

# A Review of the Species of *Drosophila* (Diptera: Drosophilidae) and Genera of Drosophilidae of Northeastern North America

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## Abstract

Despite the distinguished history of biological research on *Drosophila* in eastern North America, the northeastern fauna has never been fully reviewed, and there is no useful key to the *Drosophila* species naturally occurring in eastern North America. Keys are provided here to the 12 genera of Drosophilidae in northeastern North America, illustrated with photomicrographs of external features. Keys are further provided to the 35 species of *Drosophila* in the region, illustrated with photomicrographs of external features and of the male and female genitalia. Each species is diagnosed, with its biology and distribution summarized, based on the literature and examination of over 10,000 specimens (for which all records are provided). Important new information includes the most northerly records of *Drosophila cardini* Sturtevant, and habitat records for the highly invasive agricultural pest *Drosophila suzukii* (Matsumura).

Eastern North American species are diagnosed and redescriptions are provided for those members of the *Drosophila carsoni*, *melanica*, *robusta*, and *tripunctata* groups for which species identification has been vague or uncertain. This work should facilitate research on the drosophilids of eastern North America through the provision of accessible species-level identification tools and baseline data on general distribution and habitat preferences.

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## Introduction

The family Drosophilidae Rondani, some species of which are commonly called vinegar flies or lesser fruit flies, is a large, morphologically diverse, cosmopolitan group of acalyptrate flies. Adults are typically 1-6 mm long, yellow to black in colour, with or without bands or stripes on the abdomen and stripes or spots on the thorax. The wings are sometimes darkened or marked with dark areas, and the eyes are typically red in life (Wheeler, 1987).

The family Drosophilidae includes 73 extant and 3 extinct genera, encompassing over 3,950 species (Brake & Bächli, 2008). With the exception of two genera of uncertain subfamily affinity, the family is divided into the subfamilies Steganinae (28 genera) and Drosophilinae (43 genera). The largest genus of Drosophilidae is *Drosophila* Fallén (1,157 described species). *Drosophila* species are found in all six biogeographic regions (Australasian, Afrotropical, Nearctic, Neotropical, Oriental and Palearctic), with the largest number found in tropical areas. Several hundred additional undescribed species probably remain to be discovered in tropical regions (Markow & O'Grady, 2006; Markow & O'Grady, 2007).

*Drosophila* has been an extremely important group for evolutionary biological research since the beginning

of the twentieth century. It is one of the best-studied groups of organisms in modern biology in terms of its life history, biology, phylogeny, ecology, and especially genetics, largely attributed to the establishment of *Drosophila melanogaster* Meigen as the leading model system for genetic research. Approximately 500 species of *Drosophila* can now be easily reared and studied in a laboratory (Yassin, 2013), and the full genomes of many species have been fully sequenced, so the study of *Drosophila* has a firm comparative as well as experimental basis.

Seven secondarily widespread or cosmopolitan species of *Drosophila* are associated with human habitations (Ashburner et al., 1981). Most *Drosophila*, including the cosmopolitan species, lay eggs in decaying organic materials such as compost, overripe or rotting produce; others breed in live or decaying fungi, dung, slime or sap fluxes of trees, cacti, or flowering plants (Bächli et al., 2004; Carson, 1971; Markow & O'Grady, 2008). The Oriental species *Drosophila suzukii* (Matsumura) and *Drosophila subpulchrella* Takamori and Watabe are exceptional in that they oviposit in healthy whole fruit (Matsumura, 1931). *Drosophila suzukii* has recently spread beyond its native range to become an invasive, damaging and geographically widespread agricultural crop pest, now widely known as the "Spotted Wing

*Drosophila*” (Hauser et al., 2009; Steck et al., 2009). This has resulted in a demand for new tools to identify and monitor *D. suzukii* and other potentially damaging invasive *Drosophila* species.

### Identification Tools

The North American species of genus *Drosophila* are relatively well studied, notably by Sturtevant (1921), Patterson (1943), Patterson and Stone (1952) and Strickburger (1967). However, there are few identification keys specifically for Nearctic *Drosophila* species, in contrast to such references as Bächli et al. (2004) for the northern European species. Patterson’s (1943) key to the Drosophilidae of the southwestern United States is now out of date and cannot be used to identify all *Drosophila* species in the southwest or in other areas of North America. Moreover, that reference did not utilize the most important character system for diagnosing and identifying species: the male genitalia. M.R. Wheeler’s key in Greenberg’s (1971) *Flies and Disease* covers only the cosmopolitan and synanthropic *Drosophila* species. Strickberger’s (1967) key is not functionally effective for identification, since not all species are included, and the use of superficial characters fails to adequately distinguish several species. A key provided in Markow and O’Grady (2006) covers only the *Drosophila* species in the *Drosophila* Species Stock Centre at the University of California, U.S.A. This key includes numerous Nearctic *Drosophila* species, and although it is useful for specimens that can be reared in a laboratory, it excludes many species not currently in culture. Thus there are no current, complete keys to *Drosophila* species of all or a significant part of North America, and the northeastern North American fauna remains effectively unidentifiable.

Considering that northeastern North America is essentially the birthplace of *Drosophila* genetic research (Ashburner et al., 1981; Koehler, 1994), it is surprising that such a profound gap exists regarding the identification of *Drosophila* species naturally occurring in the region. The keys to the species of *Drosophila* and the genera

of Drosophilidae offered here provide the identification tools to ensure early detection of invasive species such as *D. suzukii*, and will facilitate cost-effective and accurate identification of wild *Drosophila* species in northeastern North America.

Label data in this study, with collection dates from January to December, include records from rotting mushroom bait traps, from apple cider vinegar bait traps (in blackberry, blueberry, raspberry, sour cherry, grape and peach fields), from rotting organic materials (onions, grapes, bananas, grass piles and compost), from field sweeps, from a hog barn, from tree wounds, from tulip bulbs (originating from Holland), from damp birch & maple, and from indoor environments.

### Notes

A list of literature records used in species distribution maps was obtained from publications in Gerhard Bächli’s TAXODROS database (Bächli et al, 2017); these sources are not listed in the materials examined.

### Material Examined

Specimens were examined from the following institutions (Codens as in Arnett et al., 1993):

AMNH: American Museum of Natural History, New York, NY, USA

CNCI: Canadian National Collection of Insects, Ottawa, ON, Canada

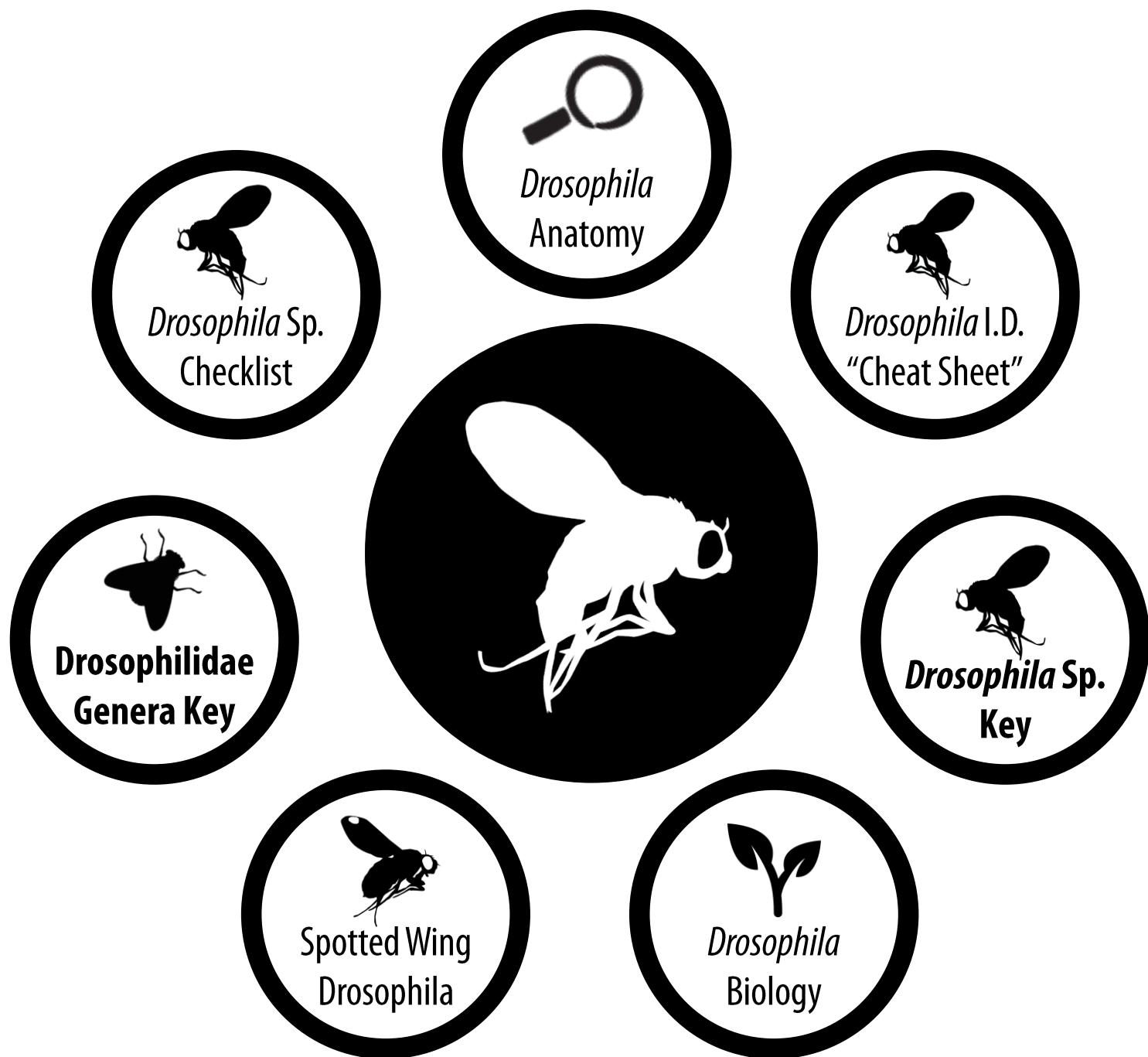
DEBU: University of Guelph Insect Collection, Guelph, ON, Canada

MCZN: Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA

USNM: United States National Museum, Washington, DC, USA

Specimen data for all specimens examined are available from The Knowledge Network for Biocomplexity (doi: 10.5063/F11J97Q0).







# *Drosophila* of Northeastern North America Species Checklist

*Drosophila (Dorsilopha) busckii* Coquillett 1901 (Introduced, Cosmopolitan)

*Drosophila (Siphodora) sigmoides* Loew 1872 (New Canadian Distributional Records)

*Drosophila (Drosophila) funebris* (Fabricius, 1787) (Introduced, Cosmopolitan)

*Drosophila (Drosophila) macrospina* Stalker & Spencer 1939

*Drosophila (Drosophila) paramelanica* Griffen 1942

*Drosophila (Drosophila) nigromelanica* Patterson & Wheeler 1942 (New Can. Distributional Records)

*Drosophila (Drosophila) melanura* Miller 1944

*Drosophila (Drosophila) hydei* Sturtevant 1921 (Cosmopolitan)

*Drosophila (Drosophila) repleta* Wollaston, 1858 (Cosmopolitan)

*Drosophila (Drosophila) colorata* Walker, 1849

*Drosophila (Drosophila) robusta* Sturtevant 1916

*Drosophila (Drosophila) americana* Spencer 1938

*Drosophila (Drosophila) borealis* Patterson 1952

*Drosophila (Drosophila) lacicola* Patterson, 1944

*Drosophila (Drosophila) virilis* Sturtevant 1916 (Cosmopolitan)

*Drosophila (Drosophila) carsoni* Wheeler 1957 (New Can. Distributional Records)

*Drosophila (Drosophila) cardini* Sturtevant 1916 (New Distributional Records)

*Drosophila (Drosophila) immigrans* Sturtevant, 1921 (Introduced, Cosmopolitan)

*Drosophila (Drosophila) deflecta* Malloch 1924 (New Can. Distributional Records)

*Drosophila (Drosophila) falleni* Wheeler 1960 (New Can. Distributional Records)

*Drosophila (Drosophila) guttifera* Walker 1849 (New Can. Distributional Records)

*Drosophila (Drosophila) palustris* Spencer 1942 (New Can. Distributional Records)

*Drosophila (Drosophila) quinaria* Loew 1866 (New Can. Distributional Records)

*Drosophila (Drosophila) recens* Wheeler 1960 (New Can. Distributional Records)

*Drosophila (Drosophila) rellima* Wheeler 1960 (New E. Can. Distributional Records)

*Drosophila (Drosophila) neotestacea* Grimaldi, James & Jaenike, 1992

*Drosophila (Drosophila) putrida* Sturtevant 1916

*Drosophila (Drosophila) tripunctata* Loew 1862 (New Can. Distributional Records)

*Drosophila (Sophophora) melanogaster* Meigen 1830 (Introduced, Cosmopolitan)

*Drosophila (Sophophora) simulans* Sturtevant 1919 (Introduced, Cosmopolitan)

*Drosophila (Sophophora) suzukii* (Matsumura) 1931 (Recently Introduced, Widespread)

*Drosophila (Sophophora) affinis* Sturtevant 1916

*Drosophila (Sophophora) algonquin* Sturtevant & Dobzhansky 1936

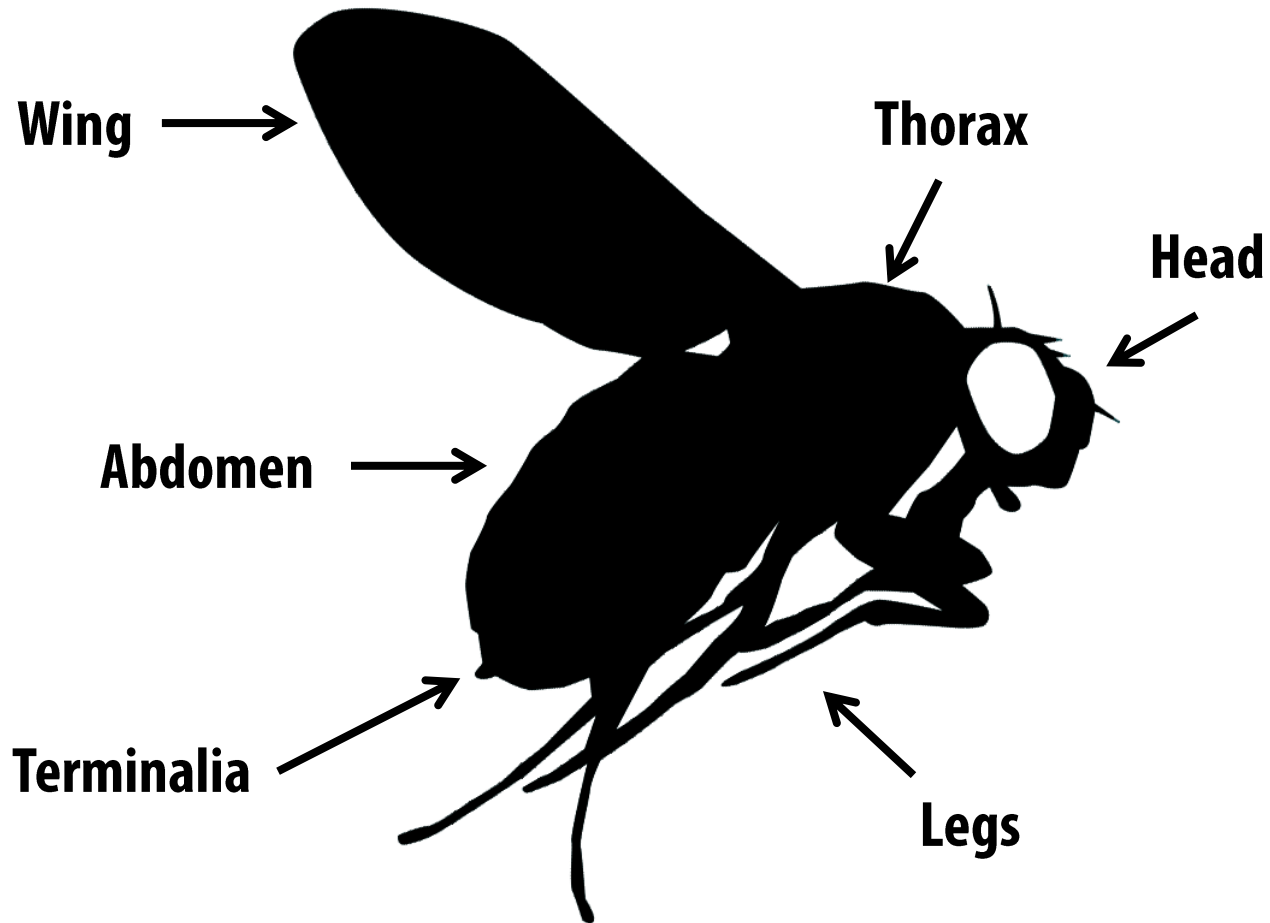
*Drosophila (Sophophora) athabasca* Sturtevant & Dobzhansky 1936

*Drosophila (Sophophora) narragansett* Sturtevant & Dobzhansky 1936



# Anatomy

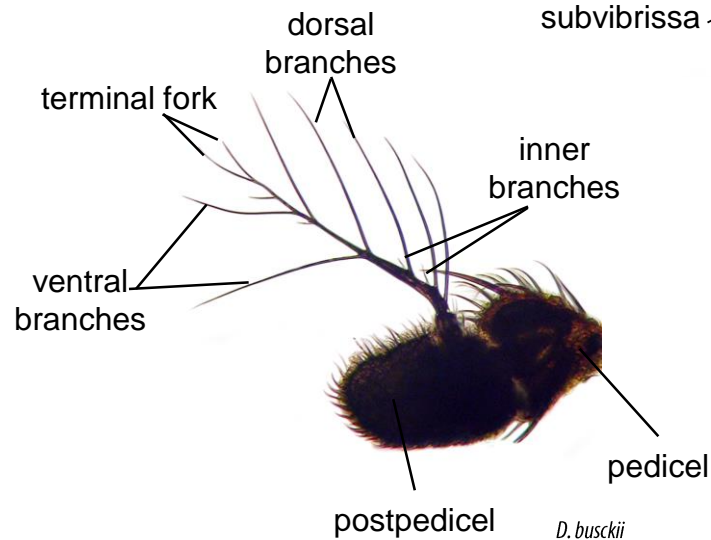
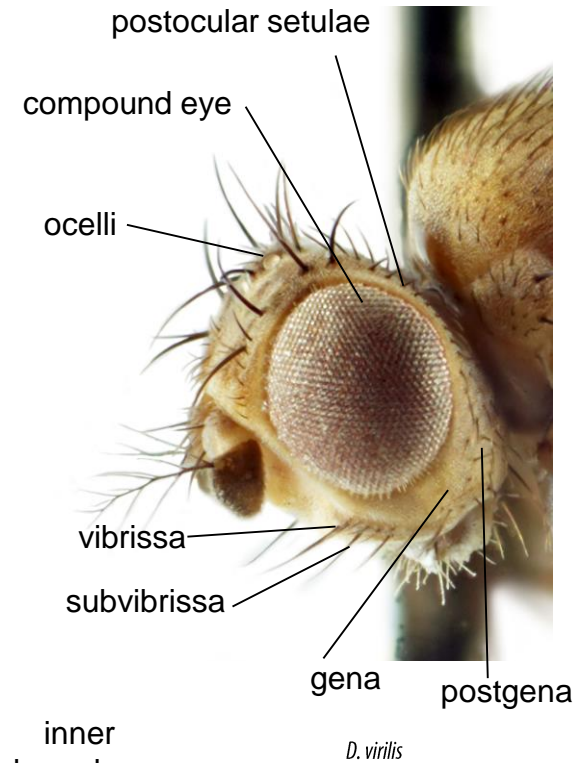
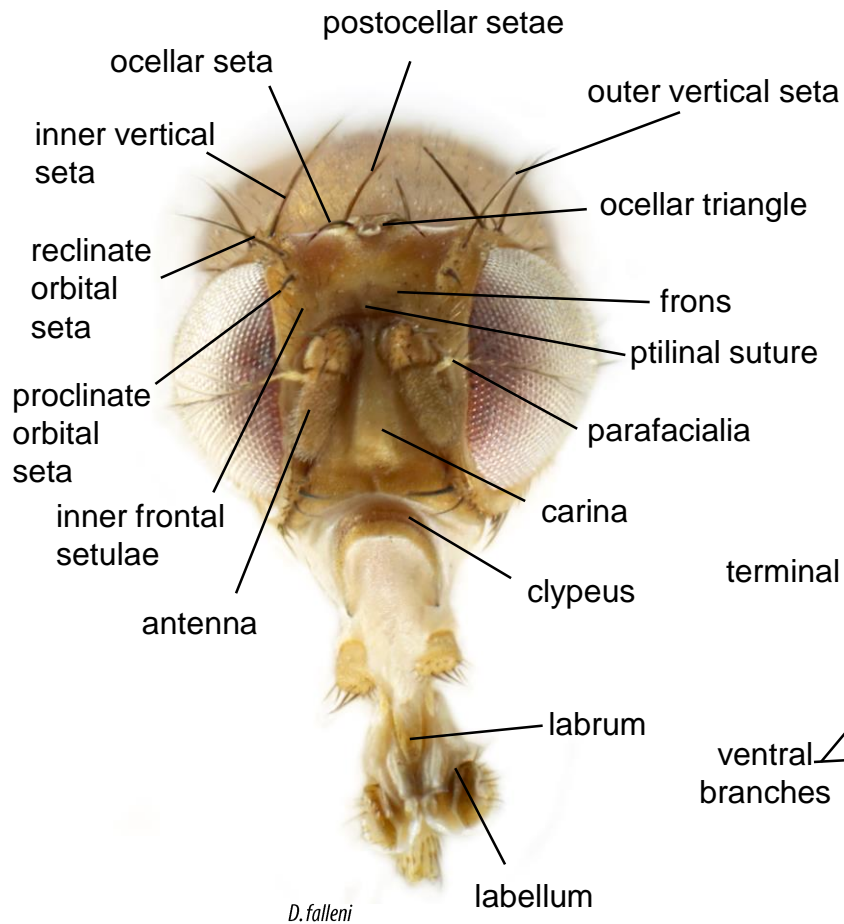
**Click for a detailed description of each feature**





