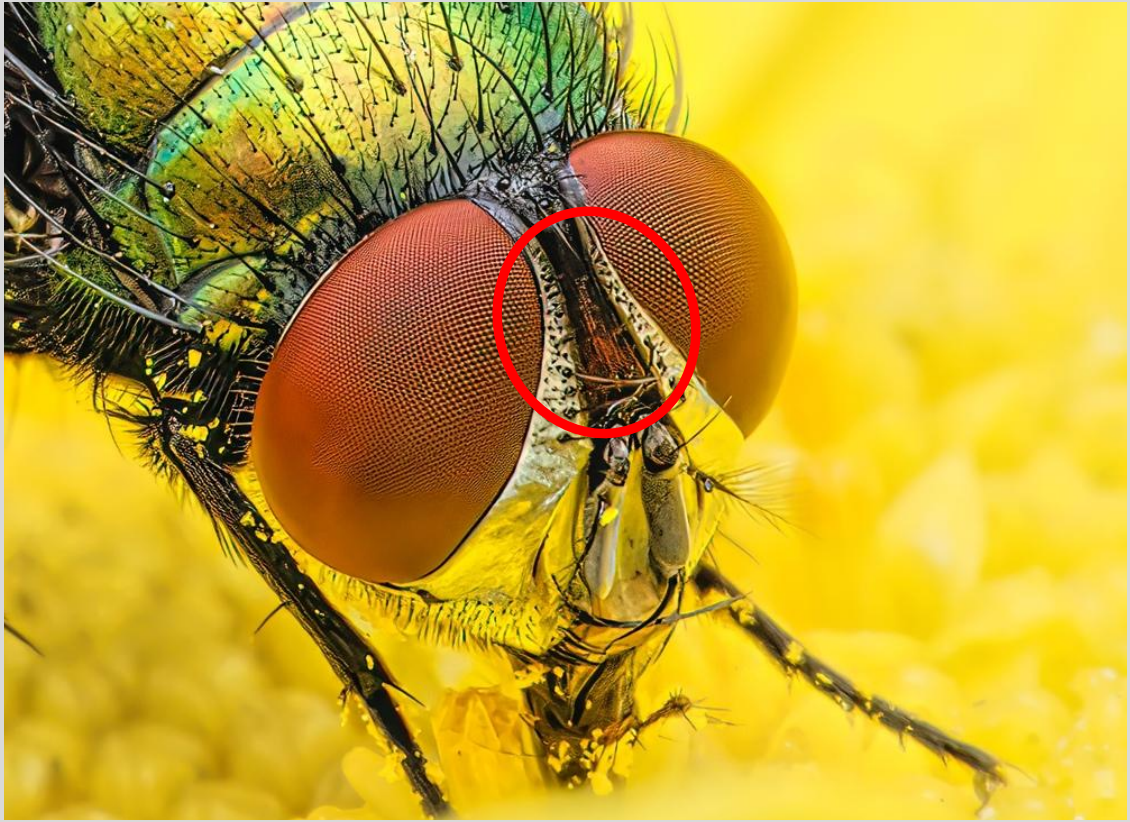
Convex posterior head ⇒ not *Lucilia*

Gymnocheta sp. © renko, iNaturalist / CC BY-NC

Frons

The frons is the region on the front of the head “above the antennae and between the compound eyes” (Cumming & Wood, 2017). The ocellar triangle (described later) is not included as part of the frons.

The frons is the easiest way to tell apart male and female *Lucilia.*

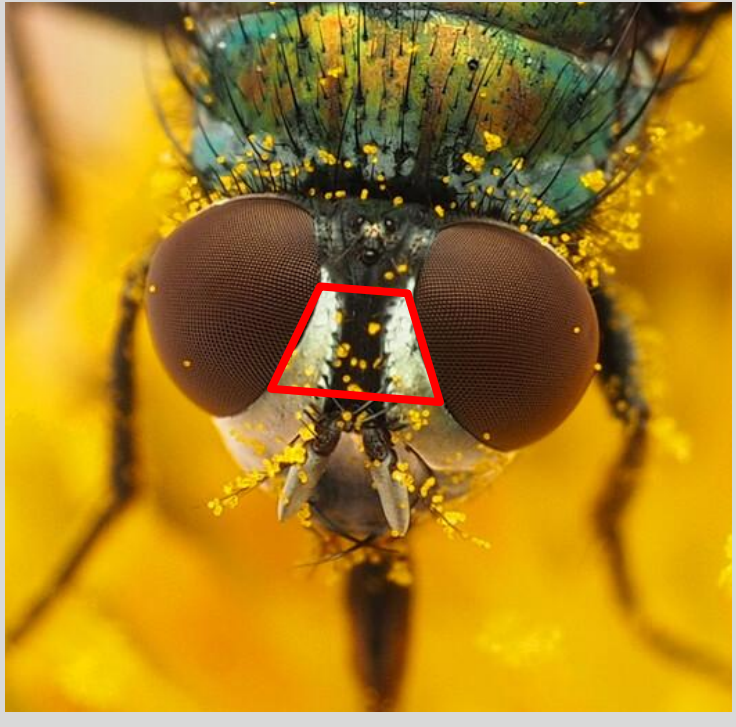


L. sericata, male © jerremie, iNaturalist / CC-BY-NC

Males have a narrowed frons

In male *Lucilia*, the frons is largely trapezoidal in shape: narrower at the top and wider toward the antennal bases.

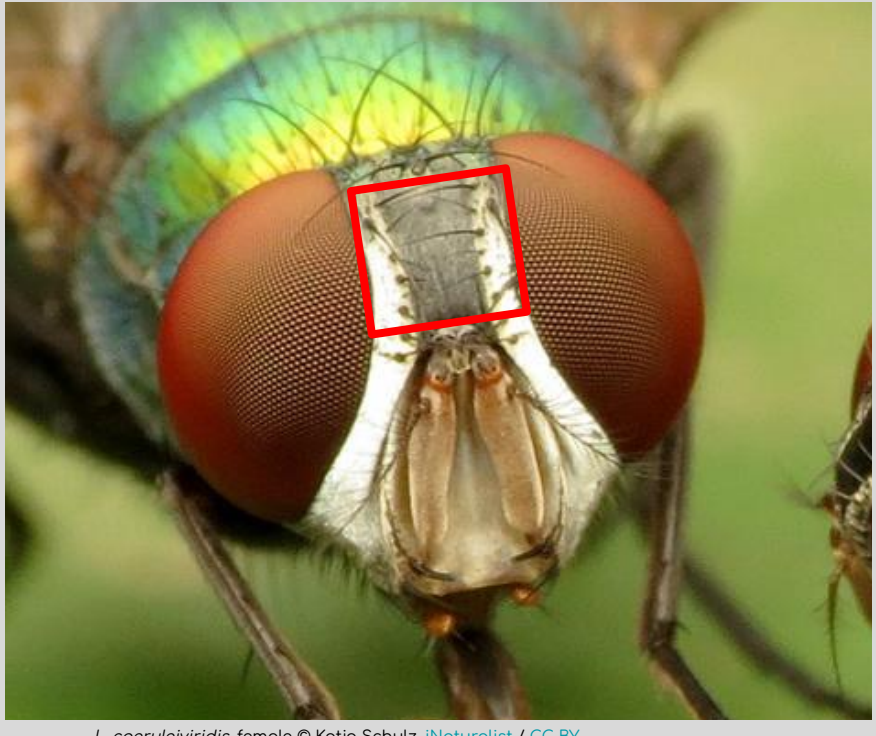
Lucilia, male © Katja Schulz, iNaturalist / CC BY



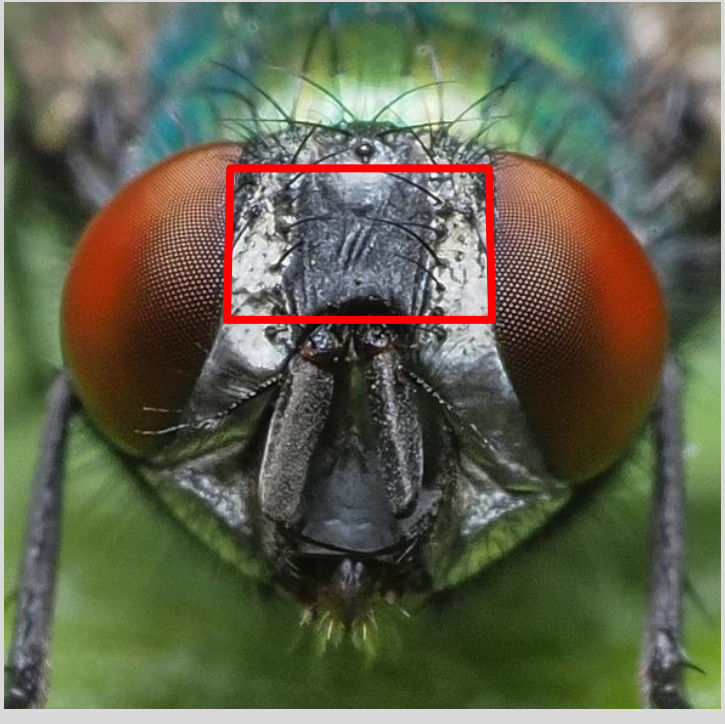
L. cuprina, male © Katja Schulz, iNaturalist / CC BY

Females have a wider, parallel-sided frons

In female *Lucilia*, the frons is rectangular in shape, with sides that are more or less parallel to one another.