# Anatomy

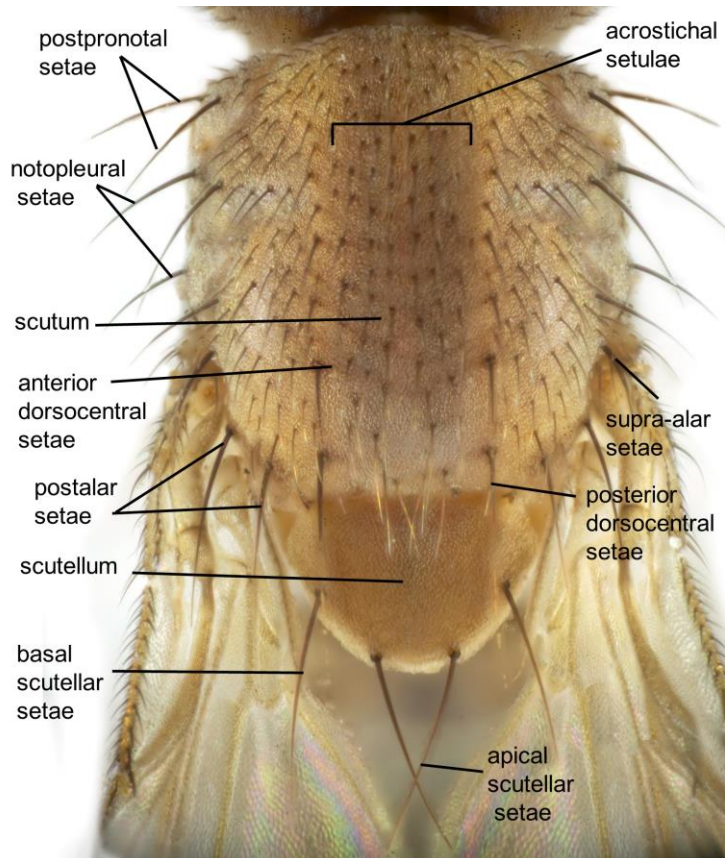
## Head



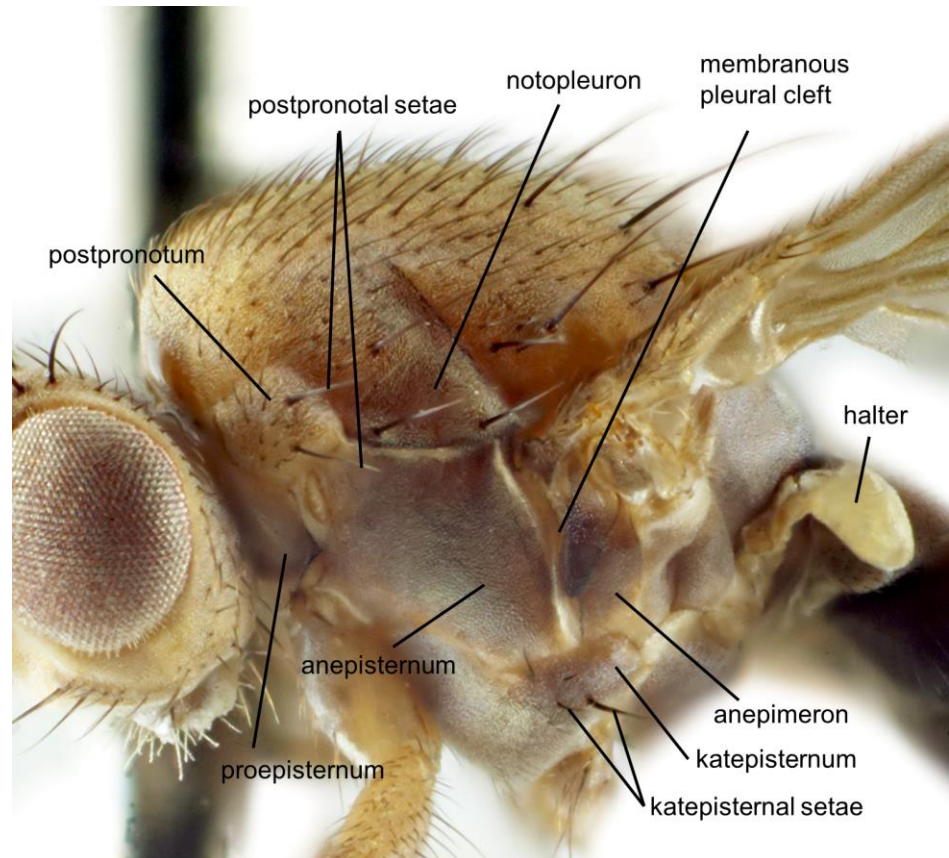


# Anatomy

## Thorax



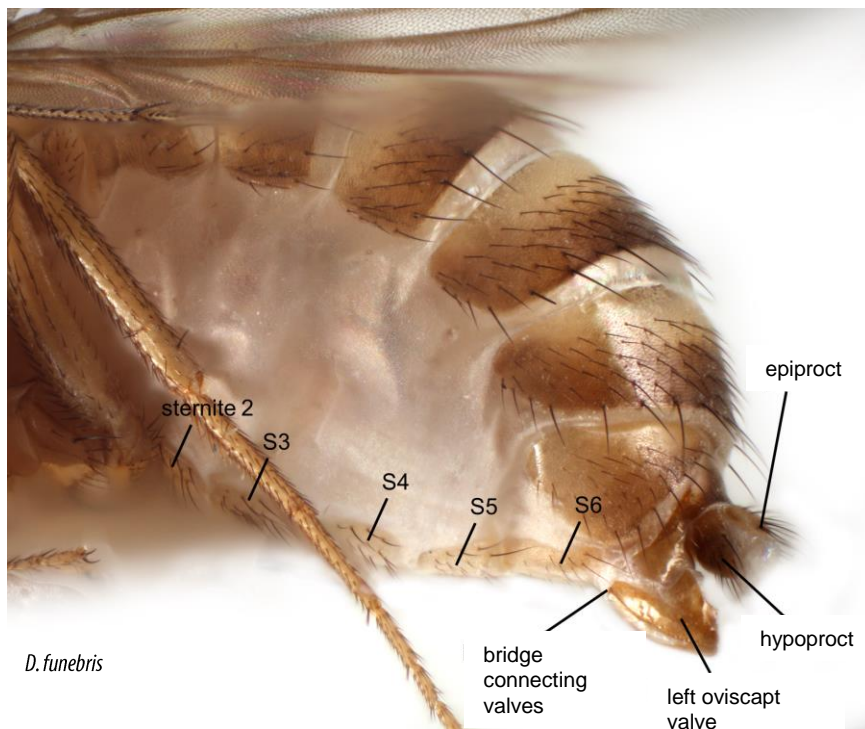
*D. virilis*



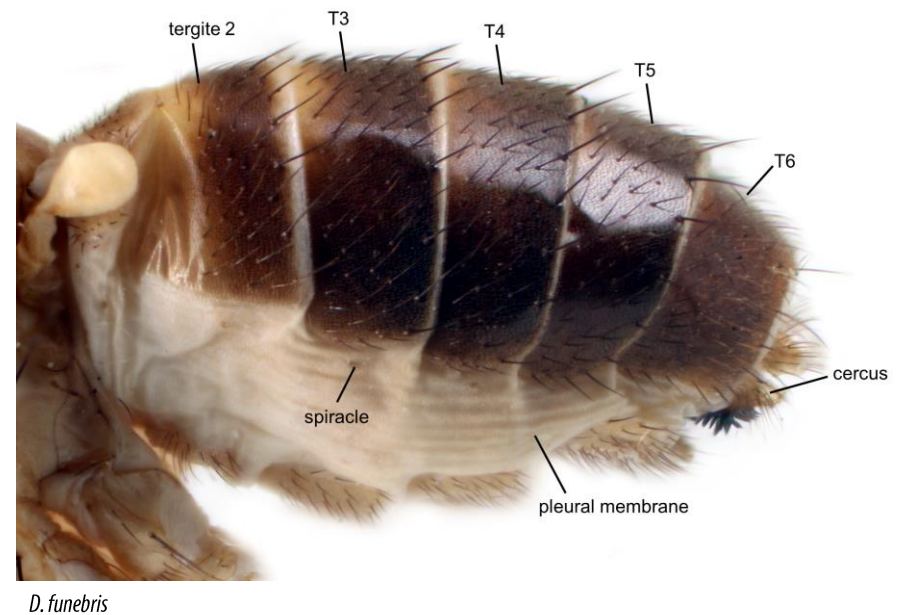
*D. virilis*

# Anatomy

## Female Abdomen



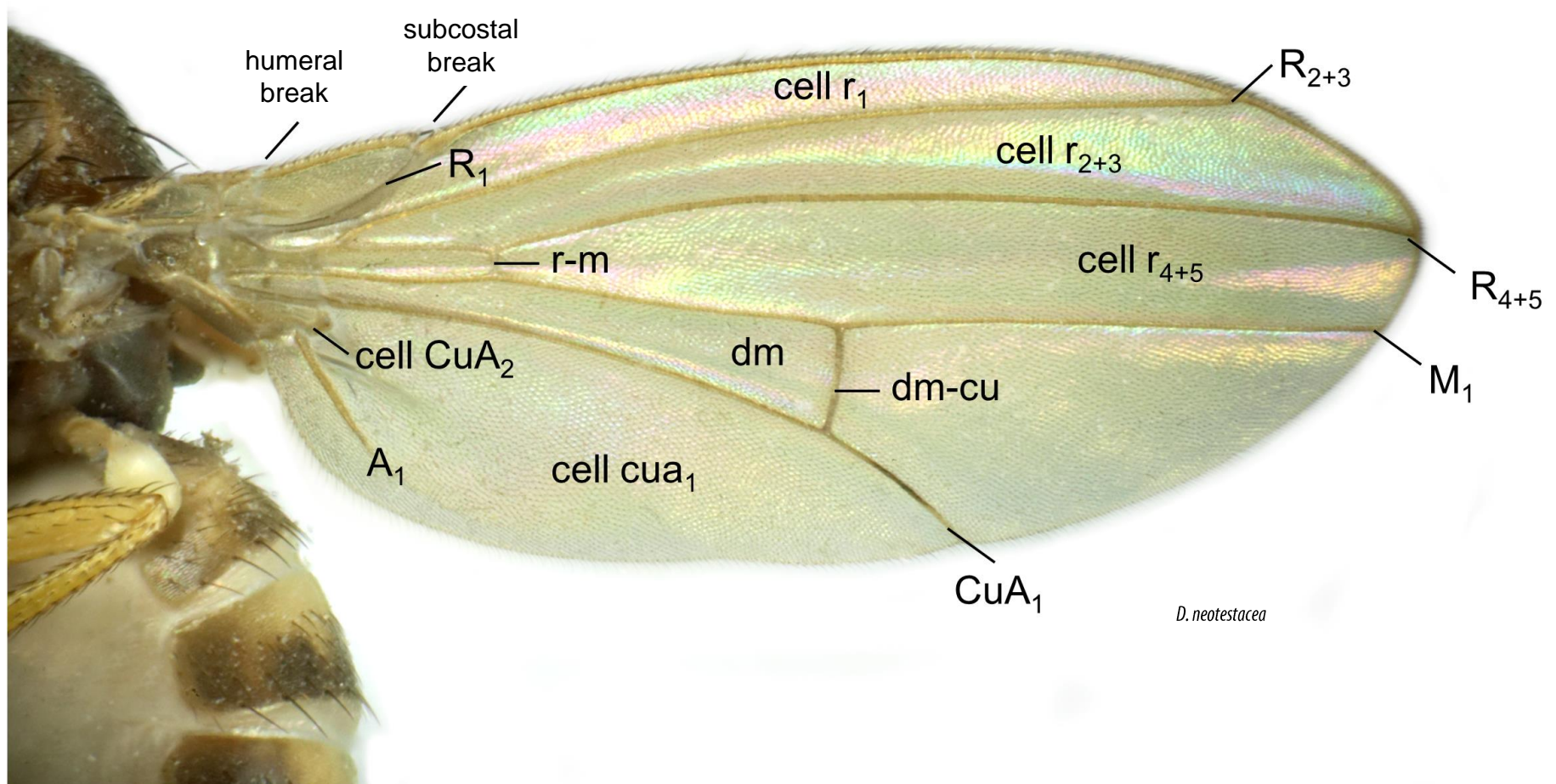
## Male Abdomen





# Anatomy

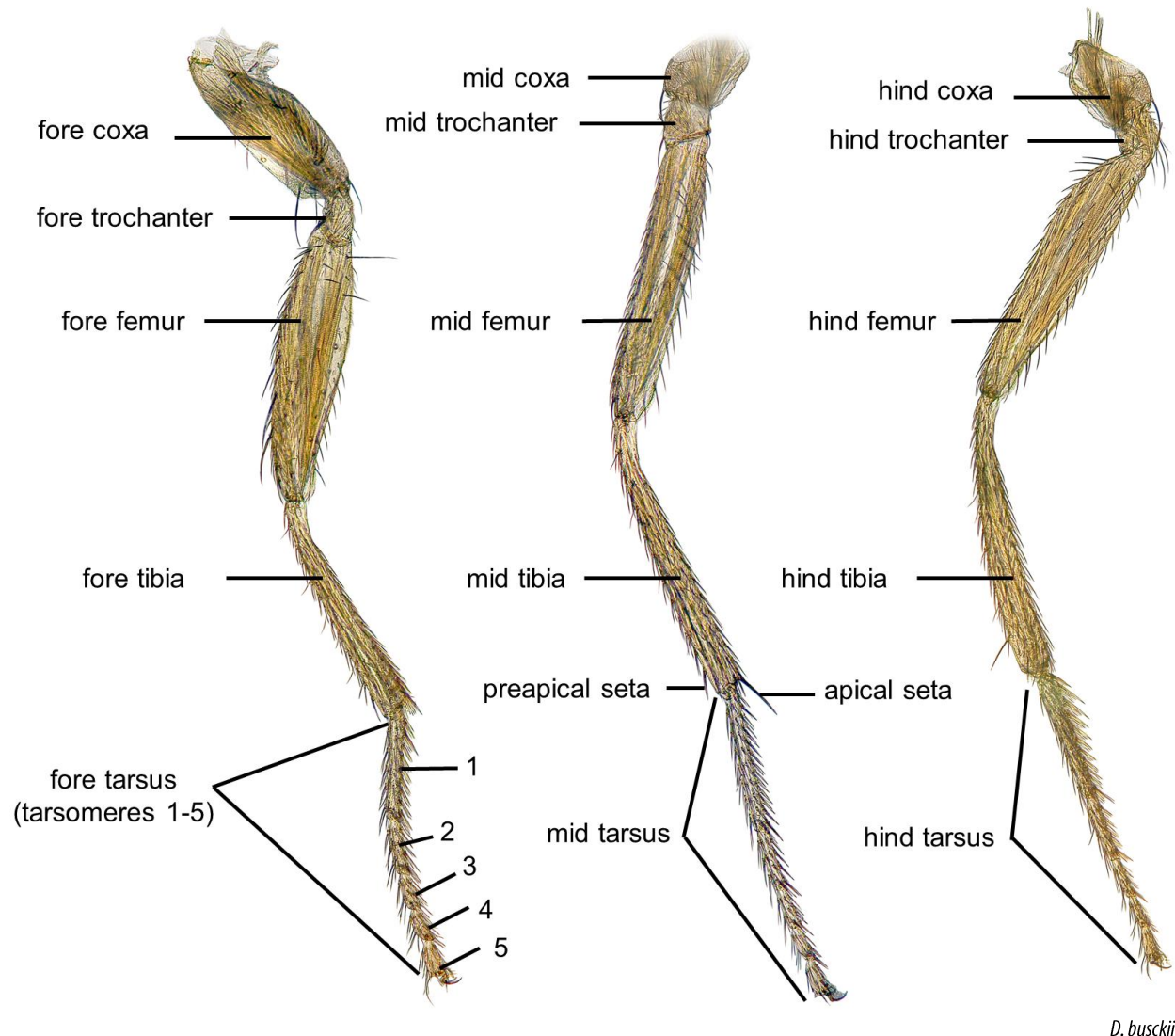
## Wing





# Anatomy

## Legs



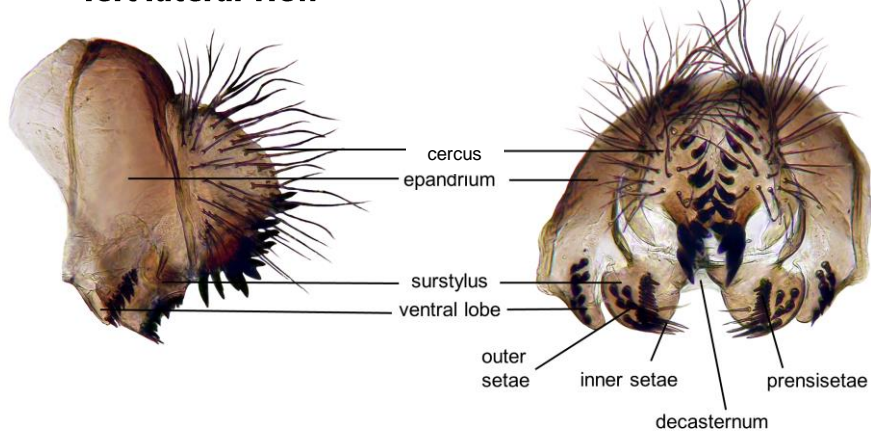


# Anatomy

## Male Terminalia *D. funebris*

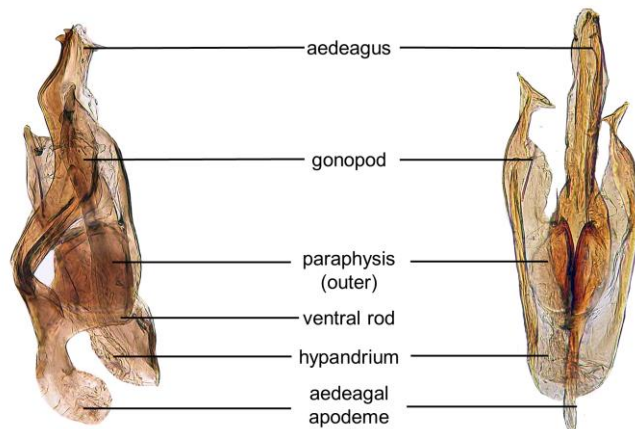
left lateral view

posterior view<sup>1</sup>

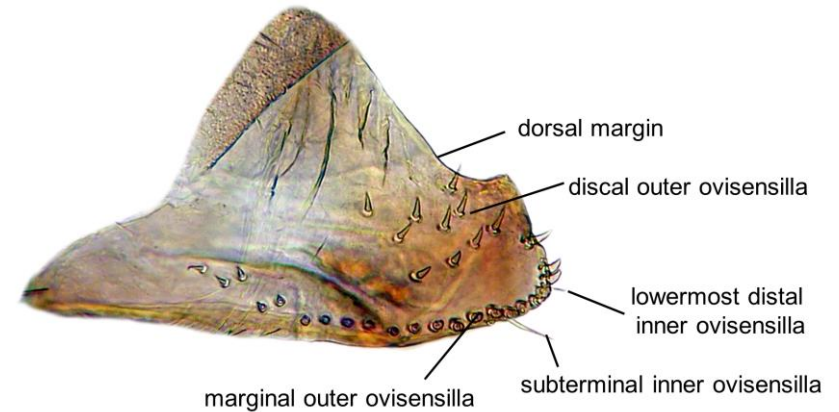


left lateral view<sup>2</sup>

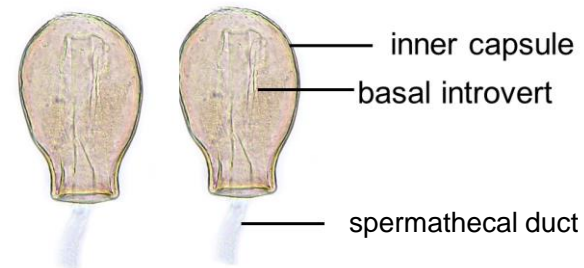
posterior view



## Oviscapt (left lateral) *D. funebris*



## Spermathecae *D. funebris*

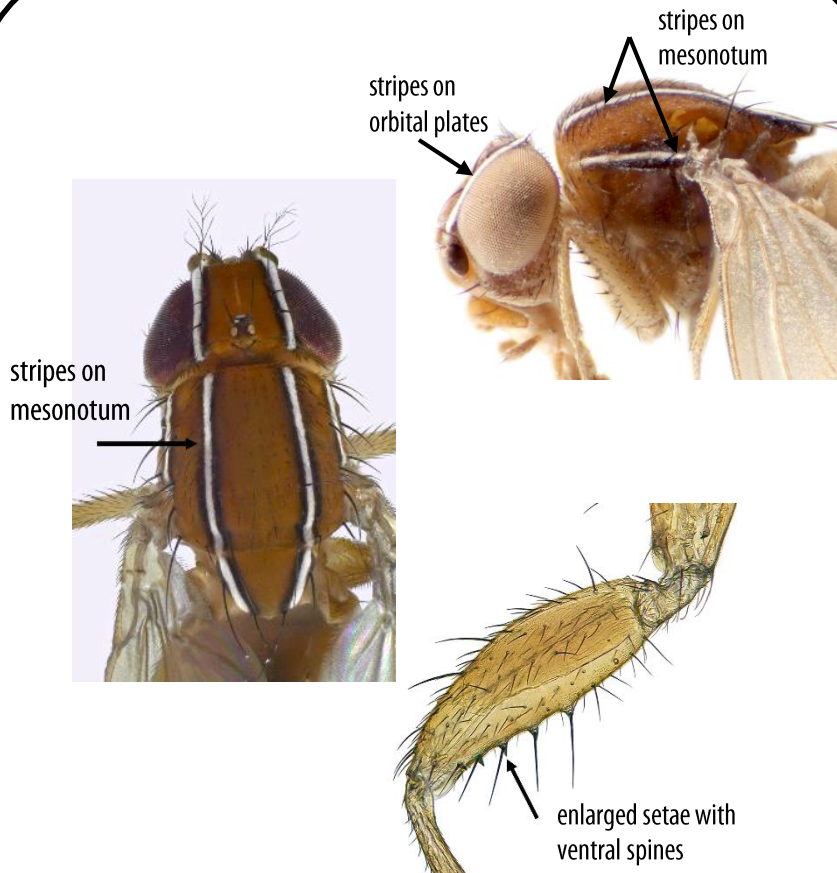


<sup>1</sup> Outer terminalia slightly rotated dorsally to show setae and decasternum

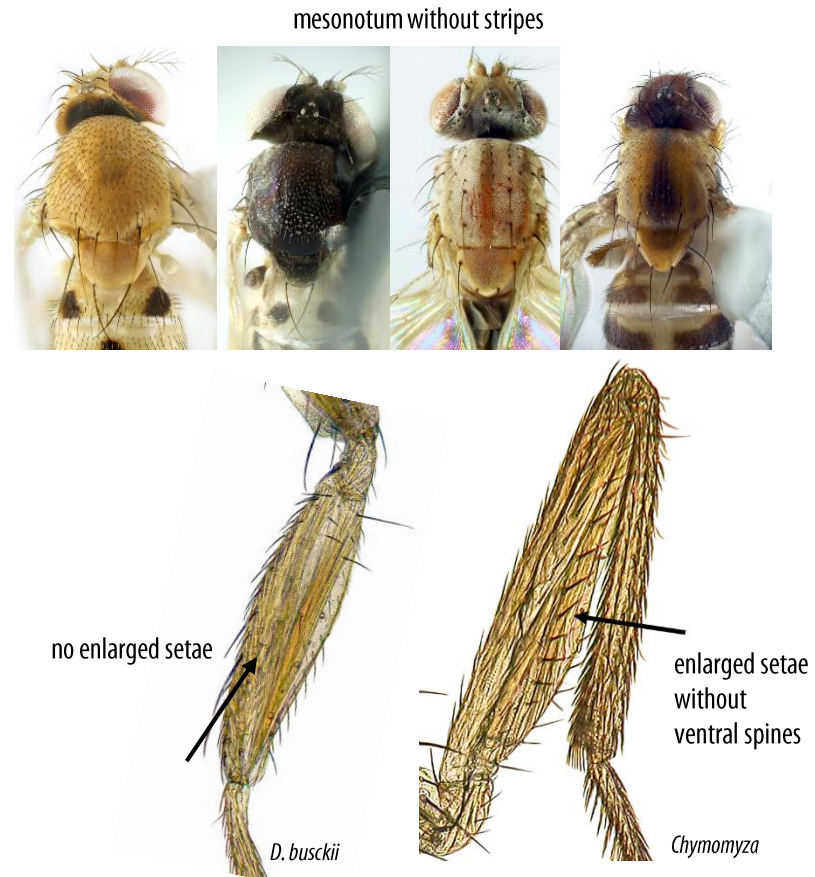
<sup>2</sup> Inner terminalia rotated 180 degrees laterally (not directly comparable to outer terminalia)



# Drosophilidae Generic Key



1. Mesonotum and orbital plates with white longitudinal stripes bordered by black lines. Fore femur with a row of 4-6 enlarged setae, the base of each a short tubercle... **Zaprionus Coquillett**



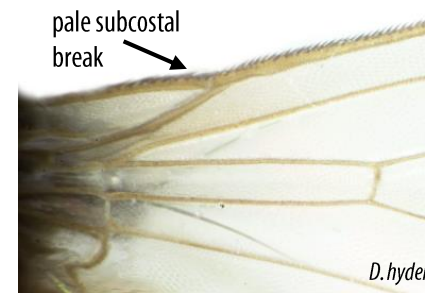
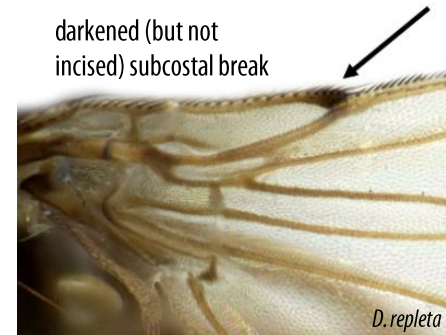
1. Mesonotum and orbital plates unicolourous or striped; if stripes present, not bordered by black lines. Fore femur with or without a row of enlarged setae; if present, without short tubercles at their base ...2



# Drosophilidae Generic Key



**2(1').** Subcostal break deeply incised, appearing as a thick black lappet. Scutellum velvety, mesoscutum with 1 pair of dorsocentral setae ... **Mycodrosophila Oldenberg**



**2'.** Subcostal break not deeply incised, sometimes darkened, but not appearing as a protruding lappet. Scutellum not velvety; mesoscutum always with 2 pairs of dorsocentral setae. ... **3.**





# Drosophilidae Generic Key



prescutellar acrostichal setulae

*Leucophenga*

**3(2').** Enlarged prescutellar acrostichal setae present. Face, postpronotum and areas below wing base often with milky white markings (*Amiota*). Alternatively, costal sector between apices of  $R_{2+3}$  and  $R_{4+5}$  with a series of small thorn-like spines along lower margin (*Stegana* & *Leucophenga*) **OR** frons thickly covered with small setae (*Rhinoleucophenga*) . . . **4.**  
(**Steganinae**)



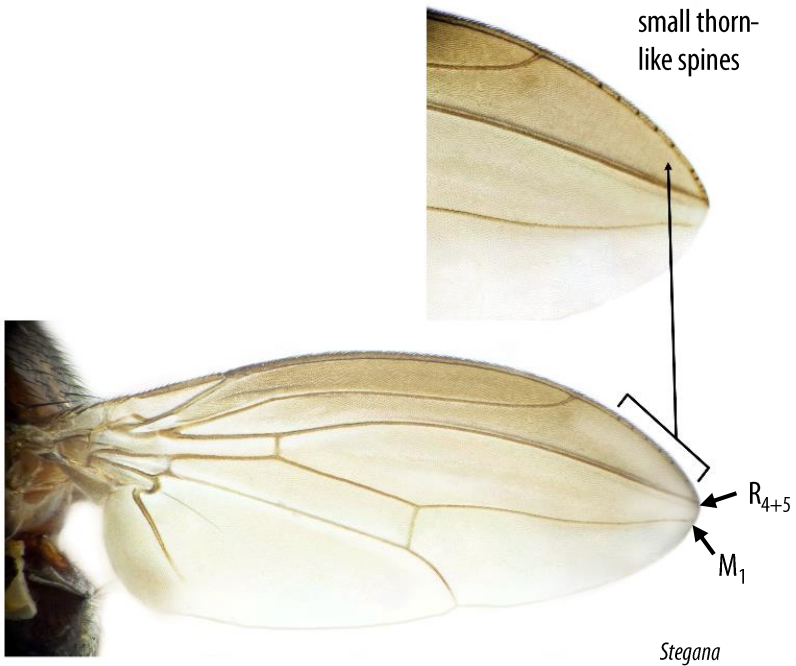
*D. virilis*

**3'.** Prescutellar acrostichal seta usually absent, if present then no more than twice as long as prescutellar acrostichal setulae. Pleuron, postpronotum and areas below wing bases without white markings. Costal sector without spines. Frons with sparsely scattered setae . . . **7.**  
(**Drosophilinae, in part**)





# Drosophilidae Generic Key



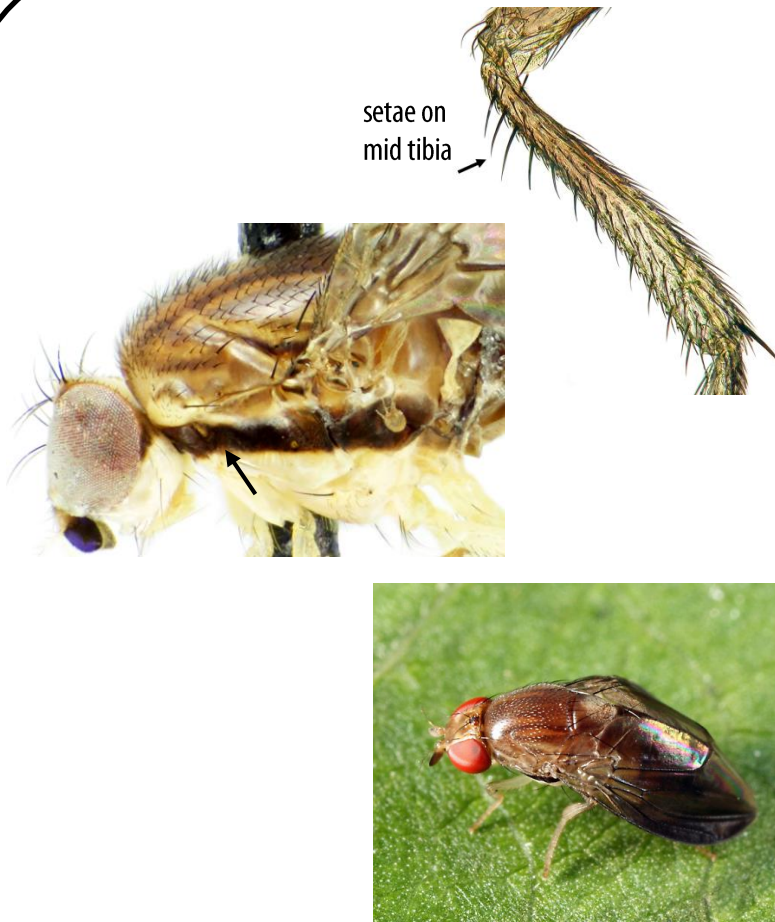
**4(3').** Wing entirely darkened or with infusate areas, tip pointed, costal sector between apices of  $R_{2+3}$  and  $R_{4+5}$  with a series of small thorn-like spines along lower margin,  $R_{4+5}$  and  $M_1$  strongly convergent apically ... **5.**



**4'.** Wing uniformly hyaline or with infusate areas, tip rounded, costal sector between apices of  $R_{2+3}$  and  $R_{4+5}$  with or without a series of small thorn-like spines along lower margin,  $R_{4+5}$  and  $M_1$  not convergent apically ... **6.**



# Drosophilidae Generic Key



**5(4).** Mid tibia with a posterodorsal row of strong setae. Pleuron with prominent dark stripe. Wing darkened; in resting position wings folded along sides of thorax and abdomen. ... **Stegana Meigen**



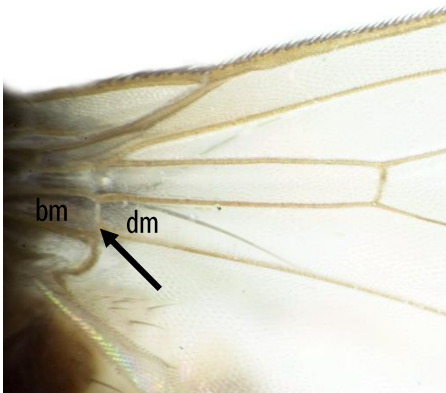
**5'.** Mid tibia without a row of strong posterodorsal setae. Pleuron lacking prominent dark stripe. Wing with infusate areas, in resting position held flat above abdomen. ... **Leucophenga Mik**



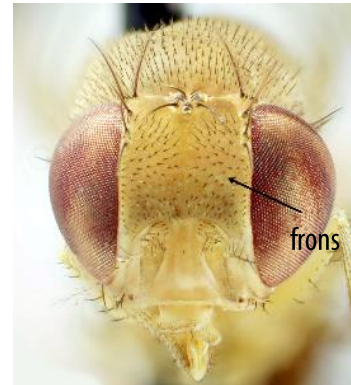
# Drosophilidae Generic Key



postpronotum & area below wing base



**6 (5').** Frons with sparse scattered setae. Body black or dark yellowish, face, postpronotum and areas below wing base with milky white markings. Wing hyaline, without infusate areas; cells dm and bm separated . . . **Amiota Loew**

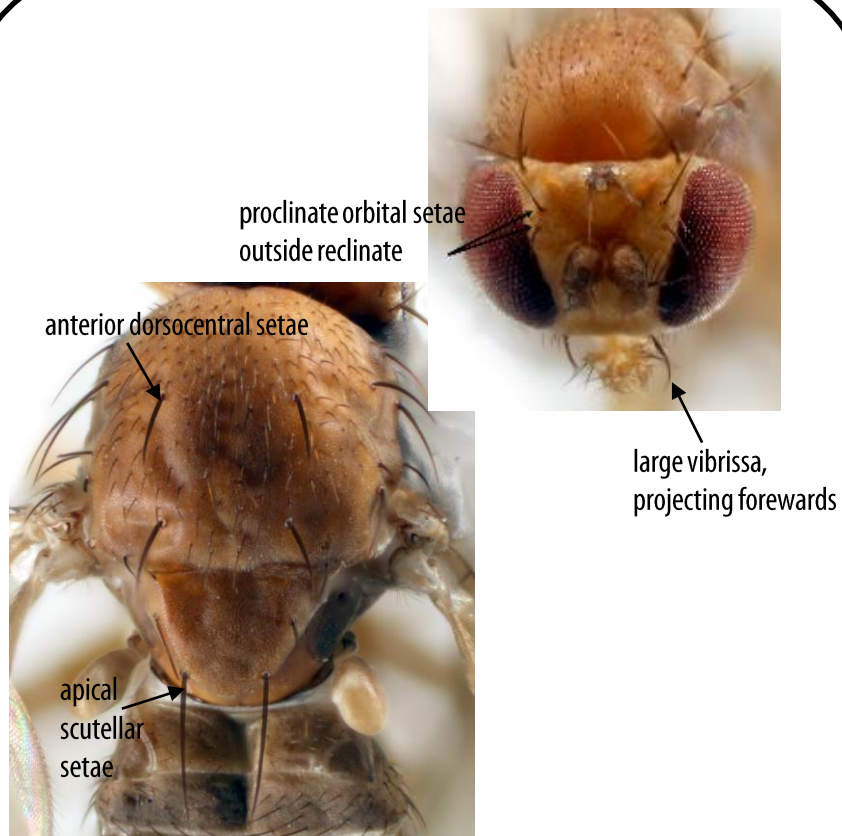


**6'.** Frons thickly covered with small setae. Body yellowish, face, postpronotum and areas below wing base without milky white markings. Wing with infusate areas; cells dm and bm confluent. . . **Rhinoleucophenga Hendel**

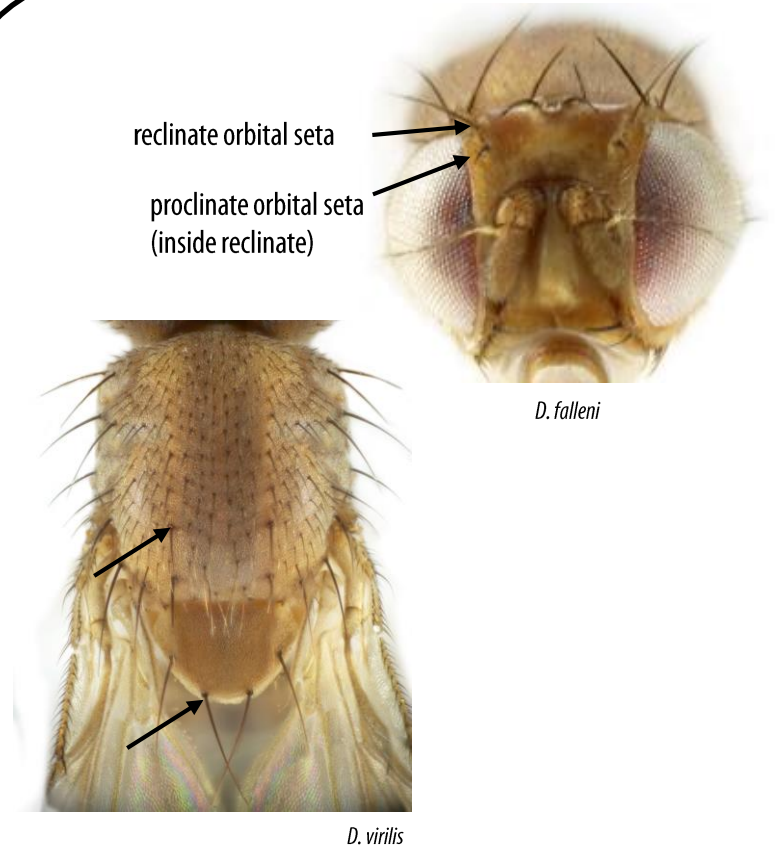




# Drosophilidae Generic Key



**7(3').** Proclinate orbital seta arising anterolateral to (outside) strong reclinate orbital seta. Anterior dorsocentral seta always far forward, at or near transverse suture. Vibrissa very large, projecting forward... **Microdrosophila Malloch**



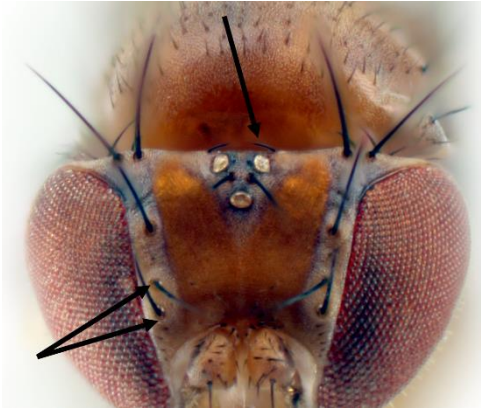
**7'.** Proclinate orbital seta arising anteromedial to (inside) reclinate orbital seta. Anterior dorsocentral seta closer to posterior dorsocentral seta, or if near transverse suture then proclinate orbital seta not outside reclinate orbital seta. Vibrissa small, not projecting forward... **8.**



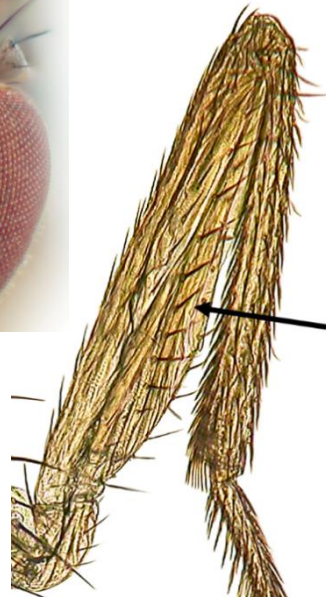


# Drosophilidae Generic Key

postocellar setae



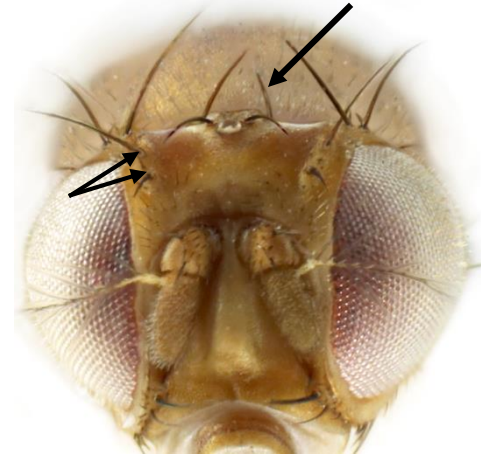
proclinate orbital seta above  
reclinate orbital seta



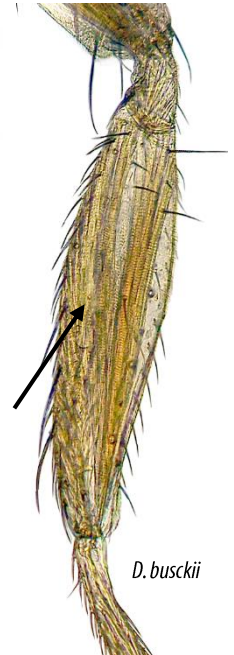
enlarged setae

**8 (7').** Postocellar setae small and inconspicuous; proclinate orbital seta arising posterior to (i.e. above), and about equal in size to, anterior reclinate orbital seta. Ventral surface of fore femur with a row of thickened, spinule-like setae... **Chymomyza Czerny**

proclinate orbital seta below  
reclinate orbital seta



*D. falleni*

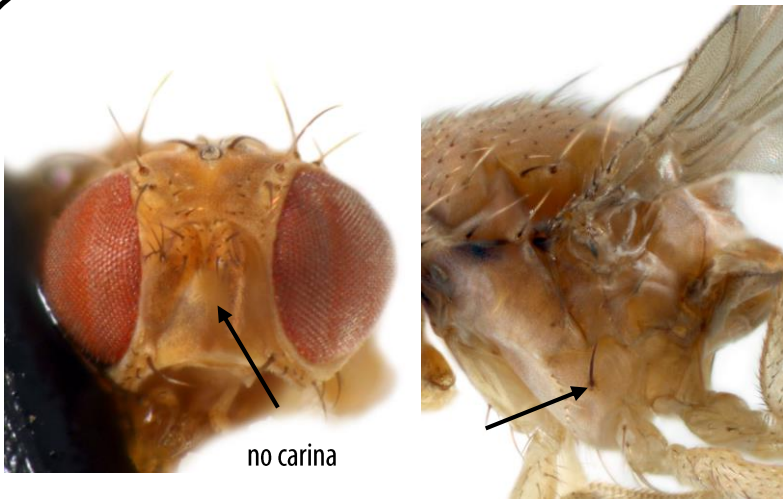


*D. busckii*

**8'.** Postocellar setae usually well-developed, proclinate orbital seta arising anterior to (i.e. in front of) anterior reclinate orbital seta and distinctly stronger than it. Fore femur with uniformly small setae...**9.**