L. coeruleiviridis, female © Katja Schulz, iNaturalist / CC BY



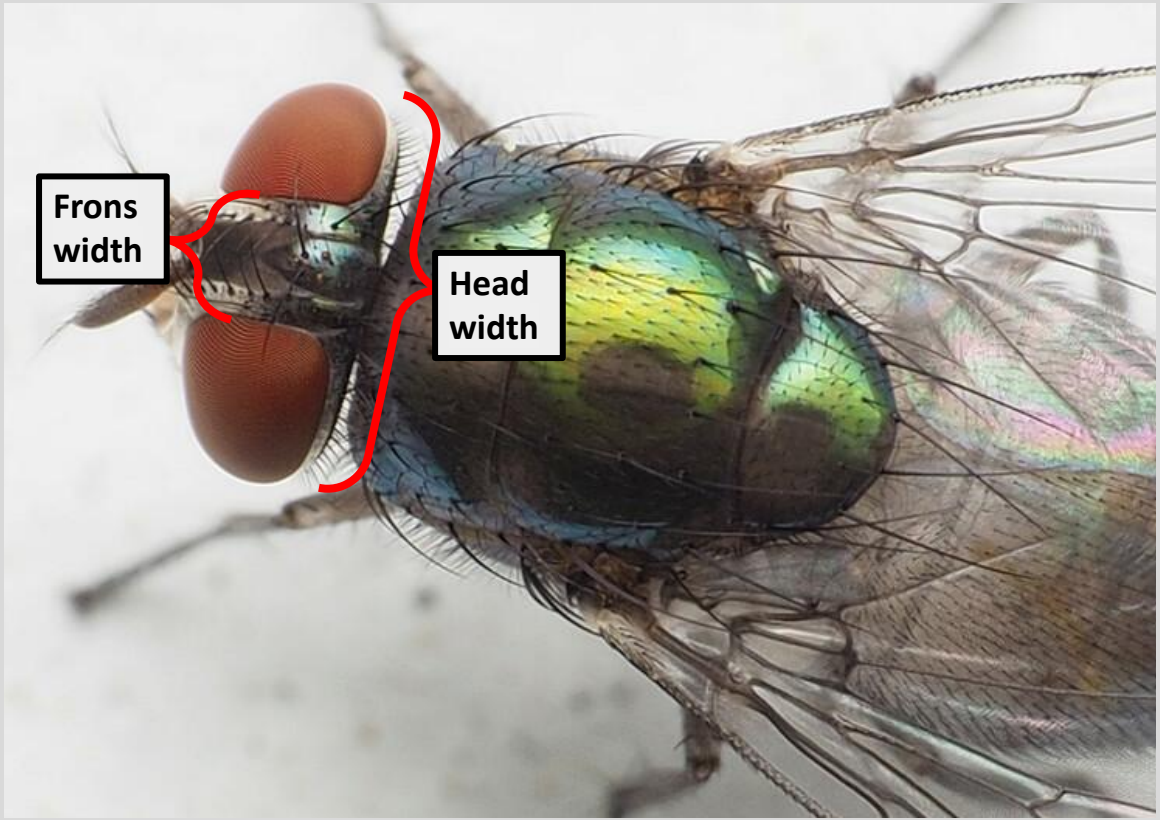
L. sericata, female © knuttutgut, iNaturalist / CC-BY-NC

Frons width at narrowest point vs. width of entire head

The relative width of the frons at its narrowest point is often helpful to narrow down the species.

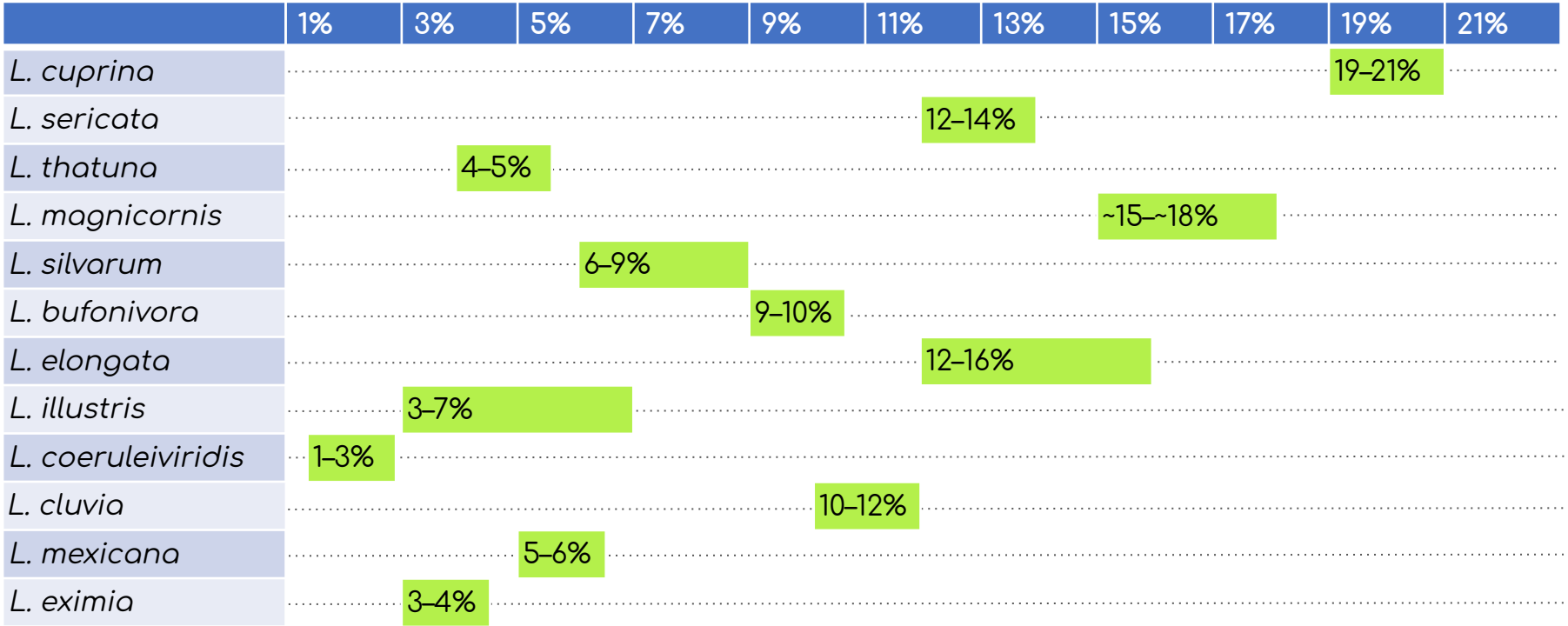
First estimate how many times the width of the frons would fit into the width of each eye. If that number is *n,* then the frons width as a fraction of the total head width is $(2n+1)^{-1}$.

In the example shown at the right, the width of the frons would fit into the width of each eye maybe about 1.2 times. Thus the frons width is $\sim(2*1.2+1)^{-1} = \sim 29\%$



L. coeruleiviridis, female © Katja Schulz, iNaturalist / CC BY

Males: frons width at narrowest point vs. width of entire head



Measurements are approximate and outliers occasionally occur. Sources: Tantawi and Whitworth, 2014; Whitworth, 2006. *L. magnicornis* based on measuring photos. *L. illustris* measured as 3.5% to 5.5% from museum specimens and generally around 5.5% from photos. I've also been told that *L. illustris* lies in the range 6–9% (T. Whitworth, personal comm.).

Males: frons width examples

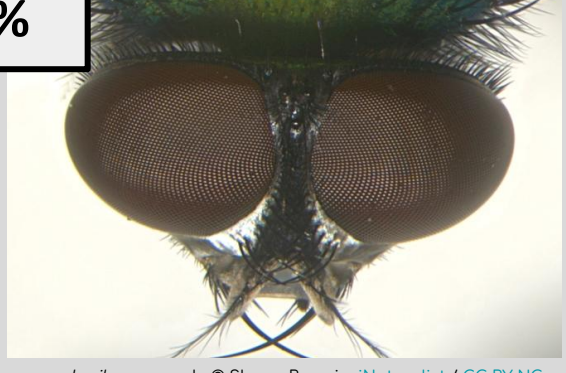
~3%

L. coeruleiviridis, male © Louis-Philippe Bateman, iNaturalist / CC BY-NC

~13%

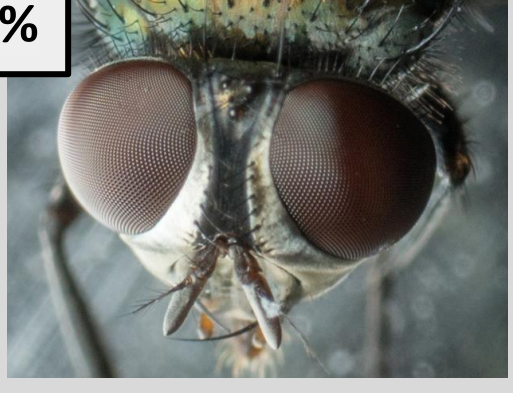
L. sericata, male © Jesse Rorabaugh, iNaturalist / CC0

~8%



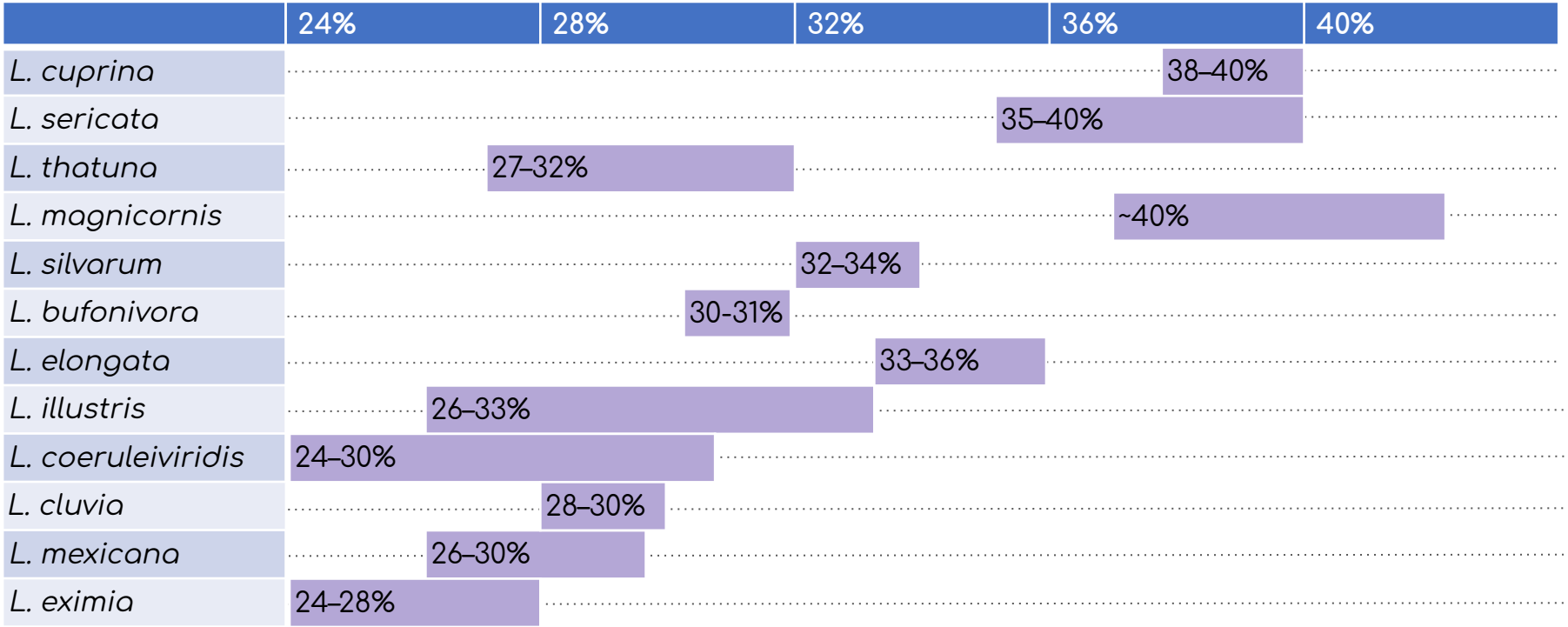
L. silvarum, male © Shawn Brescia, iNaturalist / CC BY-NC

~20%



L. cuprina, male © Jesse Rorabaugh, iNaturalist / CC0

Females: frons width at narrowest point vs. width of entire head



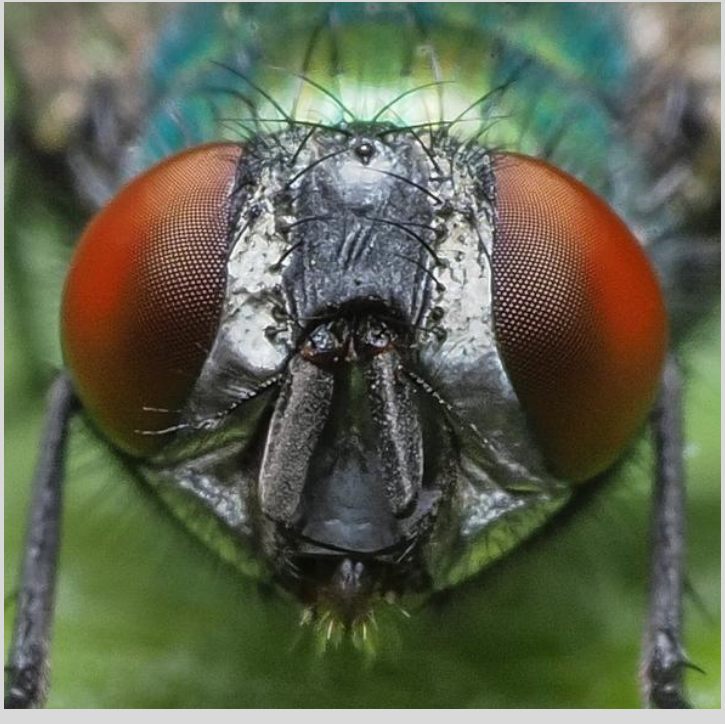
Measurements are approximate and outliers occasionally occur. Sources: Tantawi and Whitworth, 2014; Whitworth, 2006, Whitworth, 2014. Measurements of *L. magnicornis, L. coeruleiviridis, L. illustris* based on measuring specimens and photos.

Females: frons width examples

<33%

L. coeruleiviridis, female © Katja Schulz, iNaturalist / CC BY

>33%



L. sericata, female © knuttutgut, iNaturalist / CC-BY-NC

Males: fronto-orbital plates

This character is more or less equivalent to asking the width of the black frontal stripe. The edges of the frontal stripe are often more easily visible in photos than the edges of the frons itself.

If the fronto-orbital plates are almost touching, then the black frontal stripe will be obscured by the fronto-orbital plates, which are usually dusty-looking white pubescent.

If the fronto-orbital plates are somewhat separated, the black frontal stripe will be distinct from the antennae all the way up to the ocellar triangle.

See figures in Jones et al. (2019) key, pages 167, 174, 180.

almost touching

L. coeruleiviridis, male © Katja Schulz, iNaturalist / CC BY

Somewhat separated

Lucilia, male © Carol Blaney, iNaturalist / CC-BY-NC

Males: are the fronto-orbital plates separated?

	Almost touching	Somewhat separated	Strongly separated
L. cuprina			X
L. sericata			X
L. thatuna	X		
L. magnicornis			X
L. silvarum			X
L. bufonivora			X
L. elongata			X
L. illustris		X	
L. coeruleiviridis	X		
L. cluvia			X
L. mexicana		X	
L. eximia	X		

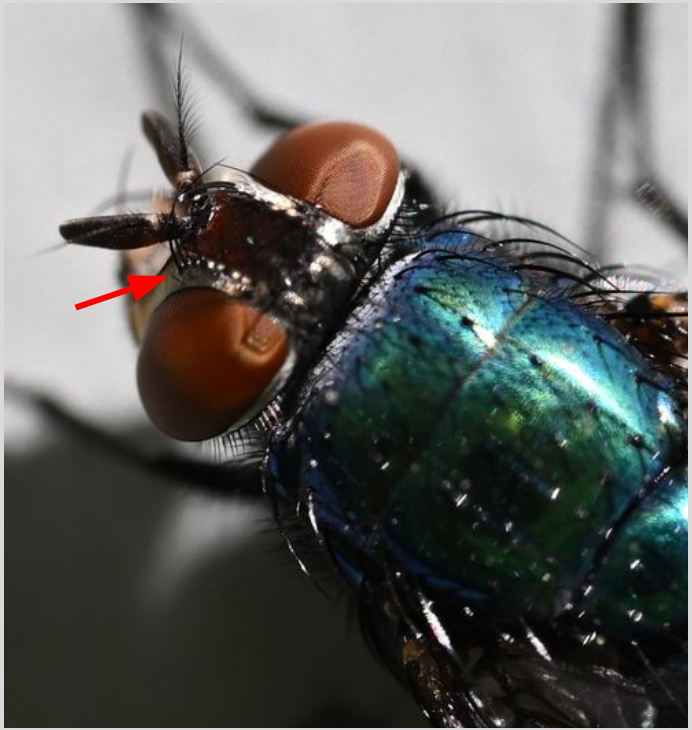
Sources: Falk (2016); Jones et al., 2019. The 'strongly separated' species were largely characterized from specimens and photos and not explicit in literature.