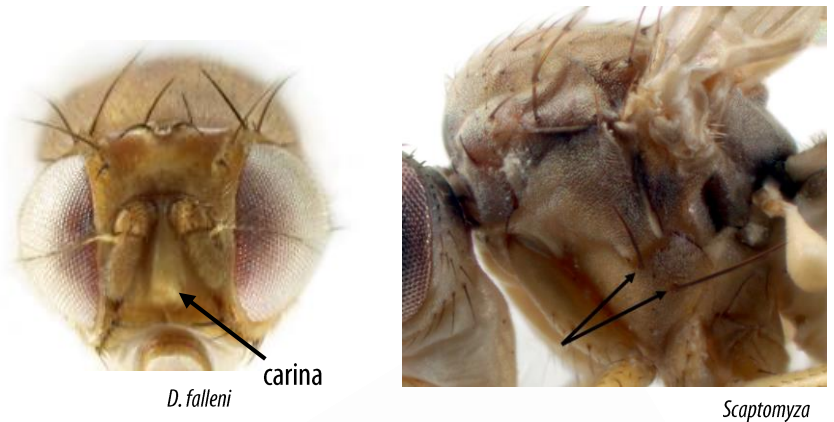


# Drosophilidae Generic Key



**9(8').** Face flat, no carina. Katepisternum with 1 strong katepisternal seta. Anterior portion of wing infusate ...

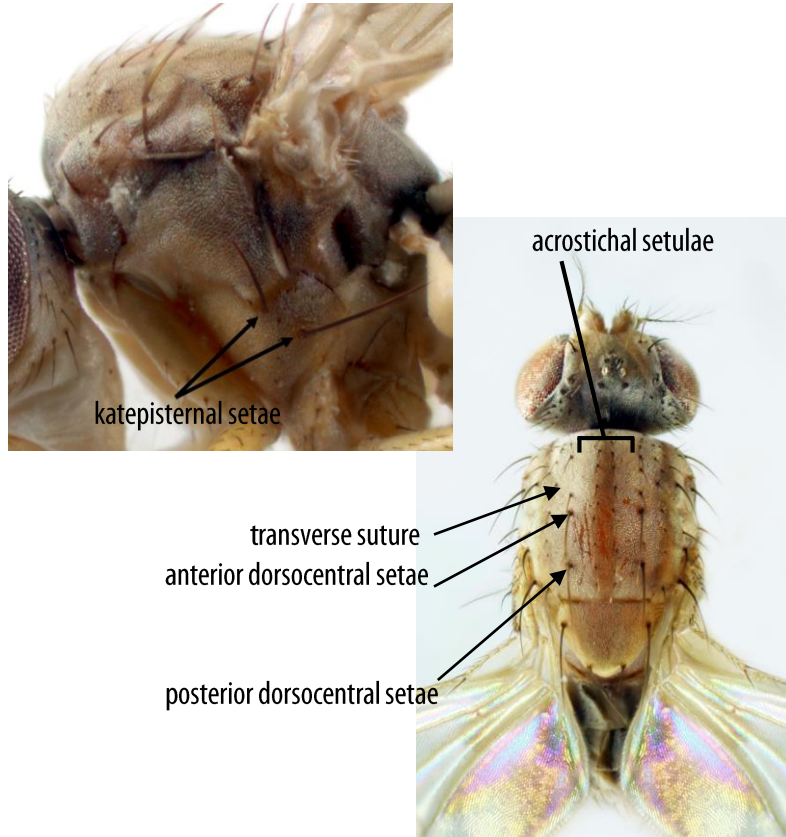
**Cladochaeta Coquillett**



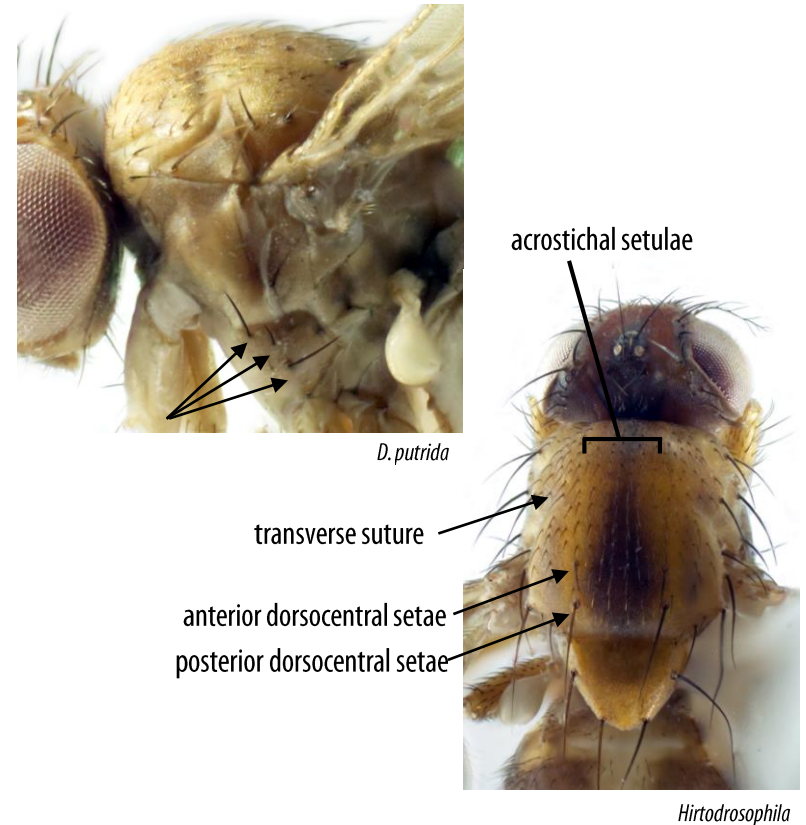
**9'.** Face with either slight or obvious carina. Katepisternum with 2-3 setae. Wing uniformly hyaline or with clouded areas...**10.**



# Drosophilidae Generic Key



**10(9').** Katepisternum with 2 setae. Acrostichal setulae arranged in 2 or 4 rows. Anterior dorsocentral setae closer to transverse suture than to posterior dorsocentral setae ... **Scaptomyza Hardy**

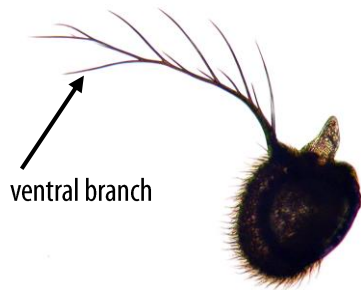


**10'.** Katepisternum with 3 setae. Acrostichal setulae arranged in 6 or more rows; anterior dorsocentral seta closer to posterior dorsocentral seta than to transverse suture ... **11.**





# Drosophilidae Generic Key

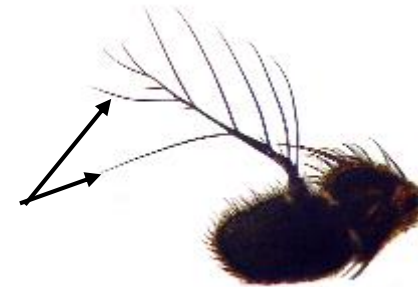


**11(10').** Facial carina narrow and small, absent on lower portion of the face. Arista with only 1 ventral branch behind terminal fork. ...

**Hirtodrosophila Duda**



*D. falleni*



*D. busckii*

**11'.** Facial carina well developed, including lower portion of face. Arista with 2 or more ventral branches. ...

**Drosophila Fallén**





# *Zaprionus* Coquillett



**Taxa Included:** This group is native to Africa and Asia, with 56 species in 2 subgenera. One introduced species is rarely encountered in northeastern North America: *Z. indianus* (Gupta).



**Biology:** *Zaprionus indianus* is a generalist, with a wide host range. In North America it has been captured in apple cider vinegar traps in raspberry, blueberry and blackberry fields in Ontario and Quebec, and overripe produce in New York City.



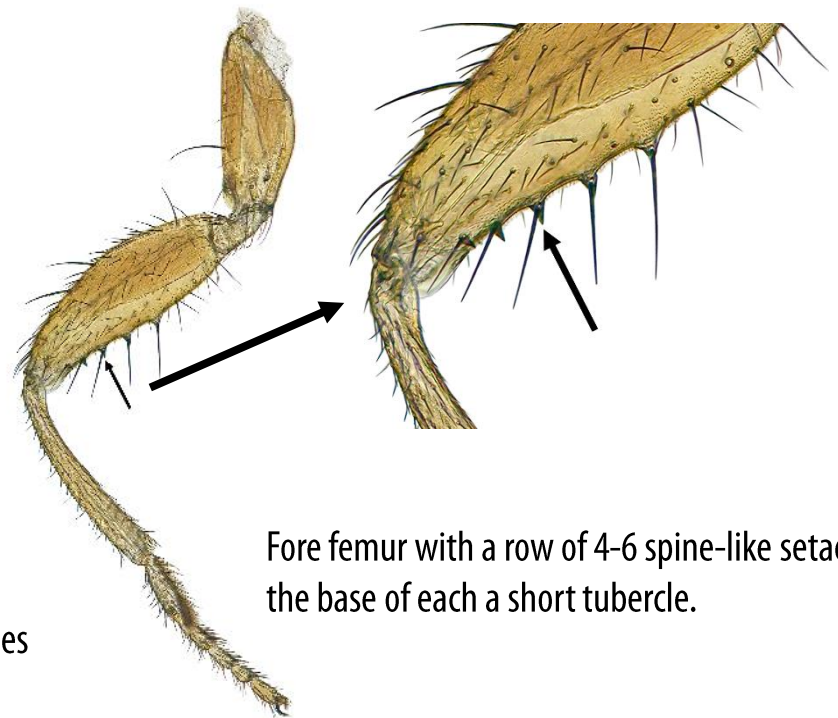
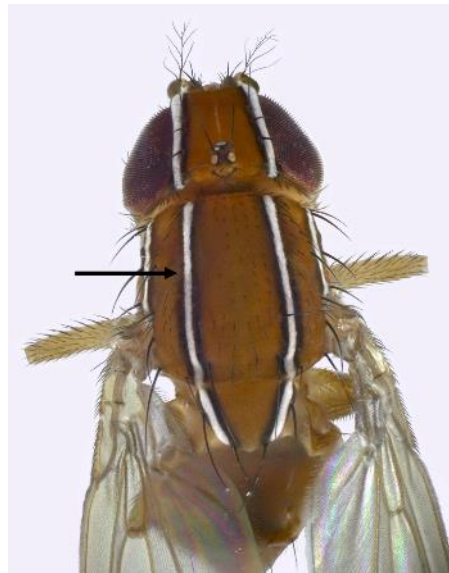


# *Zaprionus* Gupta

## Key Characters 🔍



Mesonotum and orbital plates with two white longitudinal stripes bordered by black lines.



Fore femur with a row of 4-6 spine-like setae, the base of each a short tubercle.



# *Mycodrosophila* Oldenburg



**Taxa Included:** This is a worldwide genus with 127 species in two subgenera (plus 35 species of uncertain affinity). Three species are known from northeastern North America (Brake & Bächli, 2008): *M. claytonae* Wheeler and Takada, *M. dimidiata* (Loew) and *M. stalker*i Wheeler and Takada.



**Biology:** *Mycodrosophila* are fungus breeders, found particularly on polypores (Bächli et al. 2004).

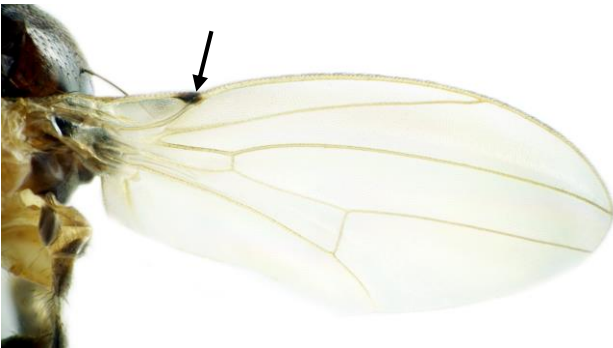




# *Mycodrosophila* Oldenburg

## Key Characters 🔍

Wing hyaline; subcostal break deeply incised, appearing as a thick black lappet.



Scutellum velvety, mesoscutum with 1 pair of dorsocentral setae.



Abdomen pale with darkened posterior bands and spots.

**Additional Characters:** : Uppermost part of pleuron dark brown to black, lowermost part of pleura pale yellow. Prescutellar setae absent; basal scutellar setae short, fine; apical scutellar setae large, convergent.





# *Rhinoleucophenga* Hendel



**Taxa Included:** A mostly Neotropical group with 18 species, 4 species are found in North America. Only one species, *R. obesa* (Loew) is known from northeastern North America.



**Biology:** All known records for the genus indicate they are larval predators of scale insects (Coccoidea). Larvae of *R. obesa* prey on *Aclerda* (Signoret) species (Ashburner et al., 1981).





# *Rhinoleucophenga* Hendel

## Key Characters 🔍

Frons thickly covered with small setae.



Acrostichal setulae in approximately 12 rows.



Tergites dull brown, without pattern of bands or spots.



**Additional Characters:** Prescutellar acrostichal setae present; basal scutellar setae divergent. Proepisternal seta usually present. Wings darkened.



# *Amiota* Loew



**Taxa Included:** A mostly Holarctic group with 116 species. 15 species are found in North America including the following 8 in northeastern North America:

*A. communis* Chen and Steyskal, *A. humeralis* Loew, *A. leucostoma* Loew, *A. lineiventris* Máca, *A. mariae* Máca, *A. minor* (Malloch), *A. steyskali* Máca and *A. subtusradiata* Duda.



**Biology:** The biology is poorly known. Typically collected in the forest canopy (Bächli et al. 2004) or by sweeping tree trunks, especially in oak forests; males fly around the head of humans, sometimes lodging in eyes; occasionally collected in beer-wine traps.





# *Amiota* Loew

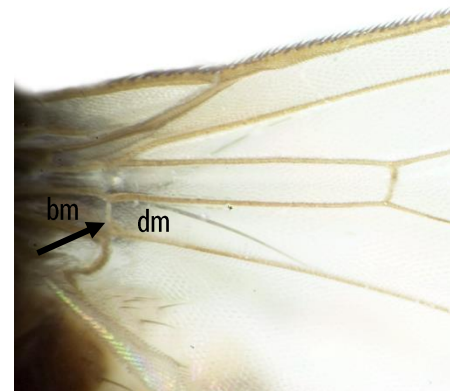
## Key Characters 🔍



Body black or dark yellowish, having face, postpronotum and areas below wing base with milky white markings.



Wing hyaline, rounded at tip.



Cells bm and dm separated.

**Additional Characters:** Arista pubescent to short plumose. Prescutellar acrostichal setae present; basal scutellar setae divergent; proepisternal seta usually present.





# *Stegana* Meigen



**Taxa Included:** A worldwide group with 116 species in 5 subgenera, plus 3 species of uncertain affinity. Six species are known from North America, with 3 species in northeastern North America: *S. antiqua* Wheeler, *S. coleoptrata* (Scopoli). And *S. vittata* (Coquillett).



**Biology:** Adults are collected on trunks of diseased or dead hardwoods such as poplar, birch, beech, oak and plum trees (Ashburner, 1981). Species in this genus are very rarely attracted to fruit baits (Bächli et al. 2004).



Key Characters



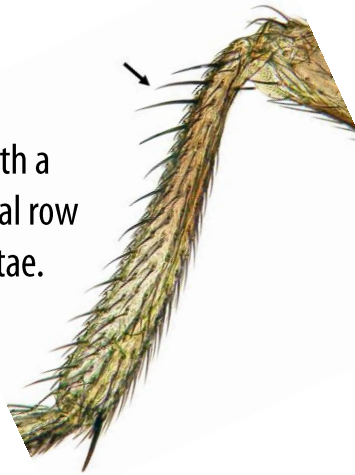
# *Stegana* Meigen

## Key Characters 🔍



Frons with sparse scattered setae.

Mid tibia with a posterodorsal row of strong setae.



Costa reaching apex of  $M_1$ ;  $R_{4+5}$  and  $M_1$  strongly convergent apically. Costal sector between apices of  $R_{2+3}$  and  $R_{4+5}$  with a series of small thorn-like spines along lower margin.



Wing darkened and tip pointed; in resting position folded along sides of thorax and abdomen.

**Additional Characters:** Prescutellar acrostichal setae present; basal scutellar setae divergent; proepisternal seta usually present.



# *Leucophenga* Mik



**Taxa Included:** This is a worldwide group, that is very diverse in the Old World. It contains 203 species, with 8 in North America. Only 2 species are found in northeastern North America; *L. maculosa* (Coquillett) and *L. varia* (Walker).



**Biology:** Poorly known. Larvae are thought to be fungus feeders (Bächli et al. 2004); local species found on mushrooms, particularly of the family Agaricaceae.





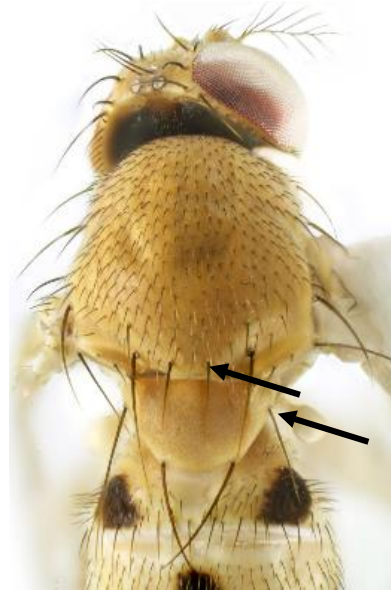
# *Leucophenga* Mik

## Key Characters 🔍

Wing with some infusate areas, pointed, costal sector between apices of  $R_{2+3}$  and  $R_{4+5}$  with a series of small thorn-like spines along lower margin.



Costa weak or absent beyond the apices of  $R_{4+5}$ ; wing tip acute.



Prescutellar acrostichal setae present; basal scutellar setae divergent.



Pale abdomen with distinctive dark spots.





# *Microdrosophila* Malloch



**Taxa Included:** This is a worldwide group with 77 species in 2 subgenera. Only one species described from North America (and found in northeastern North America) : *M. quadrata* (Sturtevant).



**Biology:** Poorly known. Species in this genus are not attracted to bait traps. Usually collected by sweeping near the ground (Bächli et al. 2004), especially over leaves of fallen trees.





# *Microdrosophila* Malloch

## Key Characters 🔍



Proclinate orbital seta arising anterolaterally to strong reclinate orbital seta.

Anterior dorsocentral setae far forward, at or near transverse suture; apical scutellar setae usually divergent or parallel.



**Additional Characters:** Vibrissa very large, projecting forward, followed by small subgenal setae. Prescutellar acrostichal setae absent; proepisternal seta absent.



# *Chymomyza* Czerny



**Taxa Included:** This is a worldwide genus with 55 species. The 13 North American species include 5 species in northeastern North America: *C. aldrichii* Sturtevant, *C. amoena* (Loew), *C. caudatula* Oldenburg, *C. procnemoides* Wheeler and *C. wirthi* Wheeler.



**Biology:** Usually found on hardwood stumps, tree wounds, and under or near peeled bark and cut logs (Bächli et al. 2004). Also known to breed in black walnut husks, domestic apples, crab apples and acorns (Band et al. 2005). Adults can be attracted to fermenting substrates and fruit bait (Band et al. 2005).



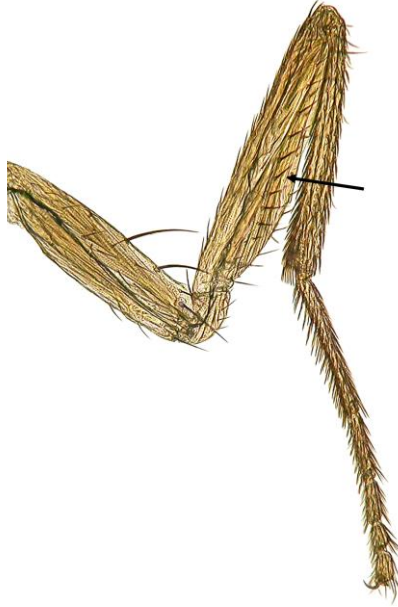


# *Chymomyza* Czerny

## Key Characters 🔍



Postocellar setae small and inconspicuous; proclinate orbital seta arising posterior to (i.e. above), and about equal in size to, anterior reclinate orbital seta.



Ventral surface of fore femur with a row of thickened, spinule-like setae.



Wings uniformly hyaline or with darkened areas.

**Additional Characters:** Prescutellar acrostichal setae absent; apical scutellar setae cruciate; proepisternal seta absent.





# *Cladochaeta* Coquillett



**Taxa Included:** A largely Neotropical group with 124 species, of which 10 occur in North America. Only one species, *C. inversa* (Walker), is found in northeastern North America.



**Biology:** Larvae of local species feed on nymphs of *Clastoptera* spittlebugs, especially *C. obtusa* (Say) on alder (Cercopidae) (Grimaldi and Nguyen, 1999).



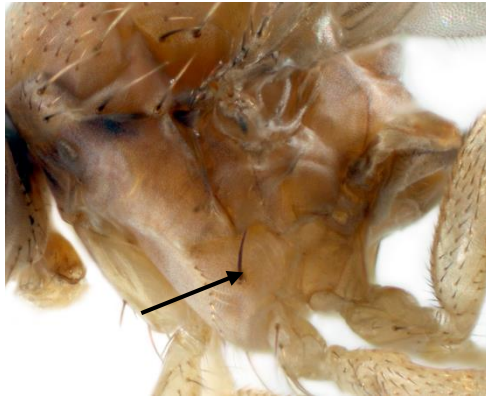


# *Cladochaeta* Coquillett

## Key Characters 🔍



Face flat, no carina.



Katepisternum with 1 strong seta.



Wing with infusate areas.

**Additional Characters:** Arista with at most 1 ventral ray in addition to apical fork. Prescutellar acrostichal setae absent; proepisternal seta absent; face flat; abdominal tergites brown, without patterns.



# *Scaptomyza* Hardy



**Taxa Included:** A large cosmopolitan genus with 262 species (in 20 subgenera + nine species of uncertain affinity); 22 species are known from North America. Seven species in northeastern North America; *S. trochanterata* Collin, *S. vittata* (Coquillett), *S. adusta* (Loew), *S. pallida* (Zetterstedt), *S. flava* (Fallén), *S. graminum* (Fallén) and *S. nigrocella* Wheeler.



**Biology:** Larvae of many species in this genus are leaf miners (Bächli et al. 2004), stem miners, or otherwise breed in vegetation.