Females: width of parafacial at level of lunule

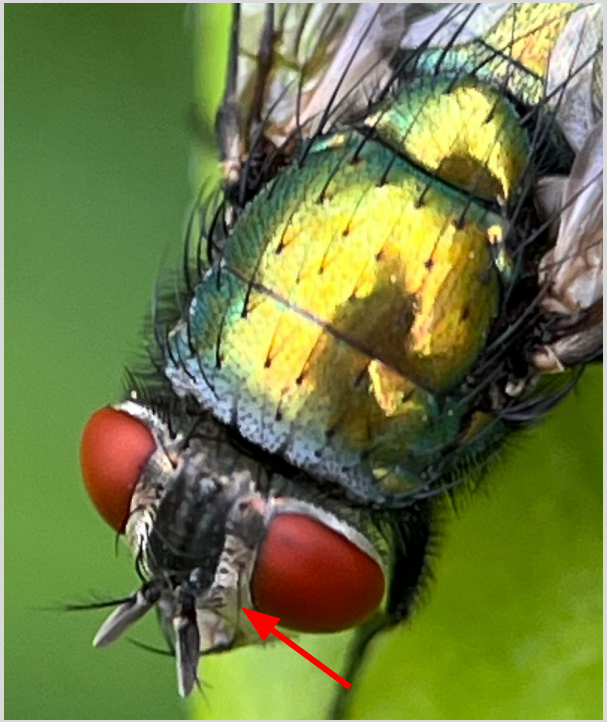
The lunule lies on the frons just above the antennal bases. The parafacial is the white pubescent region on the lateral face, continuing upward into the fronto-orbital plates.

In *L. thatuna*, the parafacial at the level of the lunule is narrower than the width of the antenna. In contrast, *L. sericata* and *L. cuprina*, the parafacial is wider than the antenna. This is the easiest way to separate females of *L. thatuna* morphologically.

This is illustrated in couplet 10 on page 179 of Jones et al. (2019).



L. thatuna, female © Brian Starzomski, iNaturalist / CC-BY-NC



L. sericata, female © madanstantines, iNaturalist / CC-BY-NC

Ocellar triangle

The ocelli are three simple eyes present in a triangular arrangement at the top of the head. The “ocellar triangle” is the sclerite that bears the ocelli (Cumming & Wood, 2017).

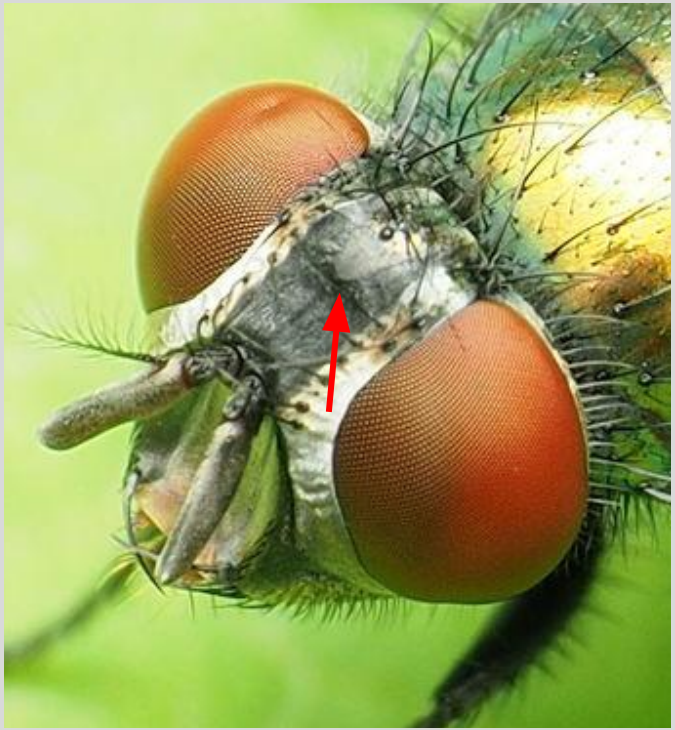
L. sericata, male © jerremie, iNaturalist / CC-BY-NC

Females: the ocellar triangle is uniquely large in *L. illustris*

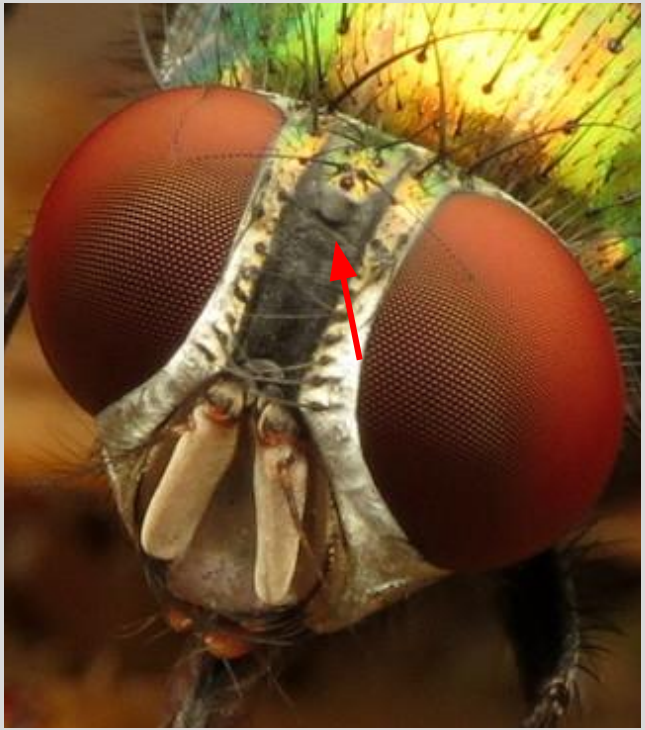
In *L. illustris* females, the ocellar triangle is “large, reaching at least half way to lunule.” The ocellar triangle is smaller in all other *Lucilia* (Jones et al., 2019).

This is not usually clear in photos, but can at least sometimes help separate *L. illustris* females from *L. cluvia, L. coeruleiviridis, L. mexicana*, and *L. eximia.*

This may be shown more clearly on page 141 of Jones et al. (2019).



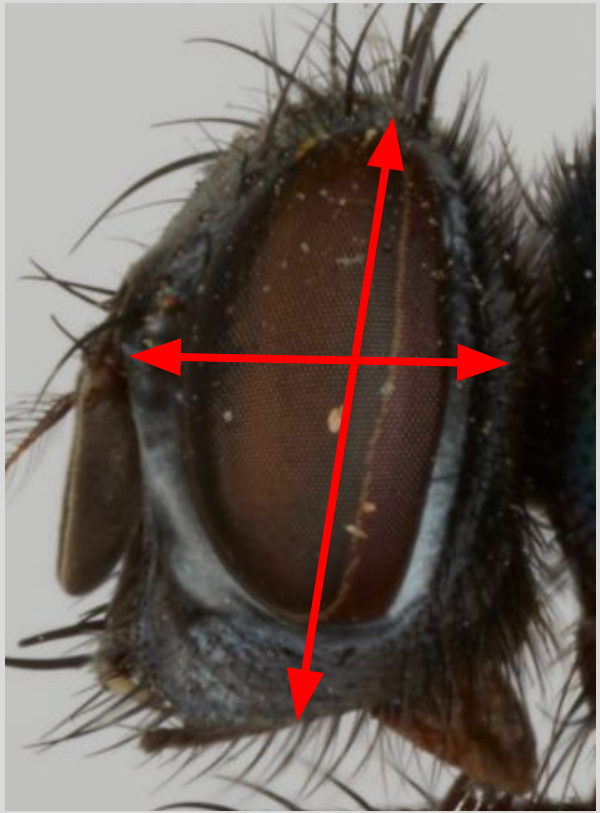
L. illustris, female © Katja Schulz, iNaturalist / CC-BY



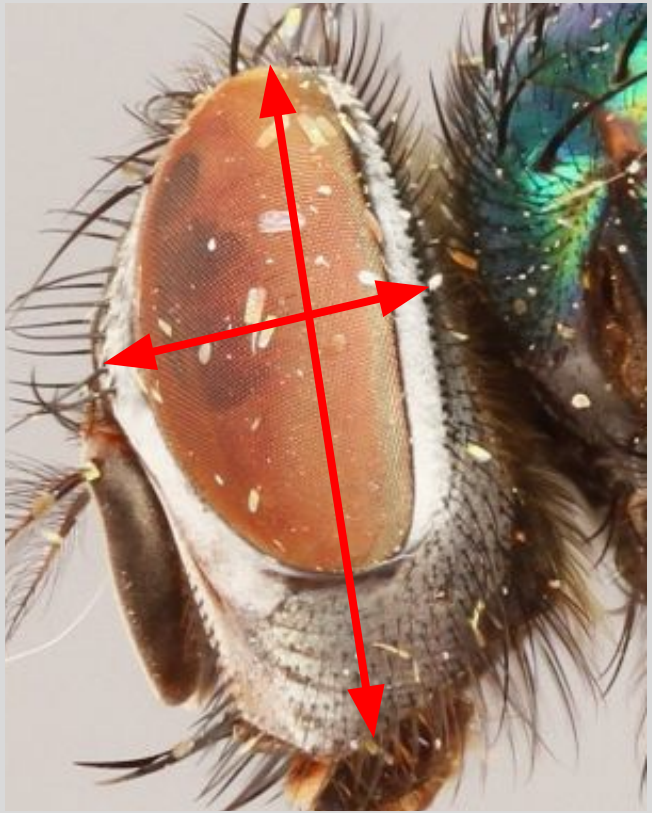
L. coeruleiviridis, female © Katja Schulz, iNaturalist / CC-BY