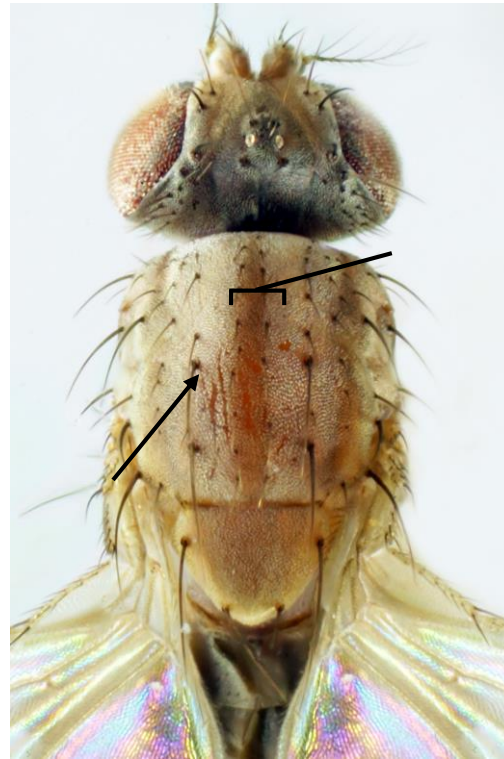


# *Scaptomyza* Hardy

## Key Characters 🔍



Katepisternum with 2 setae.



Acrostichal setulae arranged in 2 or 4 rows. Anterior dorsocentral setae closer to transverse suture than to posterior dorsocentral setae.

**Additional Characters:** Prescutellar acrostichal setae absent; proepisternal seta absent; scutum typically with faint or obvious stripes.





# *Hirtodrosophila* Duda



**Taxa Included:** A cosmopolitan genus with 159 species. 9 species are in North America, 4 species in northeastern North America; *H. alabamensis* (Sturtevant), *H. chagrinensis* (Stalker and Spencer), *H. duncani* (Sturtevant) and *H. ordinaria* (Coquillett).



**Biology:** Fungus breeders (Bächli et al. 2004), found particularly on polypores.





# *Hirtodrosophila* Duda

## Key Characters 🔍

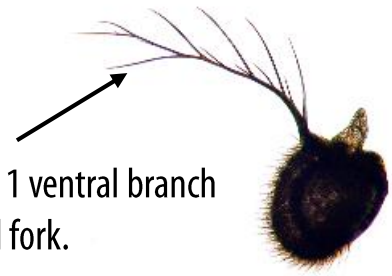


Facial carina narrow and small, absent on lower portion of the face.



Thorax unicolourous, or with dark stripe on mesonotum.

Abodomen unicolourous black, or pale with somewhat diffuse brown medially interrupted posterior bands on each tergite.



Arista with only 1 ventral branch behind terminal fork.

**Additional Characters:** Prescutellar acrostichal setae absent; proepisternal seta absent.



# *Drosophila* Fallén

**Diagnosis:** Small yellow to brown flies, body 2 to 6 mm long. Facial carina well developed, including lower portion of face; arista with 2 or more ventral branches; postocellar setae well developed; proclinate orbital seta stronger than, and arising anterior to, reclinate orbital seta. Mesonotum and pleuron unicolourous, or with stripes or spots; proepisternal setae absent; 3 katepisternal setae. Acrostichal setulae in 6 to 8 rows; 2 pairs of dorsocentral setae; prescutellar acrostichal setae absent (except subgenus *Siphlodora*). Wing uniformly hyaline or with infusate areas. Abdomen unicolourous or with transverse bands or spots.

**Taxa Included:** This cosmopolitan genus is the largest in the family, including 1157 species in 7 subgenera (Brake & Bächli, 2008). 139 species in 5 subgenera are present in North America, with only 35 species in 4 subgenera known from northeastern North America.



Biology



Key Characters



Spotted Wing  
Drosophila



To *Drosophila*  
species key



# *Drosophila* Fallén



*Drosophila* are commonly found on...

Rotting Organics



Fungi



Flowers



Cacti



Sap fluxes & stumps



Approximately 500  
species of *Drosophila* can  
be easily reared and  
studied in a laboratory.



For more information of the biology of each  
*Drosophila* species in northeastern North  
America, please see the corresponding species  
pages in this key.

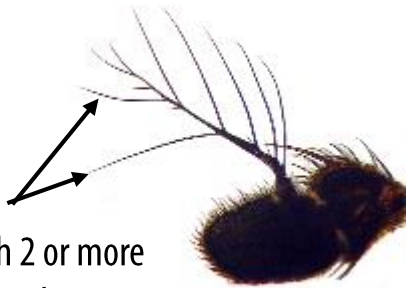
For more information on the breeding sites, pathogens, parasites, modes of isolation, heritable symbionts and additional photographs of interspecific variation of the northeastern North American *Drosophila* species, please see the ebook "**Drosophilids of the Midwest and Northeast**" by **Werner T. & Jaenike J. (2017)**.





# *Drosophila* Fallén

## Key Characters 🔍



*D. busckii*

Arista with 2 or more ventral branches.



*D. putrida*

3 large katepisternal setae.

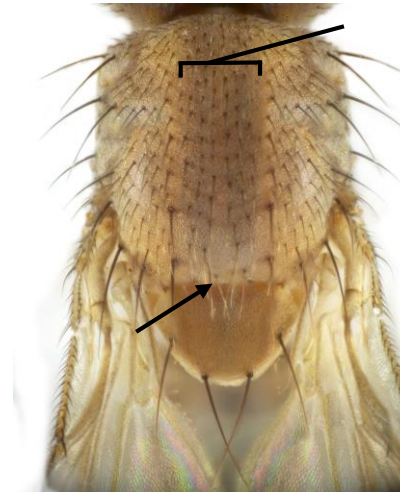
Facial carina well developed, present on lower portion of the face.



*D. falleni*

Postocellar setae well developed; proclinate orbital seta stronger than, and arising anterio-medially to reclinate orbital seta.

Abdomen unicolourous or with stripes or spots.



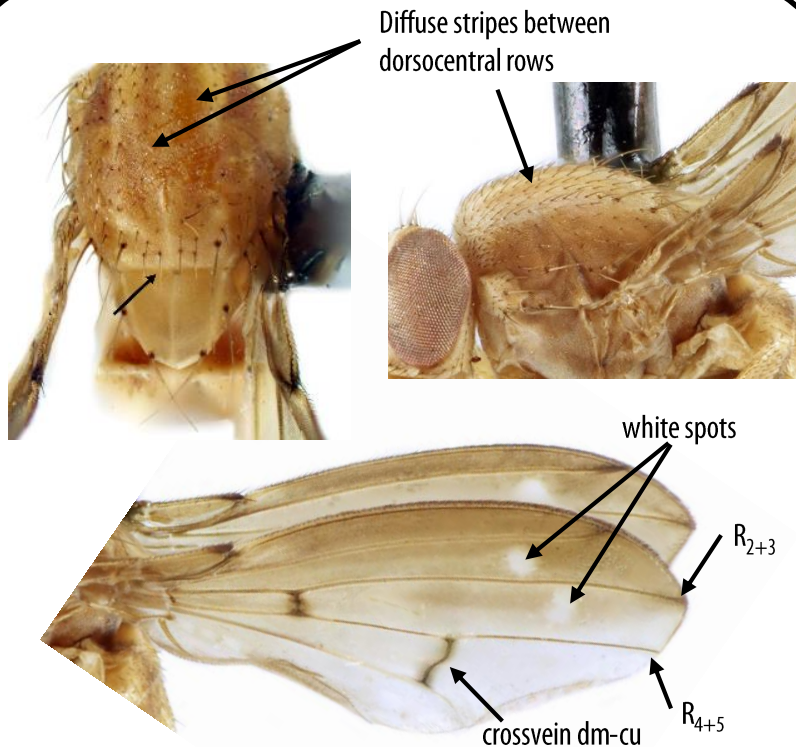
*D. virilis*

Acrostichal setulae in 6 to 8 rows; prescutellar acrostichal setae absent (except subgenus *Siphlodora*).

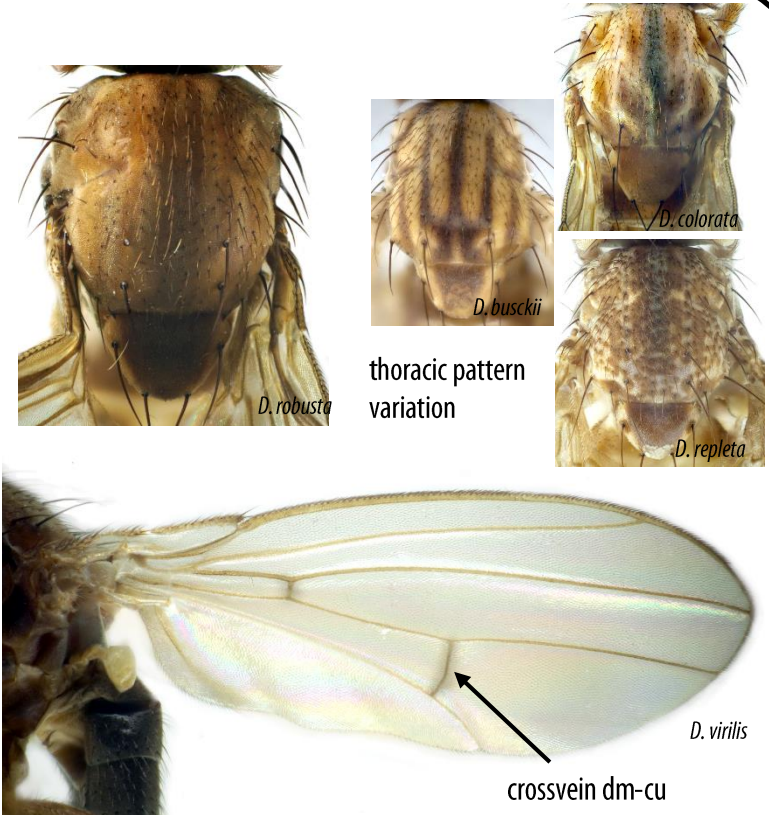
**Additional Characters:** Wing uniformly hyaline or with infusate areas.



# Drosophila Species Key



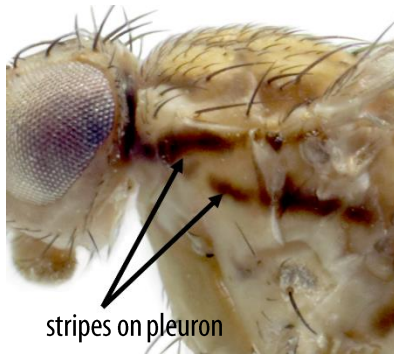
**12.** Mesonotum reddish-brown with diffuse reddish stripes bordering median yellowish stripe between dorsocentral rows; prescutellar setae visibly enlarged. Wing mostly light brown, graded to hyaline towards hind margin; apices of veins  $R_{2+3}$  and  $R_{4+5}$  and crossveins r-m and dm-cu clouded; crossvein dm-cu distinctly sinuate; males with 2 clear or white marks on apical half of wing (1 between  $R_{2+3}$  and  $R_{4+5}$ , and the other between  $R_{4+5}$  and M) ... ***Drosophila (Siphlodora) sigmoides* Loew**



**12'** Thorax unicolourous, striped, or mottled with dark spots at the bases of setulae; prescutellar setae not visibly enlarged. Wing pigmentation variable, never completely brown nor paler towards inner hind margin nor with distinct white spots; crossvein dm-cu not distinctly sinuate... **13.**



# Drosophila Species Key



**13(12').** Mesonotum and pleuron with narrow, trident-shaped dark stripes on the mesonotum. Wing hyaline, no markings. . . ***Drosophila (Dorsilopha) busckii* Coquillett**



**13'.** Mesonotum and pleura with at most a single central mesonotal stripe. Wing uniformly hyaline or with spots and clouds. . . **14.**





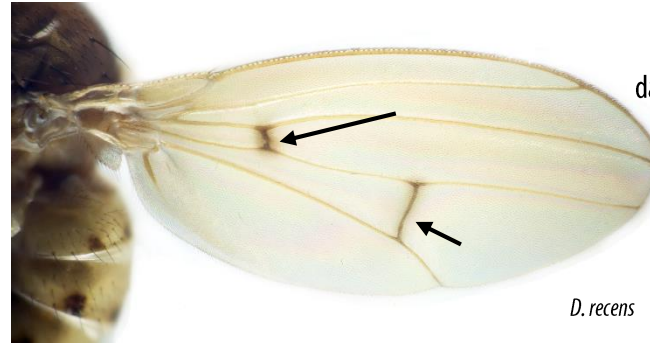
# Drosophila Species Key

hyaline



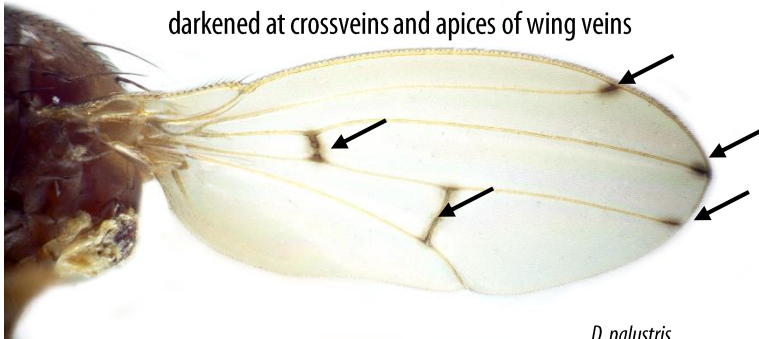
*D. paramelanica*

darkened at crossveins



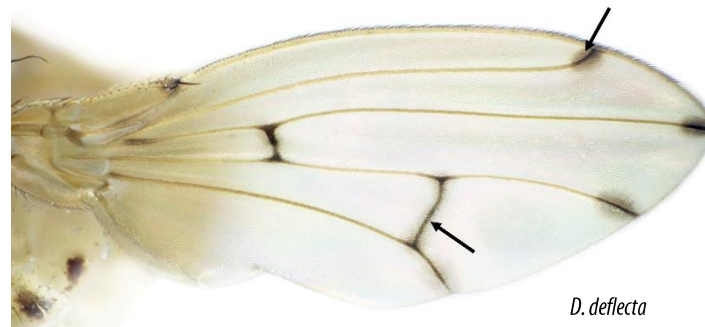
*D. recens*

darkened at crossveins and apices of wing veins



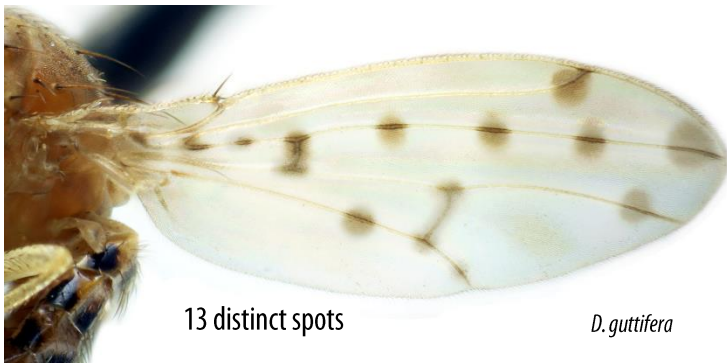
*D. palustris*

darkened at crossveins and circular spots at apices of wing veins



*D. deflecta*

13 distinct spots



*D. guttifera*

darkened at apices of veins  $R_{2+3}$  and  $R_{4+5}$



*D. suzukii* male





# *Drosophila* Species Key

complete dark posterior bands



*D. melanogaster*

dark tergites



*D. affinis*



Hyaline wing

*D. suzukii*



*D. suzukii*

**14(13').** Abdominal tergites 2-6 entirely dark or with complete dark band on each posterior margin; if tergites completely dark, wing hyaline... **15.**



*D. virilis*



*D. deflexa*



*D. colorata*

**Click for all abdominal pattern variations**



*D. recens*

**Click for all wing pattern variations**

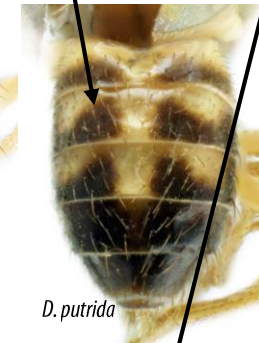
**14'. Abdominal tergites 2-6 either with posterior bands broken down the midline, or pale with round or triangular dark spots, or completely darkened; if tergites completely dark, then wing infuscate on crossveins ...23. (Subgenus *Drosophila* Fallén in part)**



# *Drosophila* Species Key

Tergites completely darkened

Tergites 2-6 with posterior bands narrowly or broadly broken down the midline



Tergites pale with round or triangular black spots



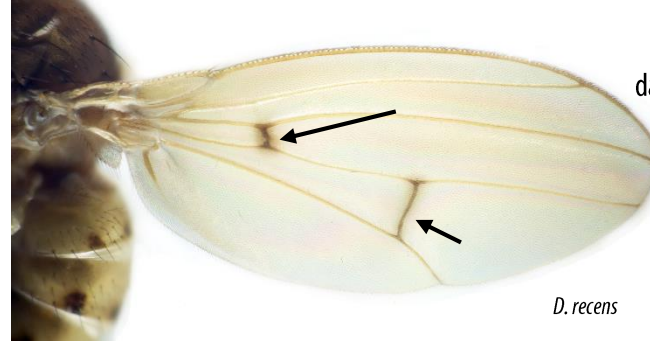
# *Drosophila* Species Key

hyaline



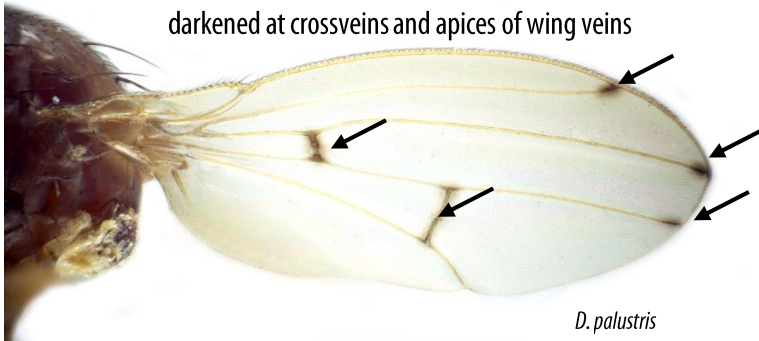
*D. paramelanica*

darkened at crossveins



*D. recens*

darkened at crossveins and apices of wing veins



*D. palustris*

darkened at crossveins and circular spots at apices of wing veins



*D. deflecta*

13 distinct spots

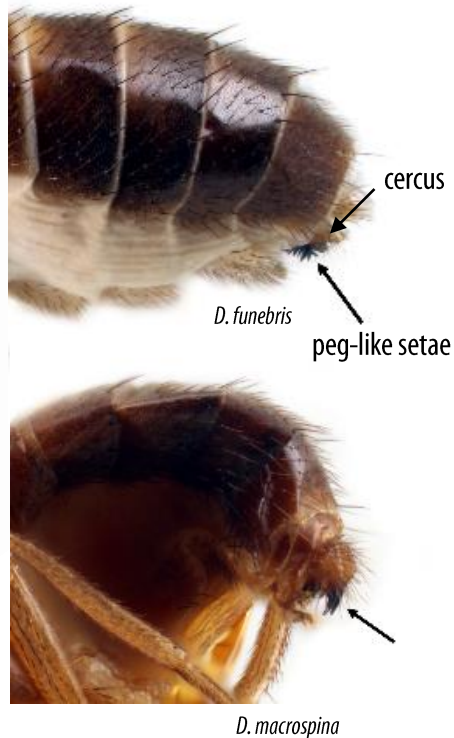
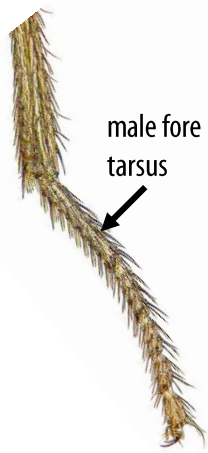


*D. guttifera*

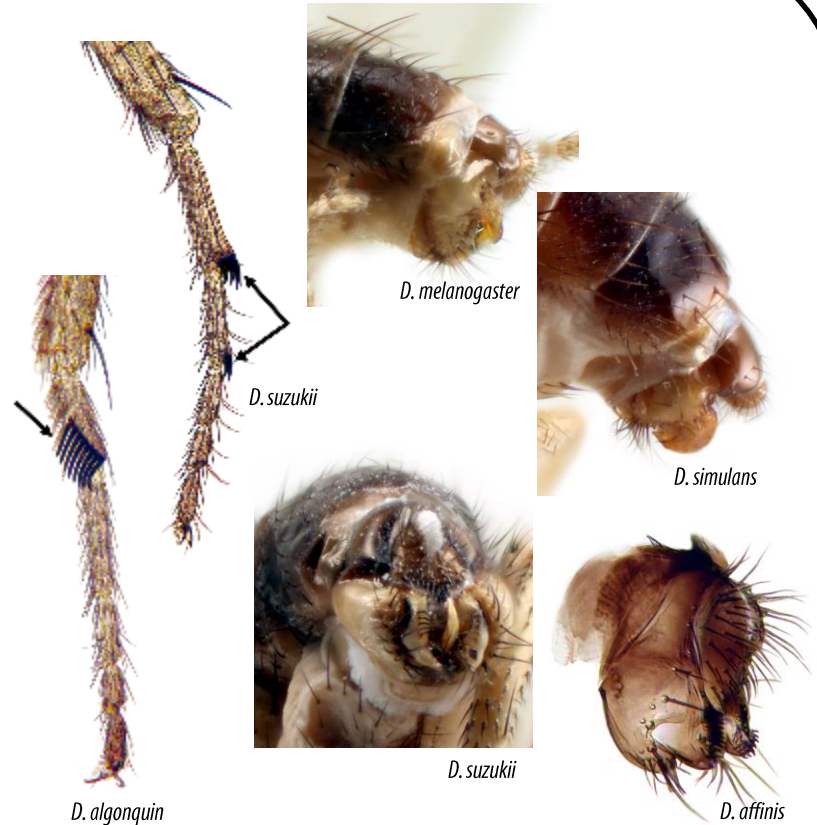




# *Drosophila* Species Key



**15(14').** Males without fore tarsal combs; with large, sclerotized, peg-like setae on cercus. . . **16. (Subgenus *Drosophila* Fallén, *D. funebris* species group males)** (High magnification and/or dissection required for species identification)



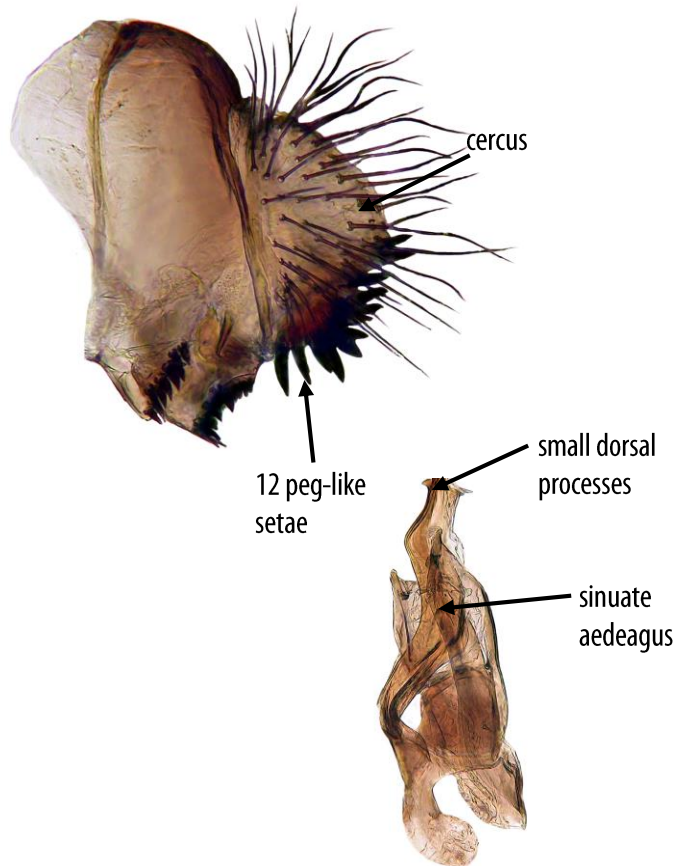
**15'. Female, or male with 1 or 2 fore tarsal combs and without large, distinct dark peg-like setae on cercus. . .**

**17. (Subgenus *Sophophora* Sturtevant males and all remaining females)**

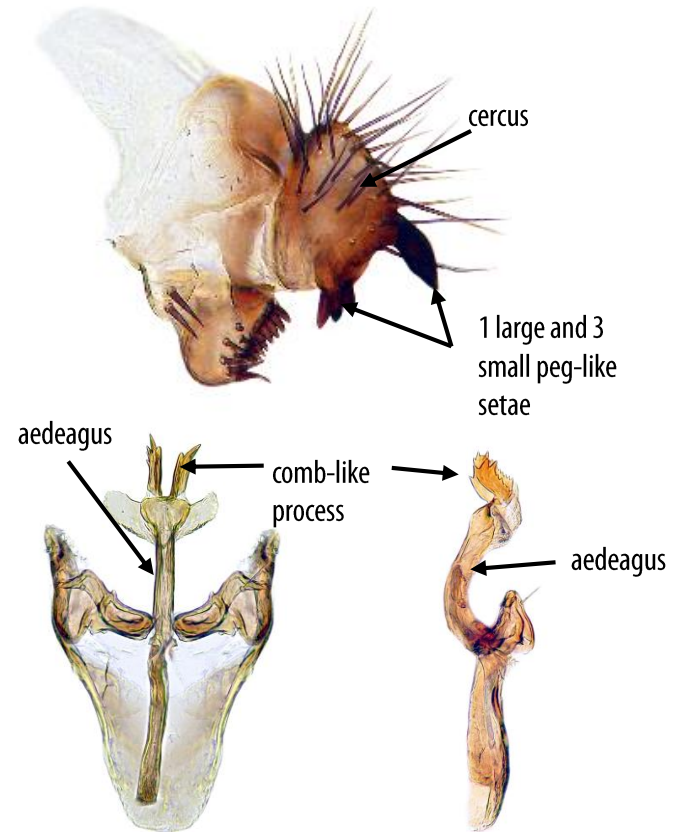




# Drosophila Species Key



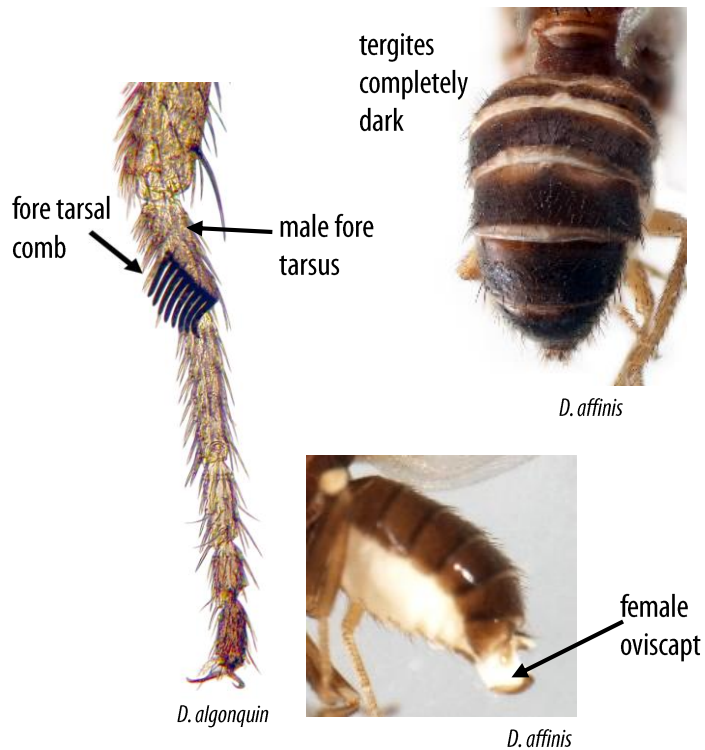
**16(15').** Male cercus with dense series of 12 strong peg-like setae near inner margin; aedeagus with a pair of small dorsal processes at apex. . . ***Drosophila (Drosophila) funebris* Fabricius male.**



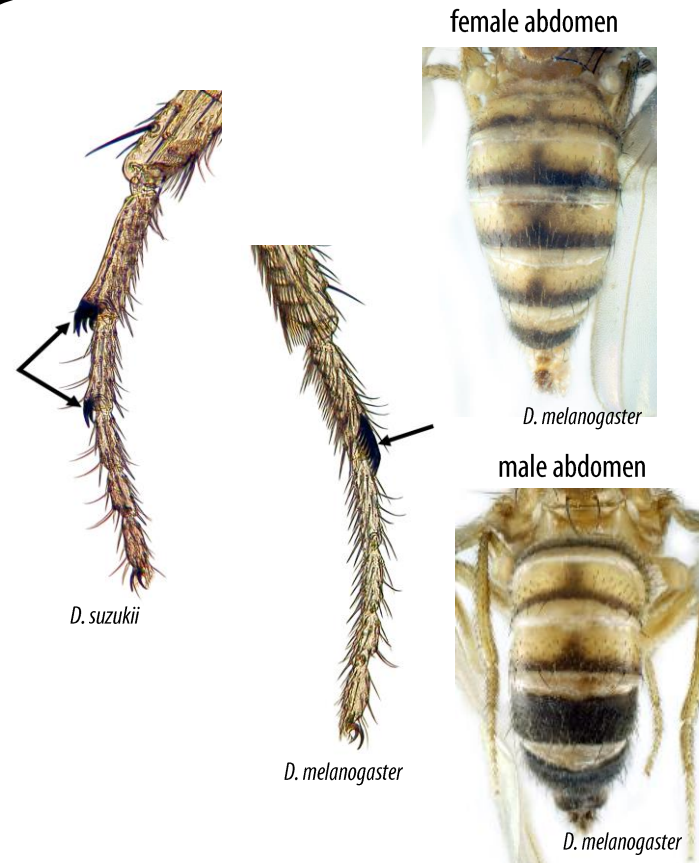
**16'.** Male cercus with 1 large and 3 smaller, stout, peg-like setae arranged in an irregular row near inner margin; aedeagus with 2 large broad comb-like processes at apex. . . ***Drosophila (Drosophila) macrospina* Stalker & Spencer male**



# *Drosophila* Species Key



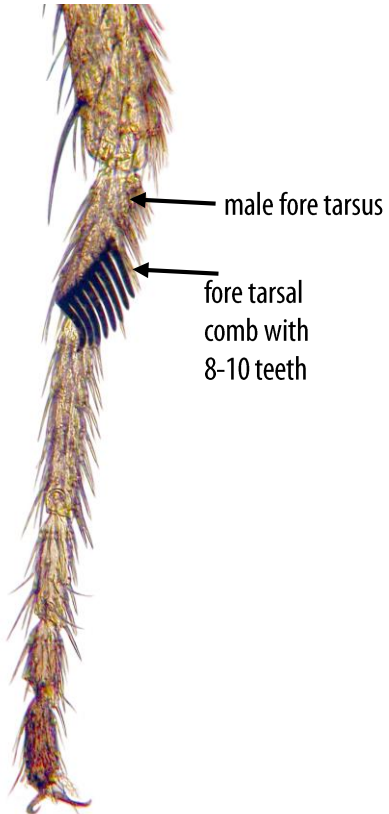
**17(15').** Dark brown to blackish species. Male fore tarsus with 1 comb; red testes visible through membrane in fresh or alcohol-preserved specimens. Tergites 2-6 completely dark. Females cannot be keyed beyond this point. . . **18.**  
(*obscura* species group - *affinis* species subgroup)



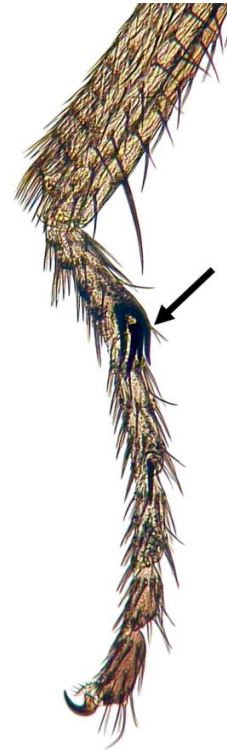
**17'.** Yellowish species. Male fore tarsus with 1-2 combs. Male tergites 2-4 pale yellow with narrow dark unbroken posterior bands, tergites 5 & 6 completely darkened; female tergites 2 to 6 pale yellow with narrow dark unbroken posterior bands. . . **21.**  
(*melanogaster* species group)



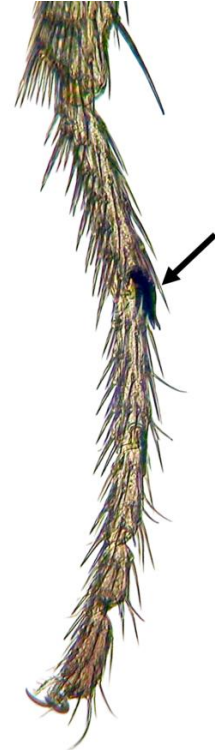
# *Drosophila* Species Key



**18(17').** Male fore tarsus with comb composed of 8-10 teeth.... *Drosophila (Sophophora) algonquin*  
Sturtevant & Dobzhansky



*D. affinis*

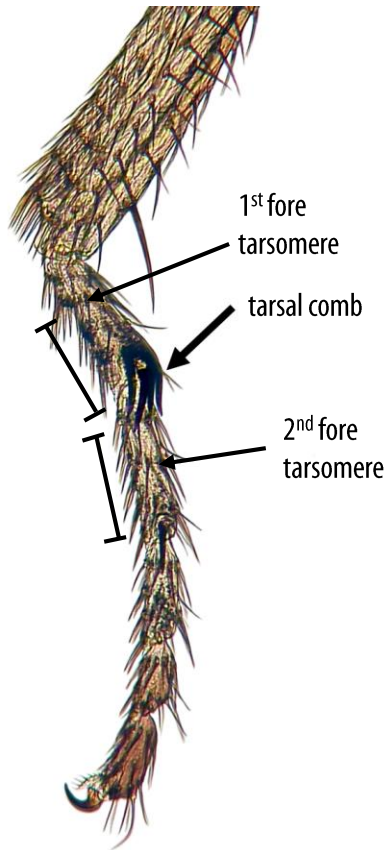


*D. athabasca*

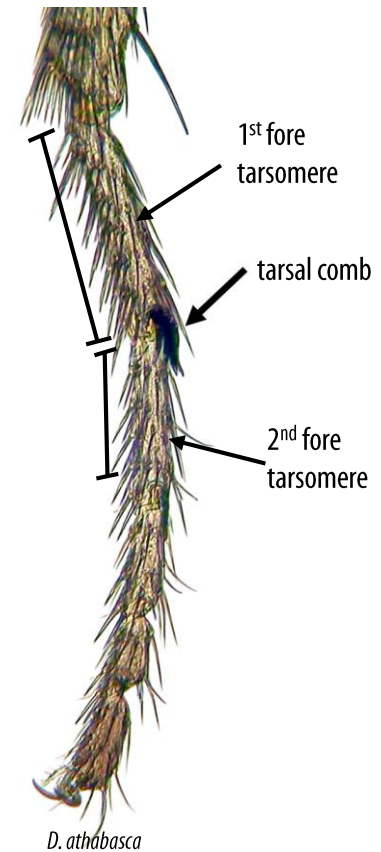
**18'.** Male fore tarsus with comb composed of 4-6 teeth....**19.**



# *Drosophila* Species Key



**19(18').** First male fore tarsomere shorter than or equal to second... *Drosophila (Sophophora) affinis* Sturtevant

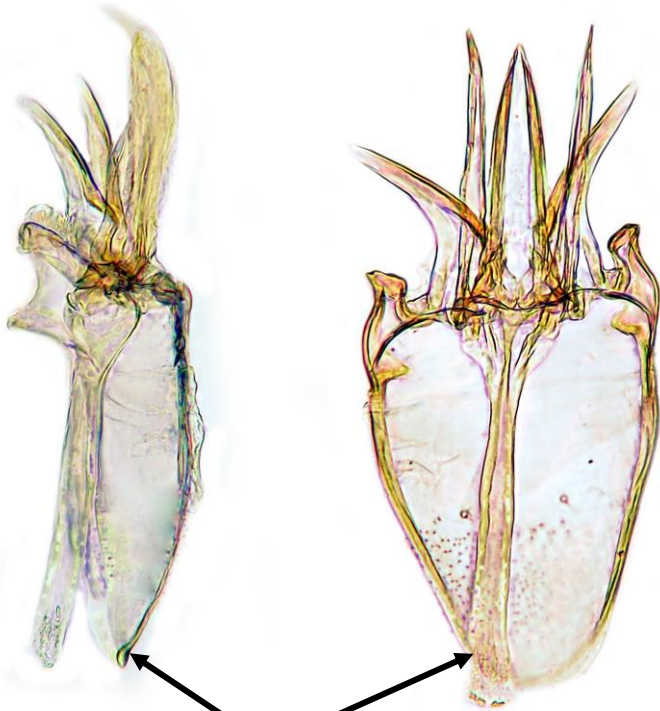


**19'.** First fore tarsomere of males always longer than the second.. Dissection required for species identification... **20.**



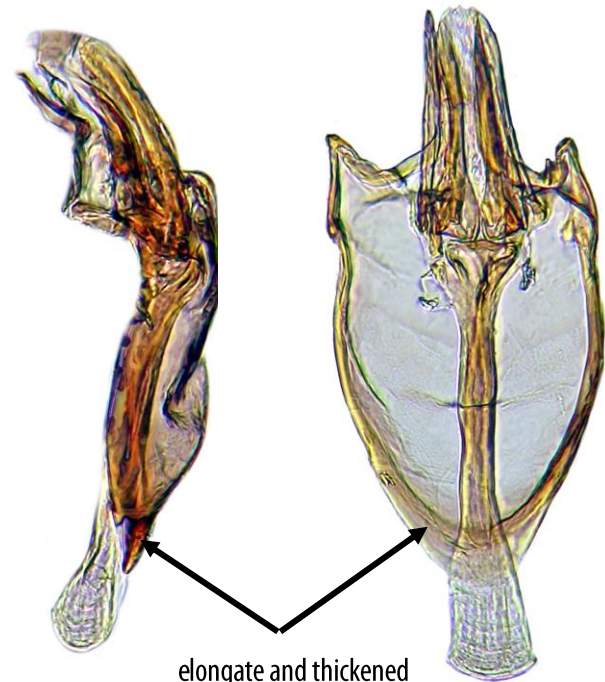


# *Drosophila* Species Key



Uniform width and relatively thin  
at edge

**20(19').** Anterior margin of hypandrium of uniform width,  
smoothly rounded, relatively thin... ***Drosophila (Sophophora)***  
***narragansett Sturtevant & Dobzhansky***

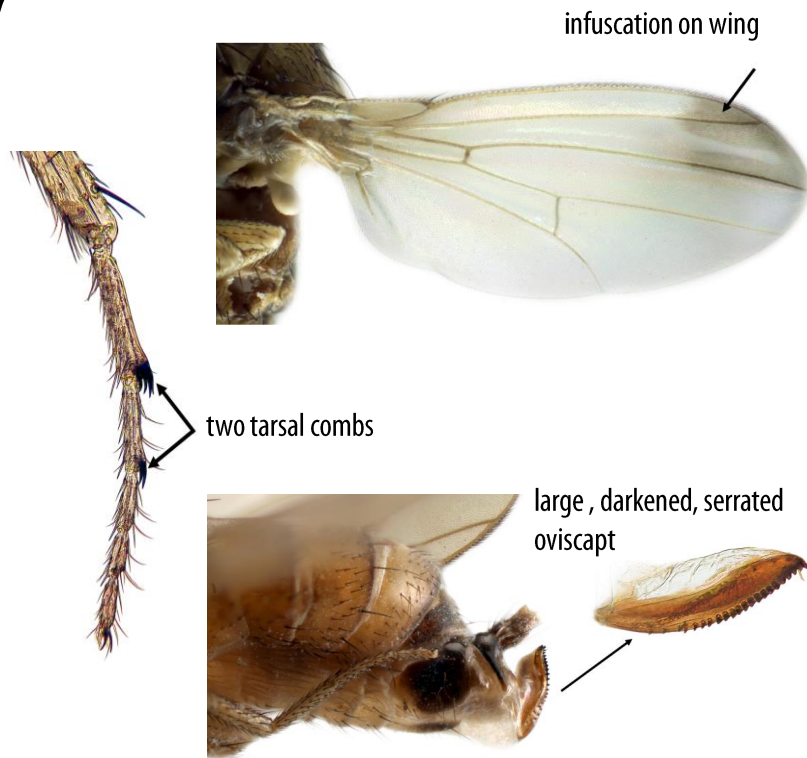


elongate and thickened  
edge

**20'.** Anterior margin of hypandrium elongate, thickened and  
blunt... ***Drosophila (Sophophora) athabasca***  
***Sturtevant & Dobzhansky***

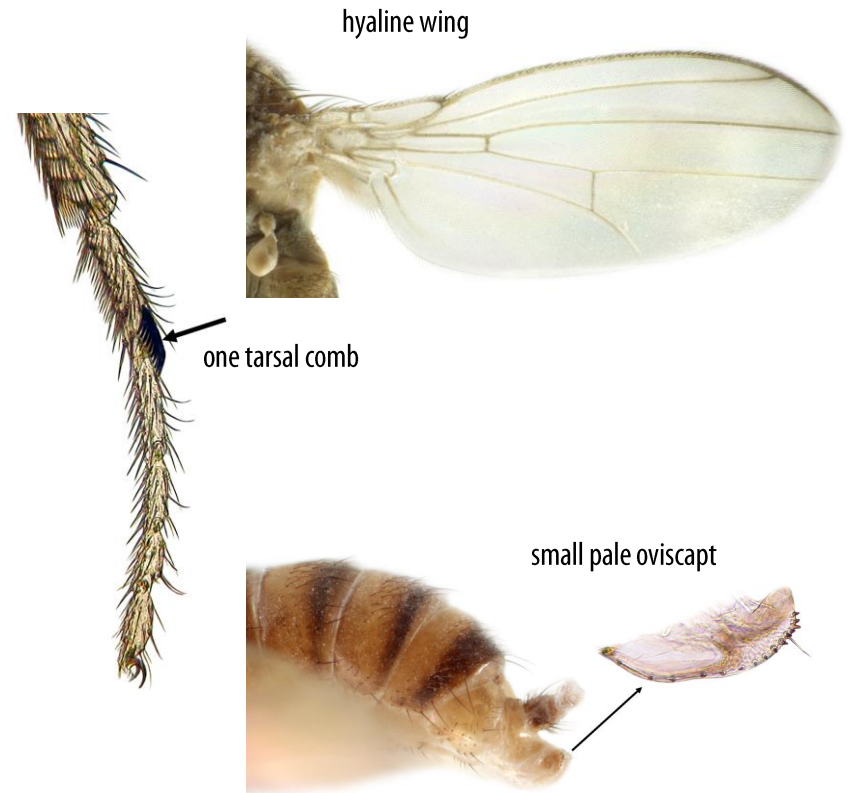


# *Drosophila* Species Key



**21(18').** Male fore tarsus with comb on first and second tarsomere. Males typically with (but sometimes without) infuscation at apices of veins  $R_{2+3}$  and  $R_{4+5}$ , female wing hyaline. Females with large, darkened, serrated oviscapt. . .