Head length

According to Whitworth (2006), *L. coeruleiviridis, L. cluvia, L. eximia,* and *L. mexicana* have the head not longer than half its height, while *L. bufonivora, L. elongata, L. silvarum, L. magnicornis,* and *L. thatuna* have the head longer than half its height. This can be hard to measure in photos, but it seems clear that the head is shorter in *L. illustris, L. coeruleiviridis, L. cluvia, L. eximia,* and *L. mexicana.*



L. silvarum, female. Smithsonian Institution, GBIF



L. coeruleiviridis. UTIC, GBIF

Antenna length

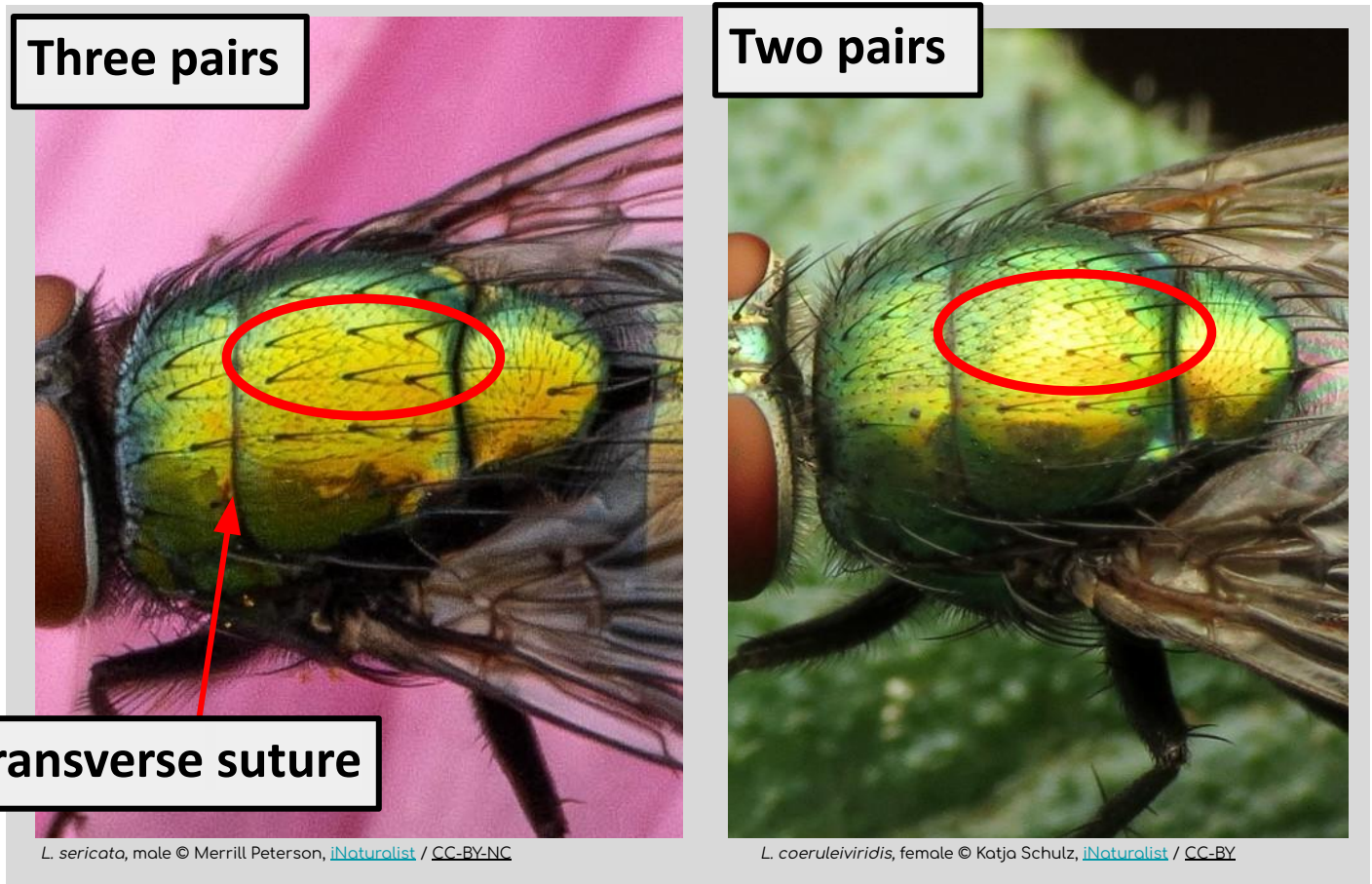
L. magnicornis is unique because the first flagellomere of this species is more than half as long as the height of the eye in lateral view (Whitworth, 2006).

L. magnicornis, female © Brevan Wagner, iNaturalist / CC-BY-NC

Post-sutural acrostichal setae

The “acrostichal” setae are the large, paired setae down the middle of the scutum. *Lucilia* typically have three pairs of acrostichal setae posterior to the transverse suture. Sometimes the anterior-most pair is absent, in which case there are only two pairs.

In rare cases, individuals may have only one pair of post-sutural acrostichal setae, as shown here and here.



L. sericata, male © Merrill Peterson, iNaturalist / CC-BY-NC

L. coeruleiviridis, female © Katja Schulz, iNaturalist / CC-BY

How many pairs of post-sutural acrostichal setae?

	Two pairs	Three pairs
L. cuprina		X
L. sericata		X
L. thatuna		X
L. magnicornis		X
L. silvarum	X	X
L. bufonivora	X	X
L. elongata	X	X
L. illustris	X	
L. coeruleiviridis	X	
L. cluvia	X	
L. mexicana	X	
L. eximia	X	

Tantawi and Whitworth (2014) looked at specimens from the USA and Canada and reported that *L. silvarum* almost always has three pairs of post-sutural acrostichals, while *L. bufonivora* and *L. elongata* vary more frequently, as shown in the following table:

	Two pairs	Three pairs
L. silvarum	~2%	~98%
L. bufonivora	~15%	~85%
L. elongata	~67%	~33%

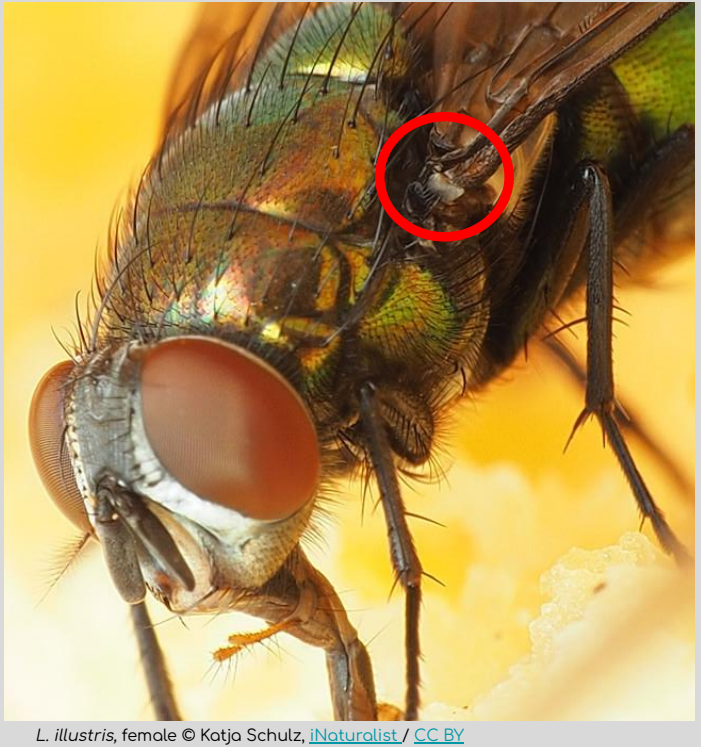
Sources: Jones et al., 2019; Tantawi and Whitworth, 2014; Whitworth, 2006

Basicosta

The basicosta is “a scale-like sclerite between the tegula and the base of the costa” (Cumming & Wood, 2017).

The basicosta lies on the front edge of the wing, right by the base of the wing. The basicosta is always present but varies in color.

L. sericata, male © Katja Schulz, iNaturalist / CC BY



L. illustris, female © Katja Schulz, iNaturalist / CC BY

What color is the basicosta?

	orange, yellow, or whitish	tan or brown	dark brown or black
L. cuprina	X		
L. sericata	X		
L. thatuna	X		
L. magnicornis			X
L. silvarum			X
L. bufonivora			X
L. elongata			X
L. illustris		X	X
L. coeruleiviridis	X		
L. cluvia	X		
L. mexicana		X	X
L. eximia		X	X

Sources: Jones et al., 2019; Tantawi and Whitworth, 2014; Whitworth, 2006; Whitworth, 2010; Whitworth, 2014

Pale basicosta in *L. cuprina, L. sericata,* and *L. thatuna*

L. cuprina, L. sericata, and *L. thatuna* have a light-colored basicosta that is visibly pale when viewed from above, as shown on the immediate right.

I have found that the whitish basicosta of these species is usually visibly pale even when out of focus, as shown on the far right. The small white spot at the base of the wing is obvious even in the poor-quality photo shown below.

L. sericata, female © F Dylan Titmuss, iNaturalist / CC-BY-NC

L. sericata, female © Merrill Peterson, iNaturalist / CC-BY-NC

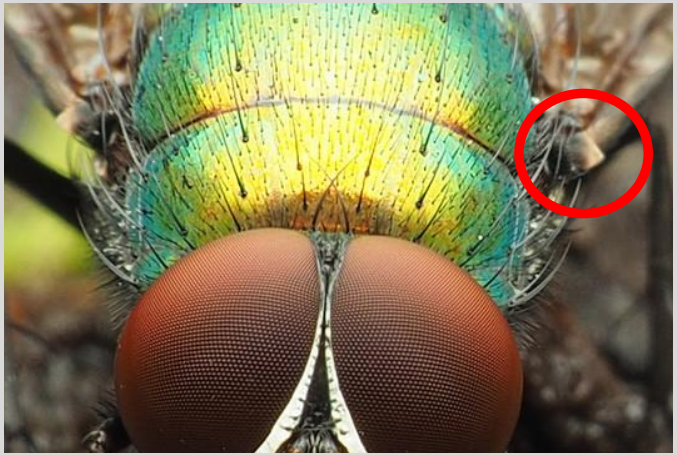
L. sericata, male © Matthew Lindsey, iNaturalist / CC-BY

Orange basicosta in *L. coeruleiviridis* and *L. cluvia*

The basicosta of *L. coeruleiviridis* appears orange when viewed from the side of the body, but particularly in males I have found that it can appear dark brown with a lighter brown tip, like some *L. illustris*, from dorsal or anterior angles. The images on the right all show the same individual, just from different angles. A similar example of an *L. coeruleiviridis* basicosta that looks dark from above is shown at iNat #249179524.

Usually the basicosta of *L. coeruleiviridis* looks bright orange from a lateral angle, but sometimes I think the orange part of the basicosta looks washed-out and brown and could be confused with *L. illustris*, e.g. iNat #132940727.

L. cluvia is probably similar.



L. coeruleiviridis, male © Katja Schulz, iNaturalist / CC-BY

Brown basicosta in *L. illustris, L. mexicana,* and *L. eximia*

L. illustris, L. mexicana, and *L. eximia* often have a fully dark brown or blackish basicosta, but when the basicosta is somewhat "tan" or “brown,” I think it can be easily confused with the “orange” basicosta of *L. coeruleiviridis* or *L. cluvia*. In such a case the basicosta color is apparently not a reliable character on its own.

I think the basicosta of *L. coeruleiviridis* can range in color from bright orange to orange-brown, and also seems to grow significantly lighter in preserved specimens. The basicosta of *L. illustris* is never bright orange, but otherwise *L. illustris* with a lighter basicosta may be hard to separate from *L. coeruleiviridis,* and other characters should be used.

L. illustris, female © Katja Schulz, iNaturalist / CC-BY

L. illustris, male © Katja Schulz, iNaturalist / CC-BY

Dark brown or black basicosta in *L. silvarum* and others

When the basicosta is blackish or dark brown, it's difficult to single out in poor quality photos--but I think the absence of any visible light spot at the base of the wing is itself evidence that the basicosta is dark brown or black for many poor-quality photos, such as the one below.

L. illustris, female © Katja Schulz, iNaturalist / CC-BY

L. illustris, female © Katja Schulz, iNaturalist / CC-BY

L. illustris, male © Katja Schulz, iNaturalist / CC-BY

Thorax or abdomen color: examples of what I mean by different colors

Coppery brown

L. cuprina, male © Katja Schulz, iNaturalist / CC BY

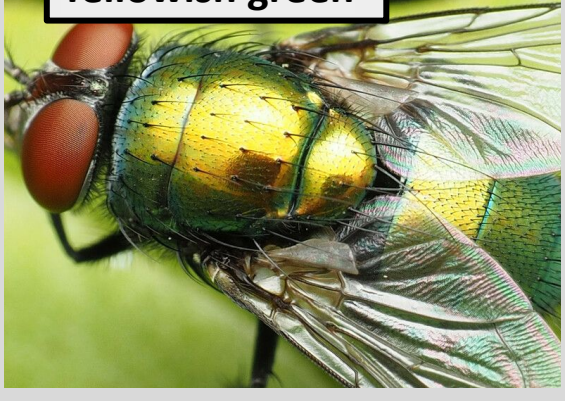
Reddish orange-brown

L. illustris, male © Katja Schulz, iNaturalist / CC BY

Orangish green

L. sericata, male © Even Dankowicz / CC BY

Yellowish green



L. sericata, male © Katja Schulz, iNaturalist / CC BY

Emerald green

Lucilia, female © Katja Schulz, iNaturalist / CC BY

Bluish

L. silvarum, male © Michel Langeveld, iNaturalist / CC BY

Thorax or abdomen color: most species are extremely variable

	Coppery brown	Reddish orange-brown	Orangish green	Yellowish green	Emerald green	Bluish
L. cuprina	X	X	X			
L. sericata		X	X	X	X	X
L. thatuna		?	?	?	?	X
L. magnicornis		?	?	?	?	X
L. silvarum		X	X	X	X	X
L. bufonivora		?	X	X	X	X
L. elongata		?	X	X	X	X
L. illustris		X	X	X	X	X
L. coeruleiviridis		X	X	X	X	X
L. cluvia		?	?	?	?	?
L. mexicana		?	?	?	X	X
L. eximia		?	X	X	X	X

Sources: Photos of live flies verified based on morphology.

Note that specimens are prone to discolor after death. For example, dead *L. sericata* may turn bluish. Emerald green or bluish *L. sericata* are very unusual and seem to be limited in North America to sites in the western mountains.

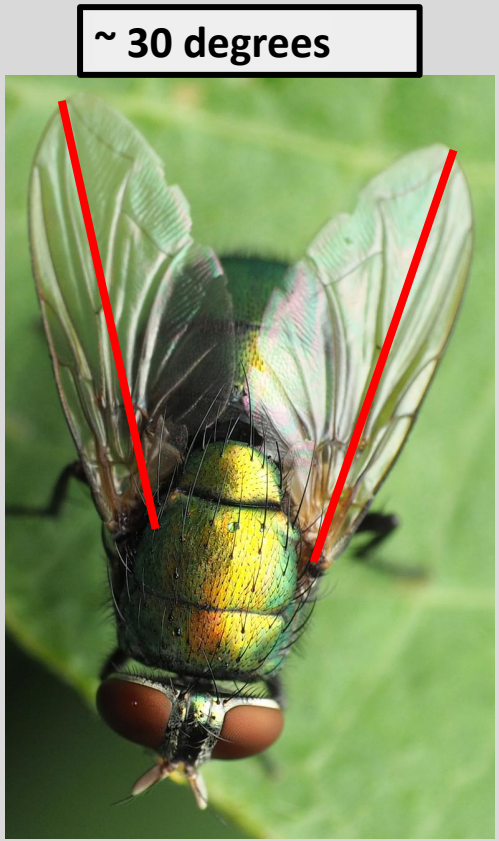
Wing angle

In most species at rest, the wings are held out at rest at an angle from about 30 to about 60 degrees.

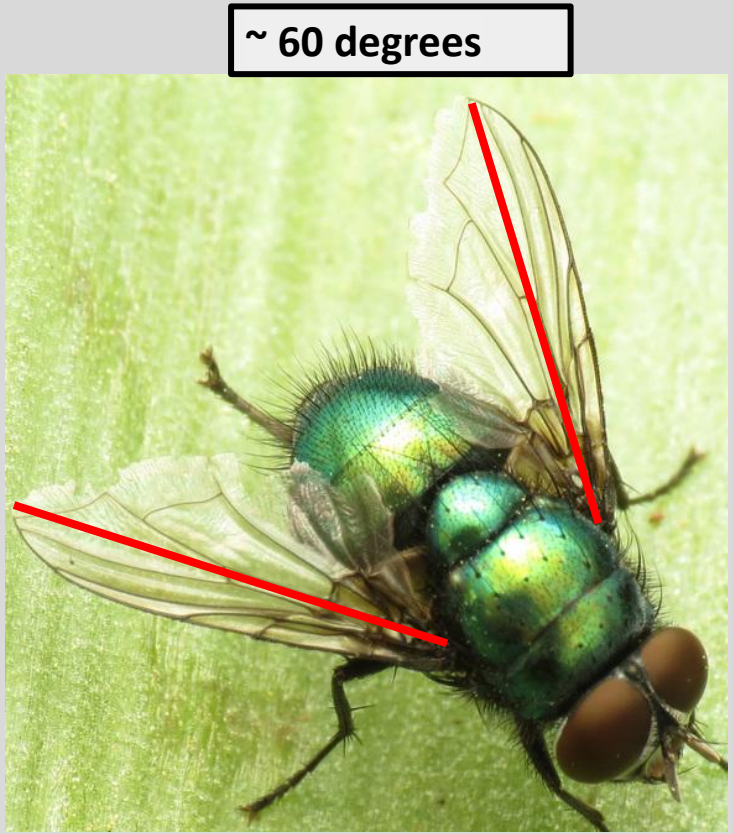
In *L. eximia, L. coeruleiviridis*, *L. mexicana,* and *L. illustris,* the wings are usually held at closer to 30 degrees in females, and the plane of each wing can be angled significantly downward anteriorly, particularly in female *L. eximia*.