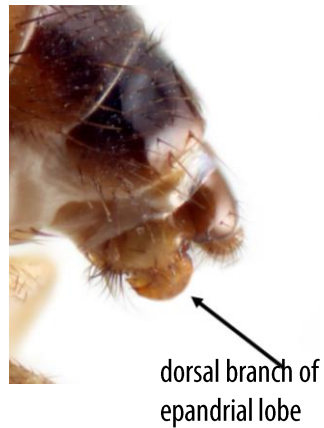
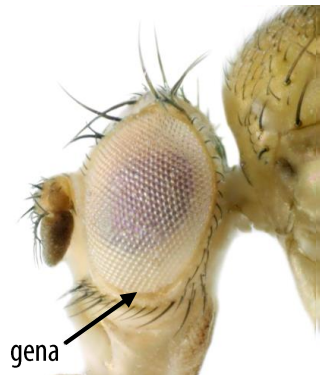
***Drosophila (Sophophora) suzukii* (Matsumura)**



**21'.** Male fore tarsus with comb on first tarsomere only. Wing hyaline. Females with small, pale oviscapt. . . **22.** (High magnification required for identification)

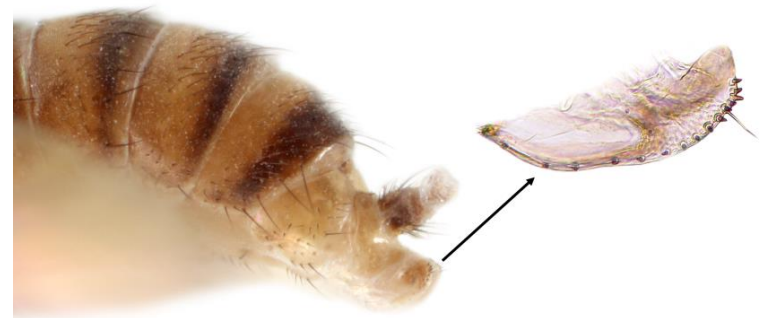
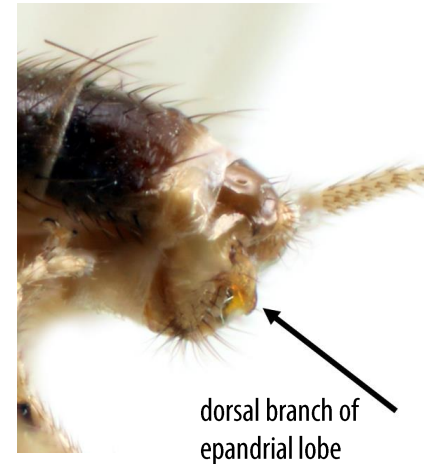


# *Drosophila* Species Key



**22(21').** Gena narrow, about 0.05X of eye diameter. Males with large, rounded, amber-colored lobe of ventral epandrial lobe. Female oviscapt with a dorsal depression. . .

***Drosophila (Sophophora) simulans* Sturtevant**



**22'.** Gena broad, about 0.10X of eye diameter. Male with small, nearly triangular, dorsal lobe of epandrial lobe. Female oviscapt without dorsal depression...

***Drosophila (Sophophora) melanogaster* Meigen**





# *Drosophila* Species Key



**23(14').** (Tergites 2-6 with dark posterior bands narrowly broken at the midline. Wing hyaline . . . **24. (*funebis* species group females)** (High magnification and/or dissection required for identification)



*D. immigrans*



*D. deflecta*



*D. colorata*



*D. virilis*



*D. carsoni*

**Click for all abdominal pattern variations**

**23'.** Tergites 2-6 either with posterior bands narrowly or broadly broken down the midline, pale with round or triangular black spots, or tergites completely dark. Wing with or without infuscate areas. . . **25. (male or female specimens)**

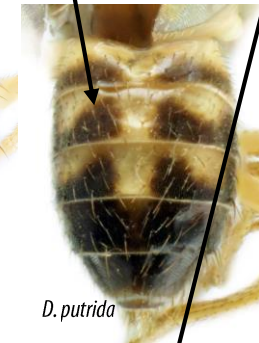
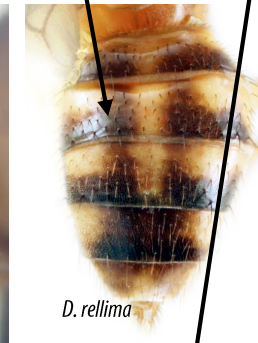
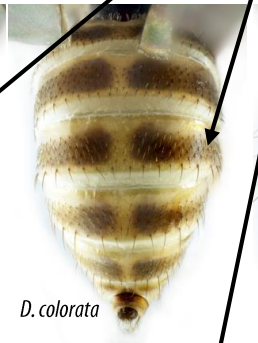




# *Drosophila* Species Key

Tergites completely darkened

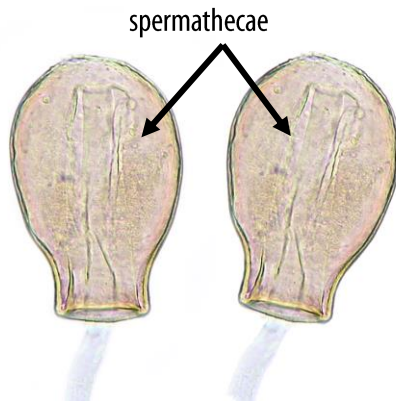
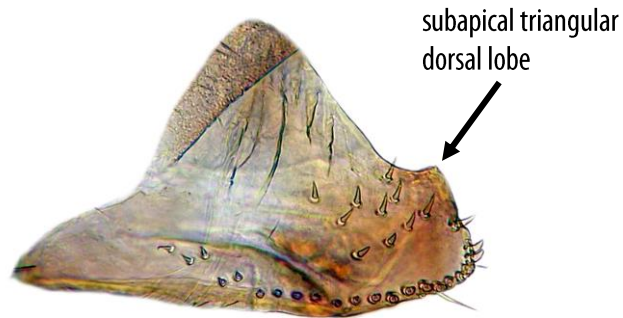
Tergites 2-6 with posterior bands narrowly or broadly broken down the midline



Tergites pale with round or triangular black spots



# *Drosophila* Species Key



24(23'). Oviscap brownish with a small dorsal lobe. Spermatheca with collar at base...

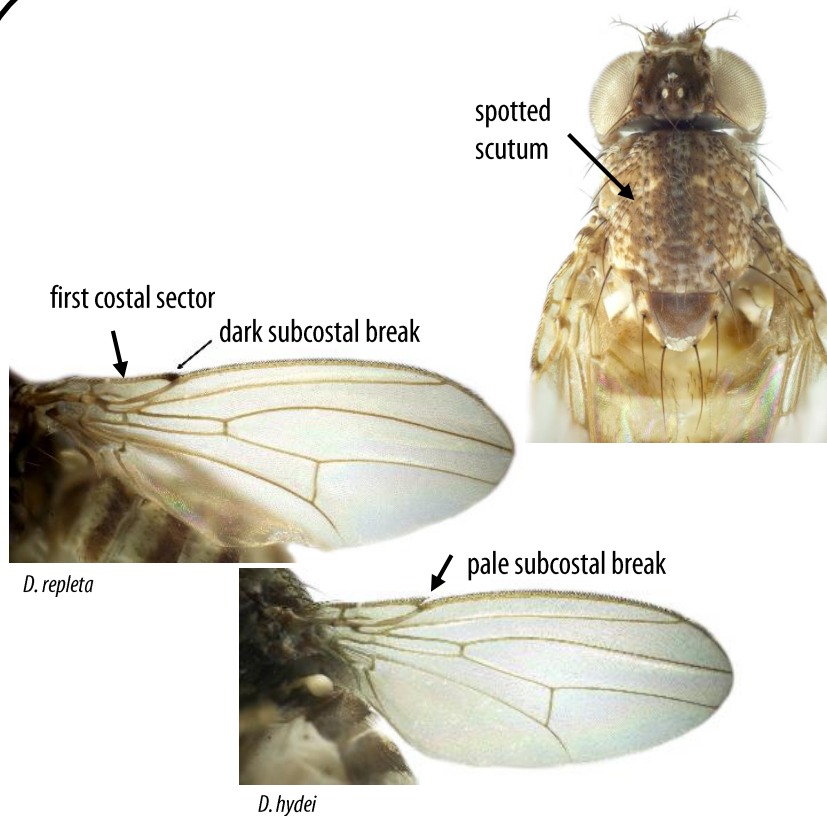
***Drosophila (Drosophila) funebris* Fabricius female**



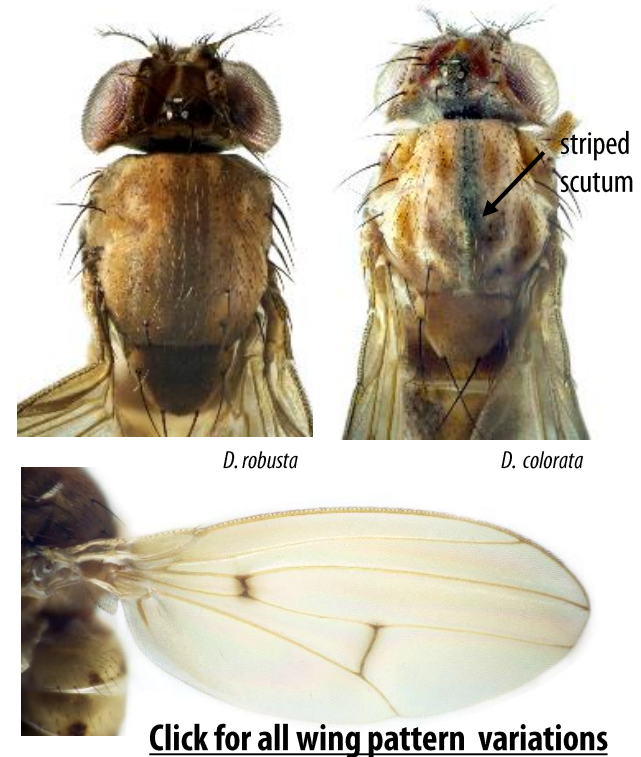
24'. Oviscap without dorsal lobe. Spermatheca base without collar  
... ***Drosophila (Drosophila) macrospina* Stalker & Spencer female**



# Drosophila Species Key



**25(23').** Scutum pale with irregular pattern of dark spots at the bases of setae and setulae. Apical part of first costal sector darkened or pale, wing hyaline. Tergites 2-6 always with dark posterior bands broken at the midline... **26. (*repleta* species group)**



**25'.** Scutum unicolourous (dark or yellowish-brown) or faintly striped, without dark spots at the bases of setae and setulae. Apical part of first costal sector pale, wing with or without infusate crossveins or other areas. Tergites 2-6 with posterior bands broken at the midline, or pale with round or triangular black spots, or tergites completely dark. . . **27.**





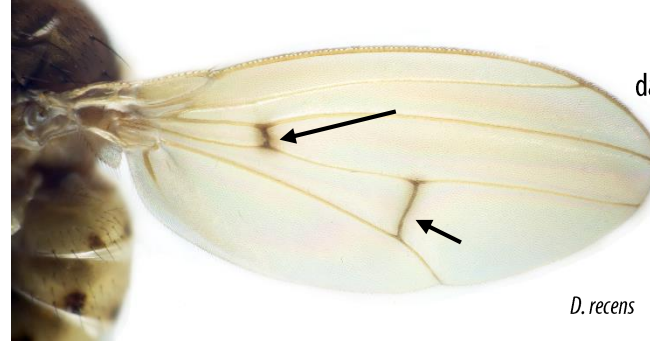
# Drosophila Species Key

hyaline



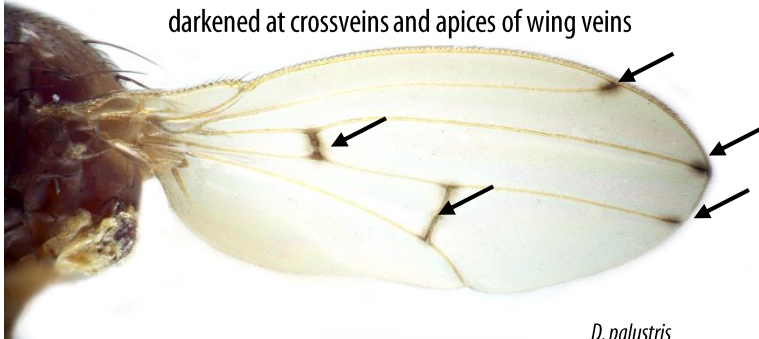
*D. paramelanica*

darkened at crossveins



*D. recens*

darkened at crossveins and apices of wing veins



*D. palustris*

darkened at crossveins and circular spots at apices of wing veins



*D. deflecta*

13 distinct spots

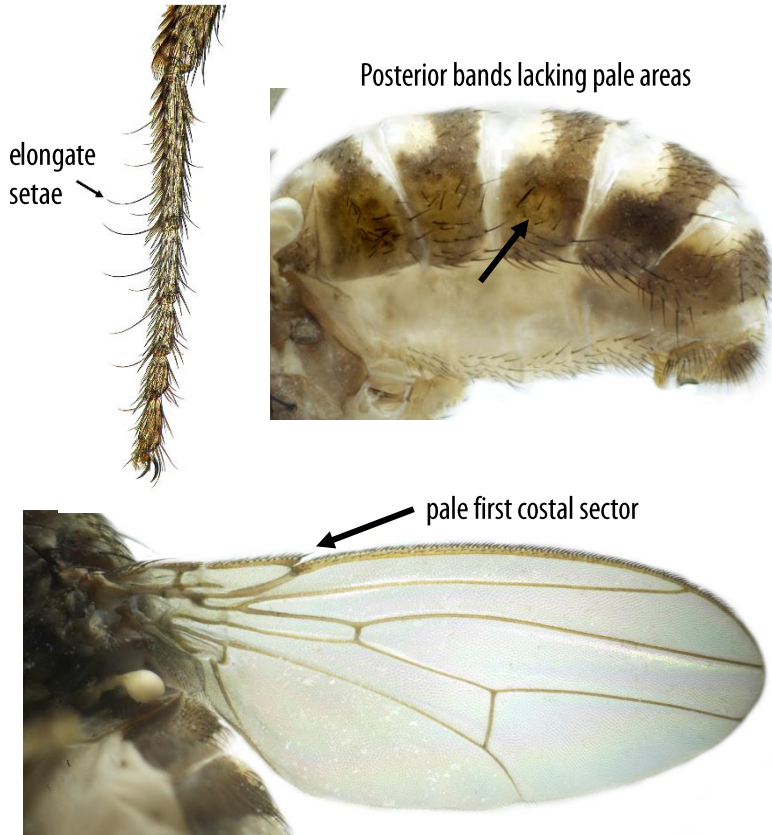


*D. guttifera*





# *Drosophila* Species Key



**26(25').** Male fore tarsus with long, fine, erect setae. Apical part of first costal sector pale. Dark posterior bands on tergites 2-6 without pale areas on lateral surface...

***Drosophila (Drosophila) hydei* Sturtevant**



**26'.** Male fore tarsus without long setae. Apical part of first costal sector darkened. Dark posterior bands on tergites 2-6 with pale areas on lateral surface...

***Drosophila (Drosophila) repleta* Wollaston**



# Drosophila Species Key



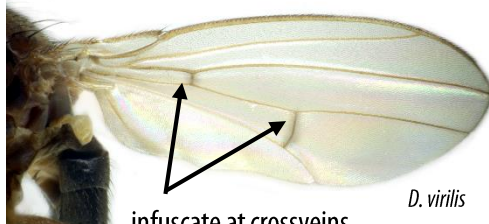
facial carina

*D. virilis*

divergent basal scutellar setae

*D. virilis*

abdomen completely dark



infuscate at crossveins

*D. virilis**D. falleni**D. colorata*

convergent basal scutellar setae



**Click for all wing  
pattern variations**



**Click for all abdominal  
pattern variations**

**27(25').** Dark to light brown flies. Tergites 2-6 completely dark. Facial carina broad, lower part triangular; with a median groove.

Wing with faint infuscation at crossveins. Basal scutellar setae always divergent. . . **28. (*D. virilis* species group)** (dissection required for the identification of male specimens, females indistinguishable)

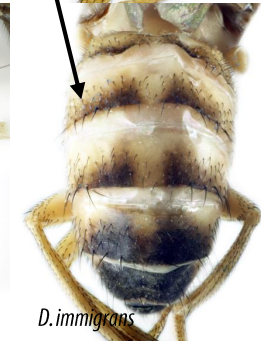
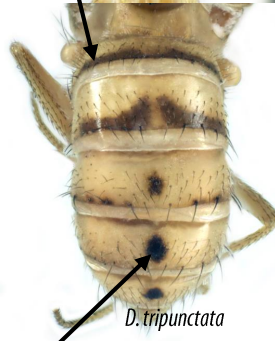
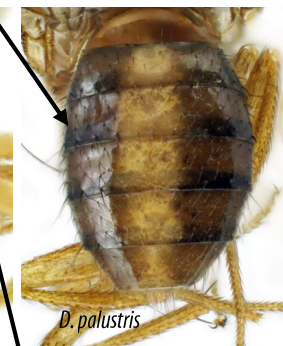
**27'.** Dark brown to yellowish flies. Tergites 2-6 with posterior bands broken at the midline, or pale with round or triangular black spots.

Facial carina narrow with straight edges and without median groove. Wing with or without infuscate crossveins or other areas. Basal scutellar setae convergent or divergent. . . **31.**



# *Drosophila* Species Key

Tergites 2-6 with posterior bands narrowly or broadly broken down the midline



Tergites pale with round or triangular black spots





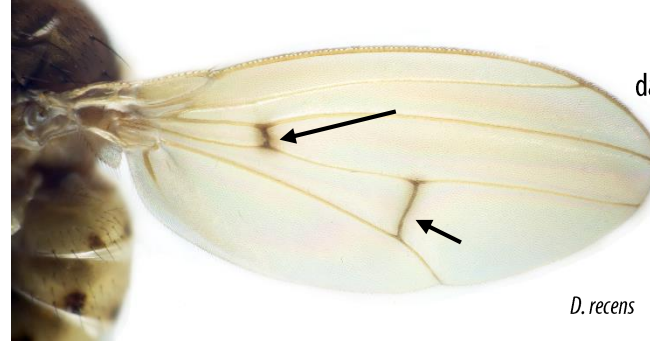
# Drosophila Species Key

hyaline



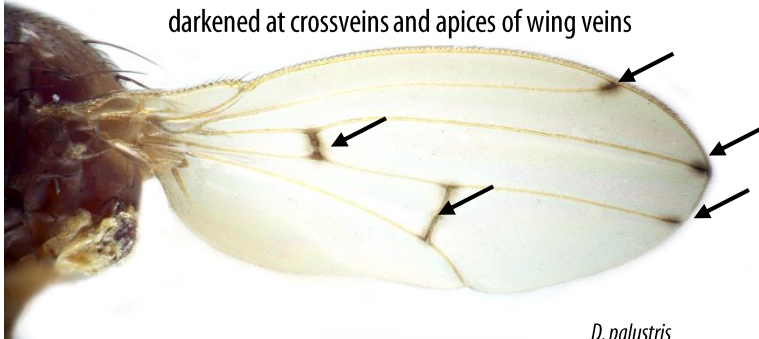
*D. paramelanica*

darkened at crossveins



*D. recens*

darkened at crossveins and apices of wing veins



*D. palustris*

darkened at crossveins and circular spots at apices of wing veins



*D. deflecta*

13 distinct spots

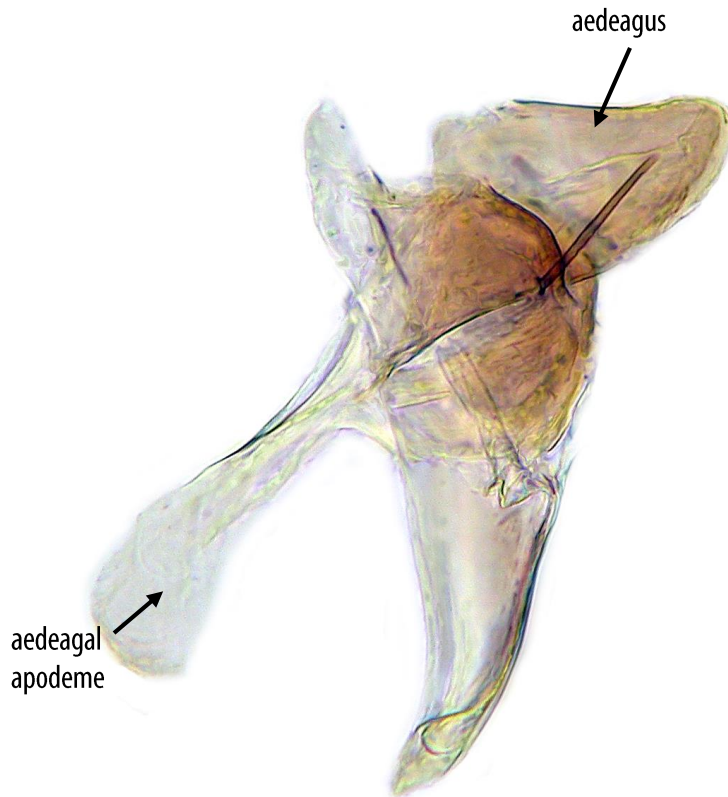


*D. guttifera*

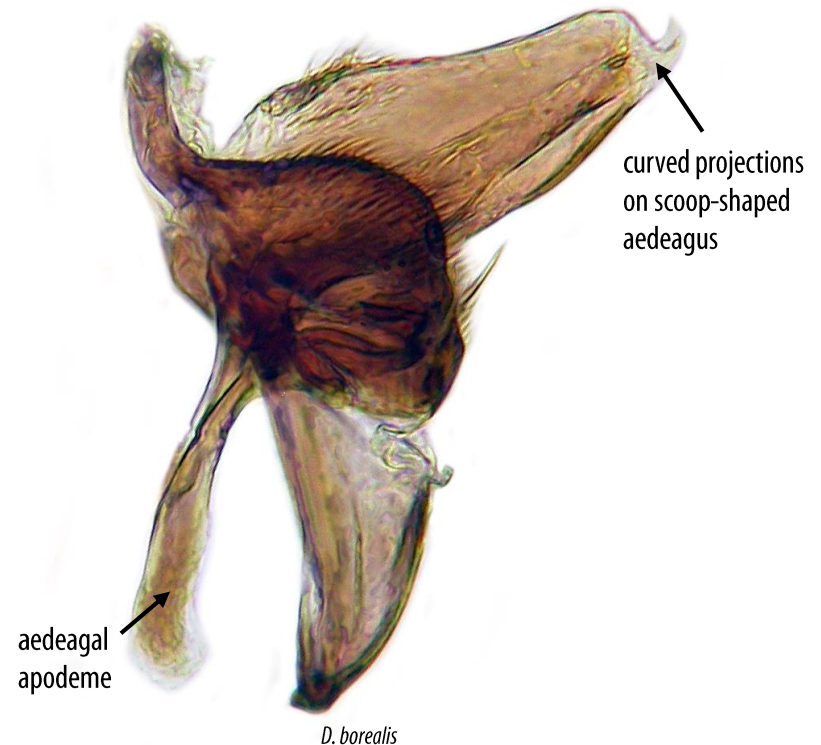




# *Drosophila* Species Key



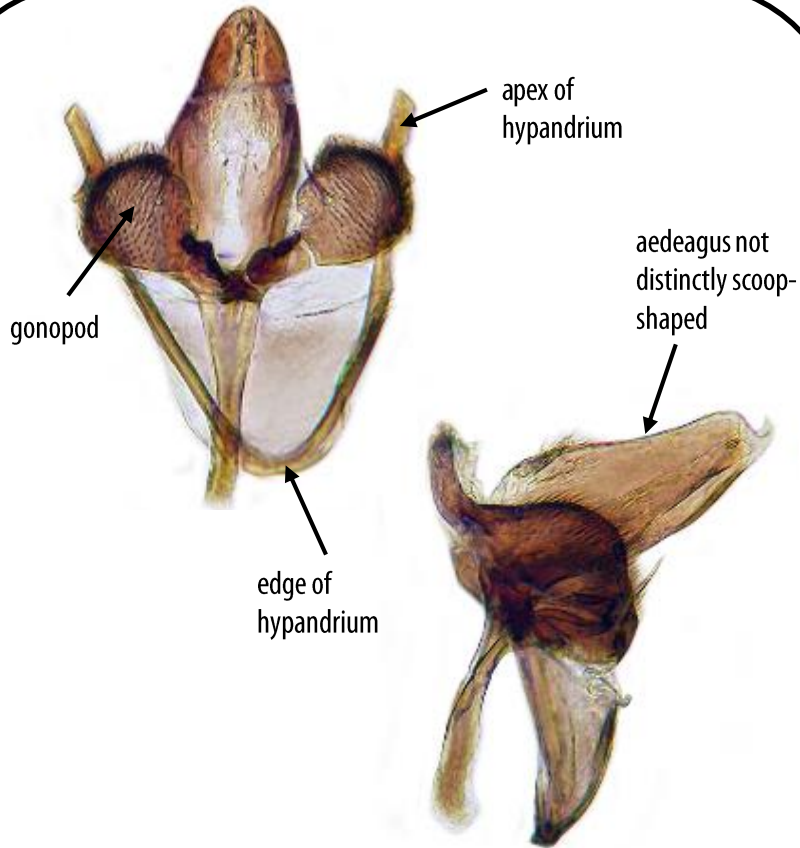
**28(27').** Aedeagus short and broad in lateral view, hooked projections at apex of aedeagus minute; aedeagal apodeme broad, fan-like . . . ***Drosophila (Drosophila) virilis* Sturtevant**