In *L. sericata*, *cuprina,* and *thatuna*, the wings are usually held out at closer to 30 degrees in both sexes, and the wings lie in more or less the same horizontal plane.

In *L. magnicornis, bufonivora, elongata,* and *silvarum*, the wings are always held out at about 60 degrees in males but occasionally held out at about 30 degrees in females, and the wings lie in more or less the same horizontal plane.



L. coeruleiviridis, female © Katja Schulz, iNaturalist / CC-BY

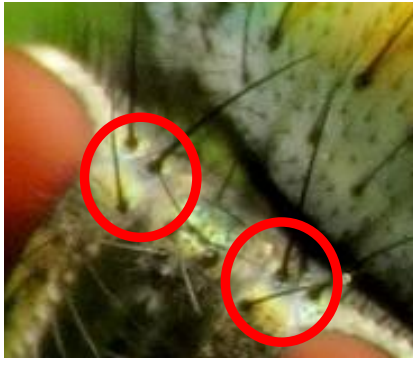


L. illustris, male © Katja Schulz, iNaturalist / CC-BY

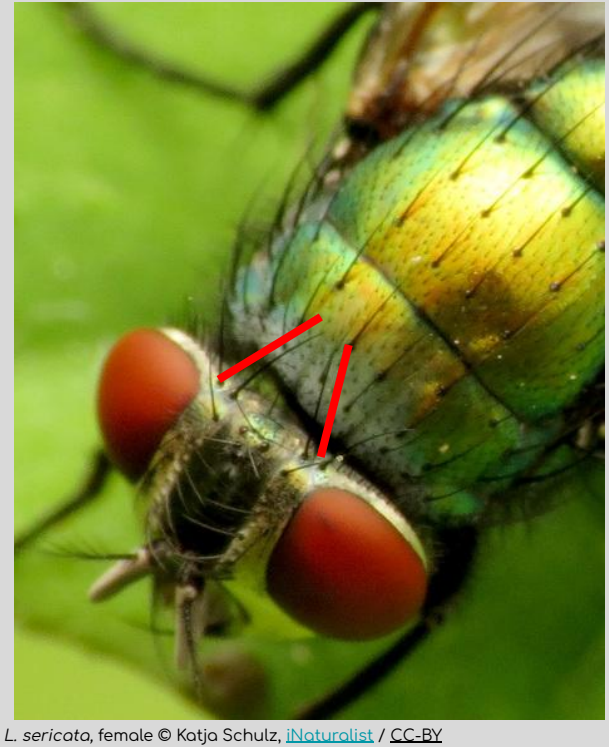
Inner Vertical Setae

Steven J. Røste pointed out to me that the angle of the inner vertical setae (IVS) can help distinguish *Lucilia* species when viewed from a consistent angle. In particular, the IVS appear nearly parallel to one another in females of *L. cuprina*, but strongly convergent in females of *L. sericata.*

Of the three pairs of setae circled below, the IVS are the pair closest to the middle in the posterior row.

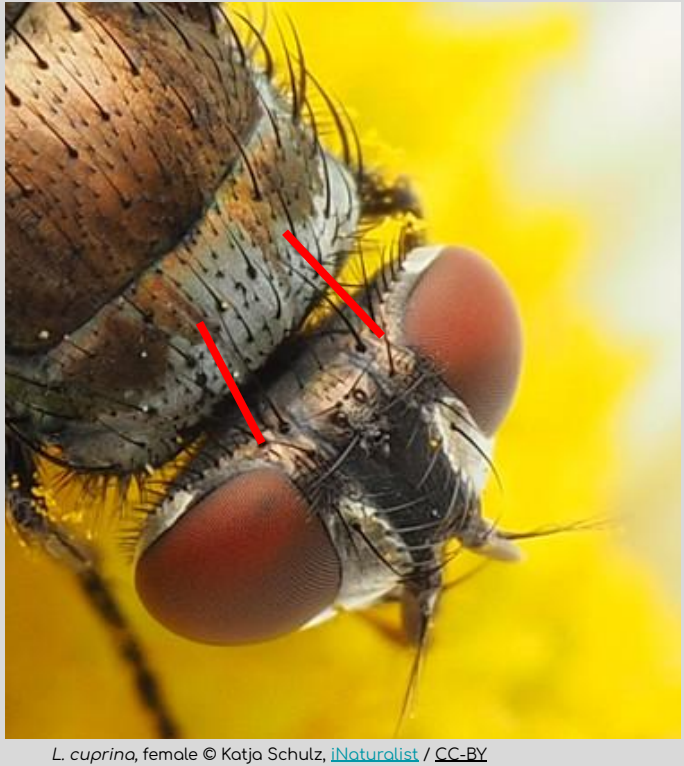


L. sericata



L. sericata, female © Katja Schulz, iNaturalist / CC-BY

L. cuprina



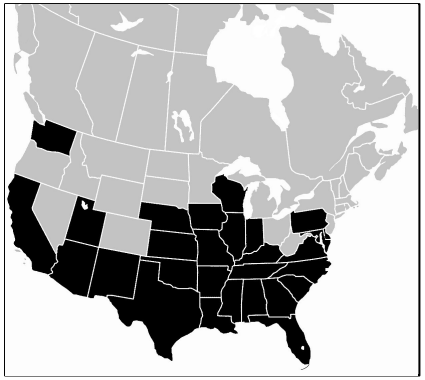
L. cuprina, female © Katja Schulz, iNaturalist / CC-BY

Lucilia cuprina

See notes regarding *L. sericata*. Sometimes possible to separate from *L. sericata* based on width of male frons or body color.

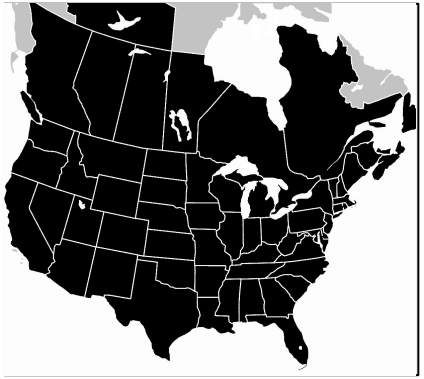
L. sericata and *L. cuprina* sometimes can be distinguished from other species by their somewhat more intense abdominal pubescence bisected by a median line on either side of which the pubescence is oriented differently. This is not usually visible in photos though.

Characters that usually require a specimen:
Separation of *L. cuprina* and *L. sericata* often requires microscopic examination of setae on the head and thorax. See couplet 11 on pages 183–185 of Jones et al. (2019). See also Williams and Villet (2014).



Lucilia sericata

L. sericata, L. cluvia, and *L. elongata* are the only species with the male frons about 13% the width of the head. Unlike *L. cluvia*, *L. sericata* has three pairs of post-sutural acrostichal setae. Unlike *L. elongata*, *L. sericata* has a pale basicosta. *L. cluvia* only occurs in the southeastern USA and *L. elongata* only occurs in Western North America.



L. sericata, L. cuprina, and *L. cluvia* are the only three species with a pale basicosta and the male fronto-orbitals strongly separated.

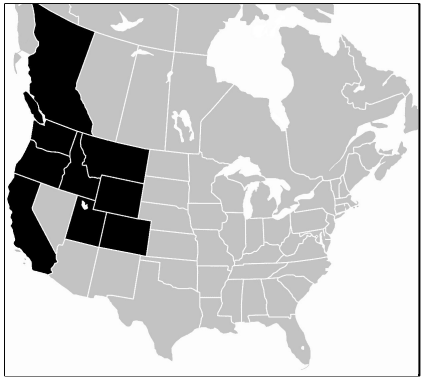
L. sericata, *L. cuprina,* and *L. thatuna* are the only species with three pairs of post-sutural acrostichals and a pale basicosta. *L. thatuna* has a narrower frons in both sexes than *L. sericata* or *L. cuprina,* and only occurs in states along the Pacific Coast and in the Rocky Mountains. *L. sericata* occurs in the northern USA and Canada, unlike *L. cuprina.*

L. sericata and *L. cuprina* are the only species with a pale basicosta and the female frons more than 33% the width of the head.

See also notes regarding *L. cuprina* for details how to separate the two species.

Lucilia thatuna

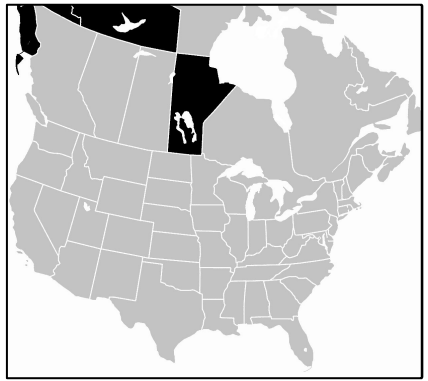
Couplet 10 on page 179 of Jones et al. (2019) shows how to separate *L. thatuna* morphologically from *L. sericata* and *L. cuprina.*



Lucilia magnicornis

The long antenna of *L. magnicornis* is distinctive.

The arrangement of intra-alar setae also helps differentiate this species from others with dark palps--see couplet 3 on page 146 of Jones et al. (2019).



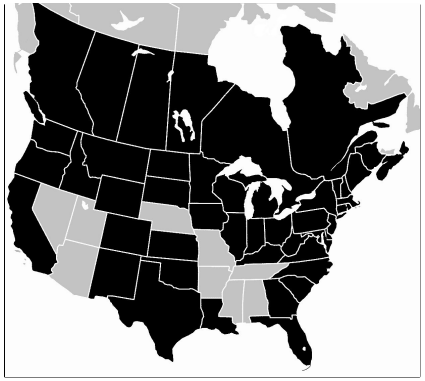
The palps are brown to black in *L. magnicornis, L. bufonivora*, *L. silvarum*, and *L. elongata*. In other species they are yellow to orange, except that they may sometimes be brown in *L. cuprina* (Whitworth, 2006; Jones et al., 2019).

L. magnicornis, L. bufonivora, *L. silvarum*, and *L. elongata* are also different from other North American *Lucilia* because they bear 1–2 pairs of long, erect setae in the middle of the posterior margin of tergite 3 (Whitworth, 2006).

Lucilia silvarum

This is the only species with three post-sutural acrostichal pairs and a dark brown basicosta throughout much of its range. The male frons is also often distinctive.

L. silvarum, *L. bufonivora, L. elongata* can be separated from all other *Lucilia* in North America by the presence of "1-2 pairs of long, erect median marginal setae" on the posterior margin of tergite 3 (Whitworth, 2006).



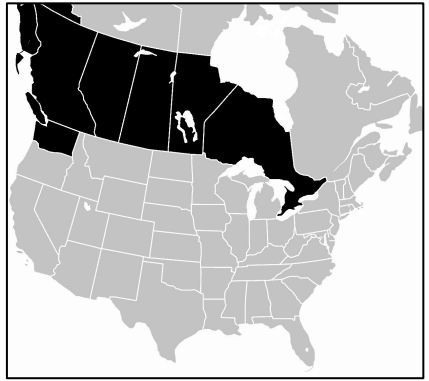
In *L. silvarum,* the distance between the posterior pair of presutural acrostichal setae is usually equal to the distance between them and the posterior-most presutural dorsocentral setae. In *L. bufonivora* and *L. elongata,* the posterior pair of presutural acrostichal setae appear to always be at least slightly closer together to one another than to the posterior dorsocentral setae (Tantawi and Whitworth, 2014).

Accurate separation of *L. silvarum, L. bufonivora,* and *L. elongata* may require dissection (Jones et al., 2019). Characters to separate them are provided in Tantawi and Whitworth (2014). Jones et al. (2019) illustrates characters to separate them as well but contradicts the earlier paper with respect to the number of post-sutural acrostichals in *L. bufonivora* and *L. elongata* without any evidence or explanation why, which may be an oversight.

Lucilia bufonivora

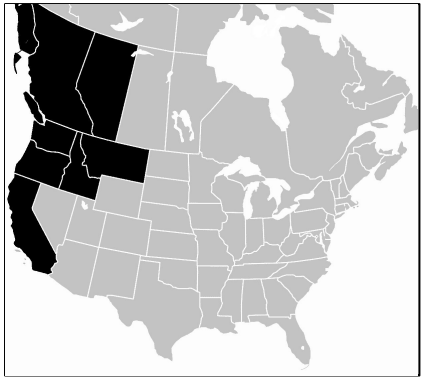
See notes regarding *L. silvarum* and *L. magnicornis*.

L. silvarum, L. bufonivora, L. elongata, and *L. thatuna* seem to be the only North American species that parasitize frogs and toads (Tantawi & Whitworth, 2014).



Lucilia elongata

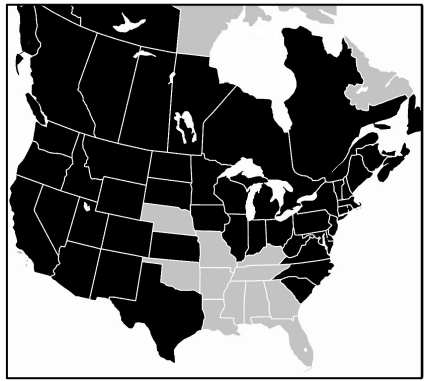
See notes regarding *L. silvarum* and *L. magnicornis*.



Lucilia illustris

Males of *L. illustris* can be distinguished from other *Lucilia* beside *L. mexicana* by the narrow frons with somewhat separated fronto-orbital plates. *L. mexicana* only occurs in the Southwestern USA, and lacks the long erect setae that *L. illustris* bears on tergite 4 in males.

Female *L. illustris* have a uniquely large ocellar triangle. See couplet 1 on page 140 of Jones et al. (2019).



L. illustris is the only species beside *L. mexicana* and *L. eximia* with the combination of the head only half as long as tall and the basicosta brown to black. *L. mexicana* and *L. eximia* only occur in the southern USA.

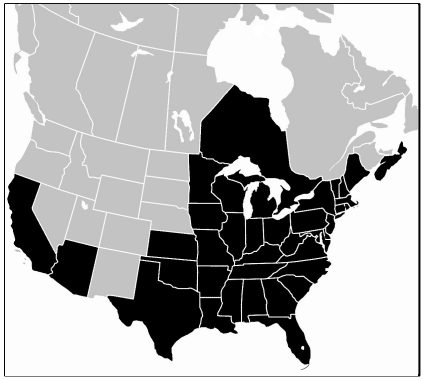
Characters that usually require a specimen:
Dark setae on the ventral subcosta distinguish *L. illustris* from all other *Lucilia*. See couplet 1 on page 140 of Jones et al. (2019). These can sometimes be hard to see or break off (T. Whitworth, personal comm.).

“Male genitalia are distinctive and readily separate this species” (T. Whitworth, personal comm.).

Lucilia coeruleiviridis

Males highly distinctive due to narrow frons, only similar to *L. eximia*. Females require good views of basicosta or frons to rule out species other than *L. cluvia*, which may require a specimen to rule out.

Characters that usually require a specimen:
Genae with dark setae; see couplet 9 on page 173 in Jones et al. (2019). Dark setae may appear light and light setae may appear dark in typical photos, depending on lighting.



Lucilia cluvia

Likely to be relatively distinctive due to wide male frons combined with basicosta and acrostichals. Females may require a specimen.

Characters that usually require a specimen:
Genae with pale setae in posterior third; see couplet 9 on page 173 in Jones et al. (2019). Seta color cannot be reliably assessed in typical photos.

Lucilia mexicana

Like *L. illustris*, the frons is narrow and the fronto-orbitals are somewhat separated. Unlike *L. illustris*, my notes from around 2018 state that tergite 4 lacks long erect setae in males, but I don't know how I figured that out and would treat it as speculation.

Characters that usually require a specimen:
A number of characters to separate *L. mexicana* and *L. eximia* are given in couplet 8 on page 166 of Jones et al. (2019).

Lucilia eximia

Unlike *L. illustris* and *L. mexicana*, the body is bulkier/wider, and in males the frons is narrow but the fronto-orbitals are not obviously separated medially. The basicosta is generally darker than in *L. coeruleiviridis*. The pubescence on the anterior and lateral face (and maybe also the occiput/frons) is more silvery in *L. mexicana* but more tan/orangish in *L. eximia* (Jones et al., 2019).

Characters that usually require a specimen:
A number of characters to separate *L. mexicana* and *L. eximia* are given in couplet 8 on page 166 of Jones et al. (2019).

Hawaiian *Lucilia*

L. cuprina and *L. sericata* are widespread in Hawaii.

Lucilia graphita is also recorded from the Midway and Laysan islands (Kurahashi, 2016). *L. graphita* has a shining black body and a narrow male frons.

Lucilia is the only genus of Luciliinae in North America, but the related genus *Dyscritomyia* has a number of endemic species in Hawaii. *Dyscritomyia* bear many prominent, erect abdominal bristles, unlike any of the Hawaiian *Lucilia.*

L. graphita, male. Smithsonian Institution, GBIF

Dyscritomyia lucilioides, female. © Andrew Meeds, iNaturalist / CC-BY

Maps

Maps based on Jones et al. (2019) and confirmed BG and iNat records.

Acknowledgments

Terry Whitworth graciously replied to my email questions, and his research forms the basis of the information presented in this document. Thanks to Torsten Dikow for giving me access to specimens at the Smithsonian, James Morris for giving me lab space to examine *Lucilia*, and Zachary Dankowicz for examining specimens to double-check certain characters.

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