**28'.** Aedeagus narrower in lateral view, scoop-shaped, with 2 large hooked projections at apex; aedeagal apodeme narrow. . . **29.**

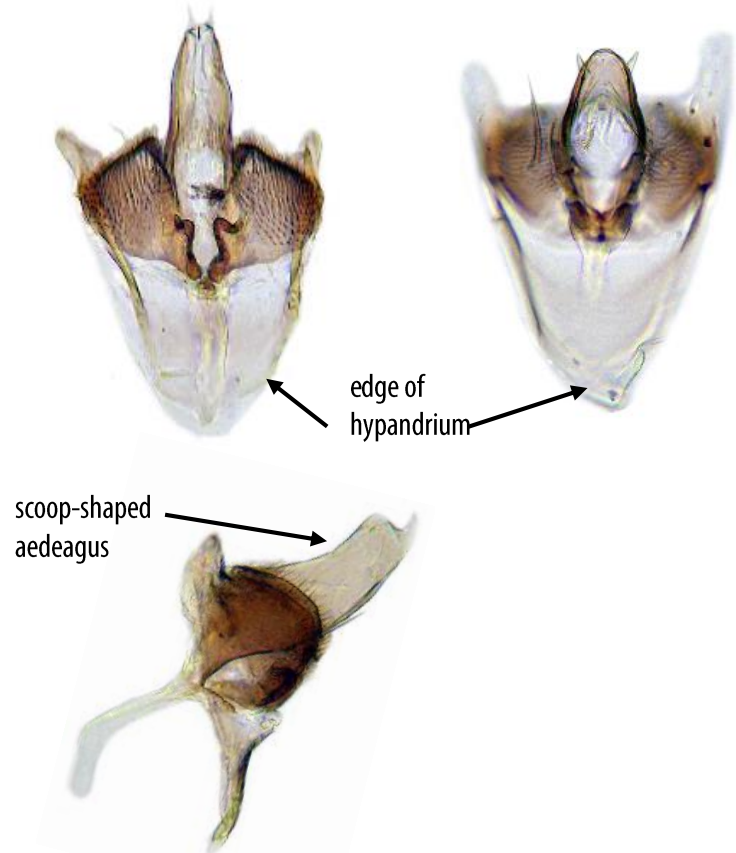


# *Drosophila* Species Key



**29(28').** Gonopod and hypandrium sclerotized, posterolateral projection of hypandrium peg-like and blunt at apex; gonopod rounded; aedeagus only slightly scoop-shaped, dorsolateral margins not emarginate . . .

***Drosophila (Drosophila) borealis* Patterson**



**29'.** Gonopod and edge of hypandrium membranous; gonopod slightly triangular; aedeagus distinctly scoop-shaped, with emarginate dorsolateral margins. . . **30.**

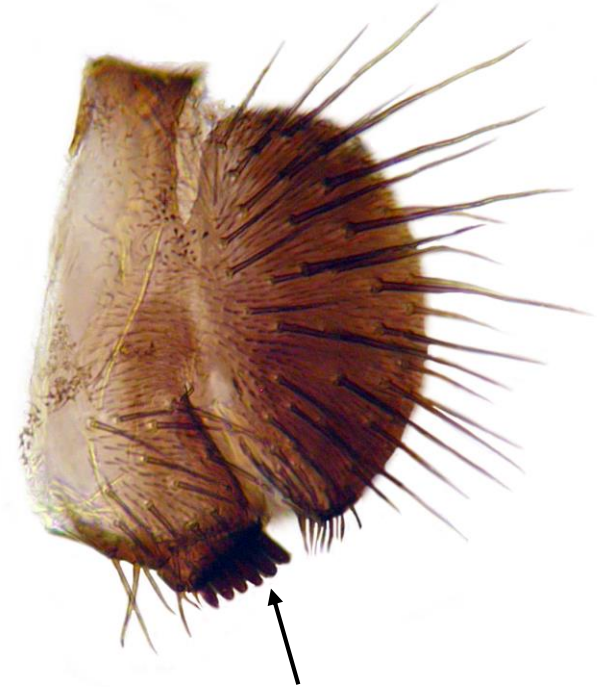


# *Drosophila* Species Key



prenisetae

**30(29').** Surstylus usually with 5 prenisetae ...  
***Drosophila (Drosophila) laticola* Patterson**

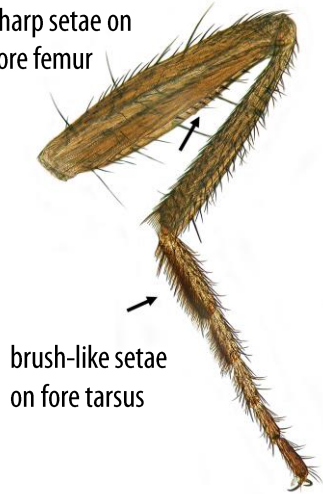


**30'.** Surstylus usually with 6-7 prenisetae... ***Drosophila***  
***(Drosophila) americana* Spencer**



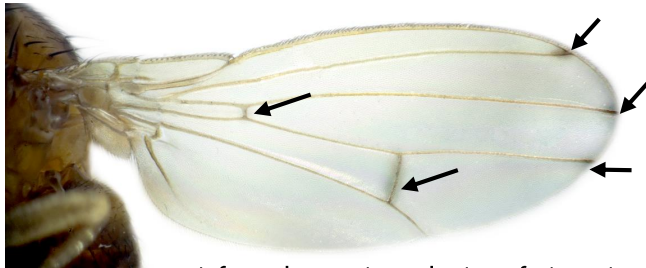
# Drosophila Species Key

sharp setae on  
fore femur



brush-like setae  
on fore tarsus

diffuse  
triangular  
bands on  
abdomen



infuscated crossveins and apices of wing veins

**31(27').** Fore femur with a row of small, dark, spinule-like setae, male fore tarsus with thick ventral brush of fine setae. Wing always infuscate at crossveins and apices of veins. Tergites 2-6 pale with diffuse triangular posterior bands that do not reach the lateral margin. . . ***Drosophila (Drosophila) immigrans* Sturtevant**

fore tarsus  
without  
brush



**Click for all abdominal  
pattern variations**



**Click for all wing  
pattern variations**



**31'.** Fore femur with only uniformly small setae, no spinules; male fore tarsus without ventral brush. Wing with or without infuscate areas. Tergites 2-6 with posterior bands broken at the midline, or with round dark spots. If diffuse triangular bands are present, then reaching the lateral edge of the tergites . . . **32.**





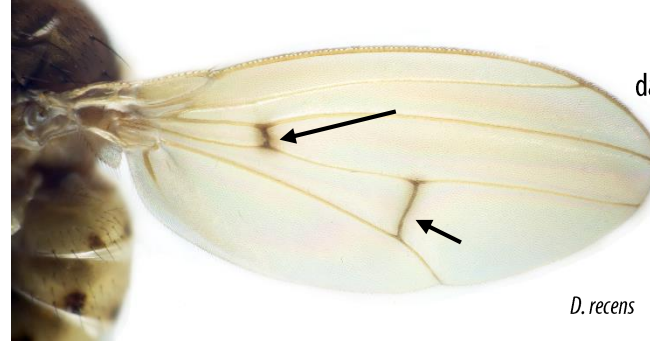
# *Drosophila* Species Key

hyaline



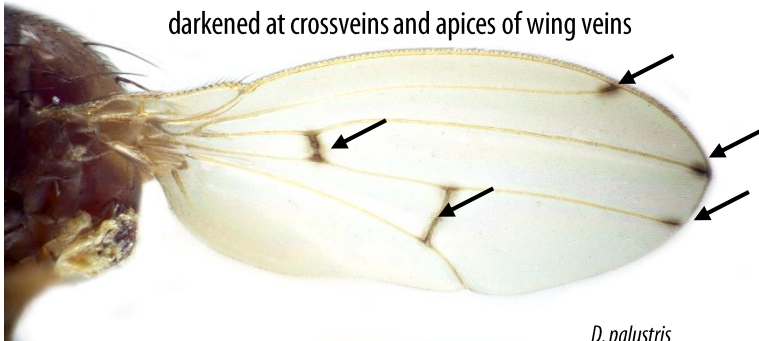
*D. paramelanica*

darkened at crossveins



*D. recens*

darkened at crossveins and apices of wing veins



*D. palustris*

darkened at crossveins and circular spots at apices of wing veins



*D. deflecta*

13 distinct spots

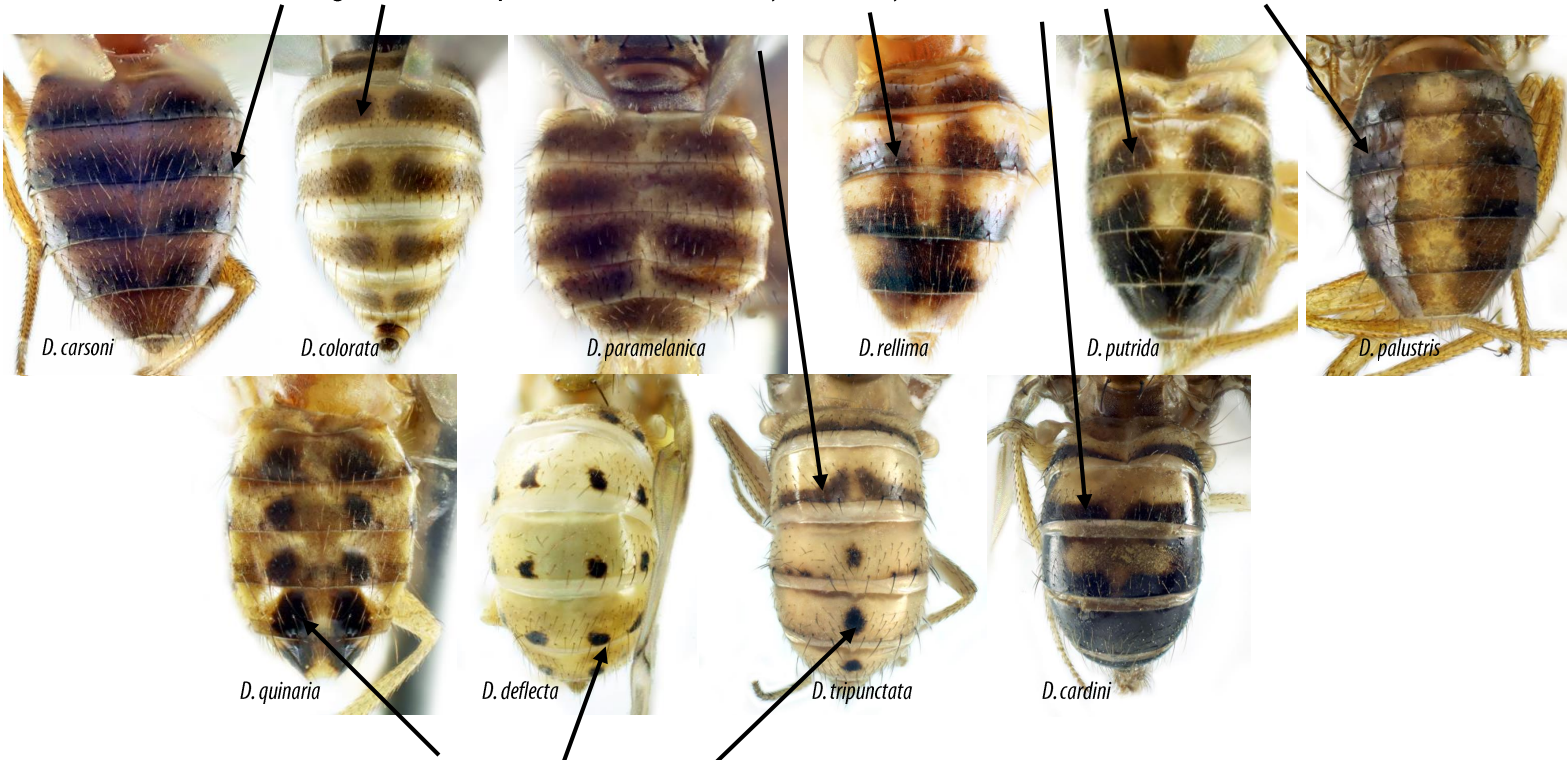


*D. guttifera*



# *Drosophila* Species Key

Tergites 2-6 with posterior bands narrowly or broadly broken down the midline



Tergites pale with round or triangular black spots



# Drosophila Species Key

presutural acrostichal setae



*D. neotestacea*



*D. putrida*

presutural acrostichal setae



*D. putrida*

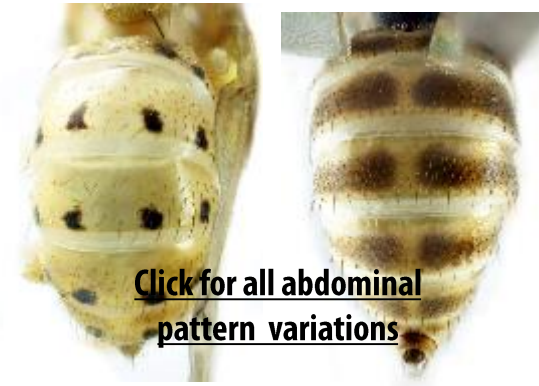


*D. putrida*

**32(31')**. Mesonotum with a pair of presutural setae (between rows 2-5), presuturals fine and erect or stout and decumbent. Wing hyaline. Tergites varying from four spots on each to tergites 2-4 with dark posterior bands broken at the midline and tergites 5-6 completely darkened. . . **33. (testacea species group)**



*D. robusta*



**Click for all abdominal pattern variations**

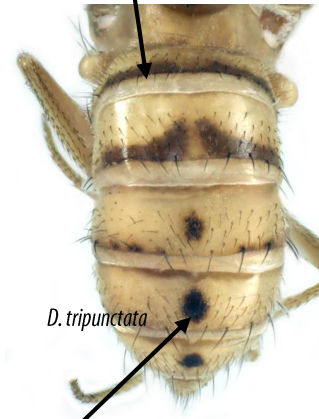
**32'**. Mesonotum without presutural setae. Wing uniformly hyaline or with infusate areas. Tergites with posterior bands broken at midline, or with dark spots. If tergites 5-6 completely darkened, then wing with infusate areas. . . **34.**





# *Drosophila* Species Key

Tergites 2-6 with posterior bands narrowly or broadly broken down the midline



Tergites pale with round or triangular black spots





# *Drosophila* Species Key



large, flat,  
serrated lobes on  
apex of aedeagus



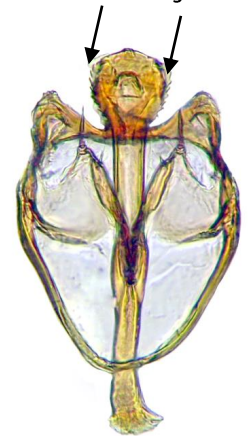
presutural acrostichal setae

**33(32').** Presutural setae short, thick, always decumbent. Aedeagus with 2 large, flat, apically pointed, serrated lobes; apex with deep medium cleft... ***Drosophila (Drosophila) putrida* Sturtevant**

presutural  
acrostichal setae



rounded corners  
at apex of  
aedeagus



**33'.** Presutural acrostichal setae long, fine, slightly sinuate, usually erect. Apex of aedeagus blunt, with rounded corners... ***Drosophila (Drosophila) neotestacea* Grimaldi, James & Jaenike**



# Drosophila Species Key



*D. robusta*



*D. colorata*



*D. paramelanica*



*D. colorata*



*D. carsoni*

**34(32').** Mesonotum unicolourous dark brown or reddish-brown, with median dark stripe bordered by diffuse, variable, reddish-brown interrupted stripes. Wing hyaline. Tergites 2-6 pale, to dark brown with dark brown-black posterior bands broken at the midline. ... **35.**



*D. cardini*



*D. guttifera*



[Click for all wing pattern variations](#)



[Click for all abdomen pattern variations](#)

**34'.** Mesonotum unicolourous reddish brown, sometimes with faint longitudinal stripes. Wing infusate at crossveins or elsewhere, with up to 13 infusate spots. Tergites 2-6 with brownish-black bands broken at the midline (tergites 5 & 6 sometimes completely darkened), completely brownish with a diffuse pale area at the midline, or pale with black spots

... **40.**



# *Drosophila* Species Key

Tergites 2-6 with posterior bands narrowly or broadly broken down the midline



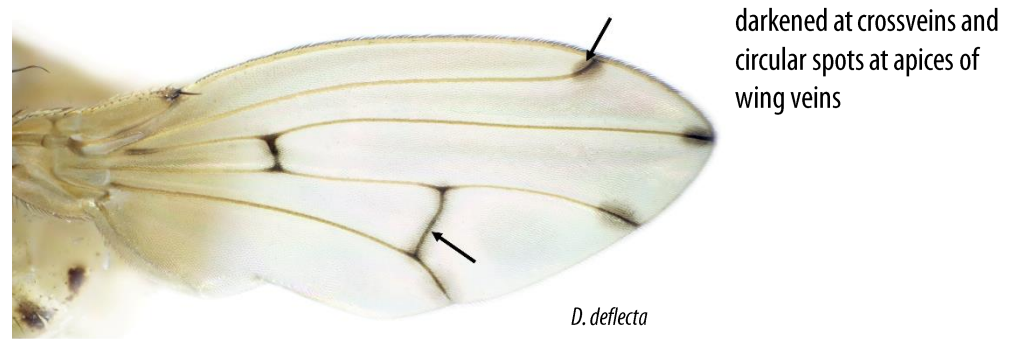
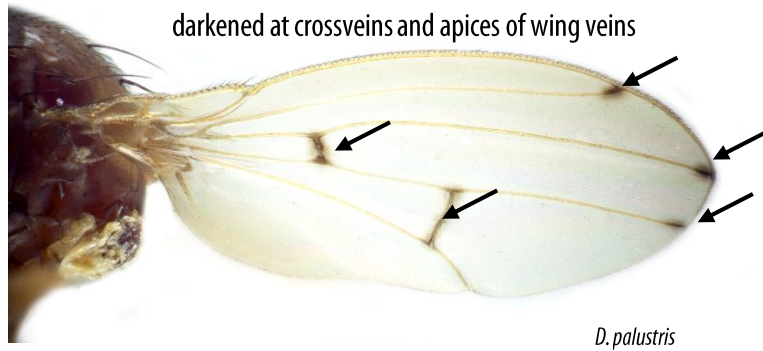
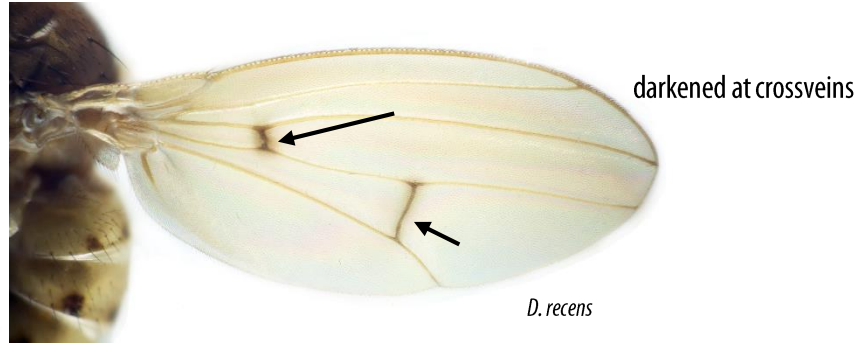
Tergites pale with round or triangular black spots





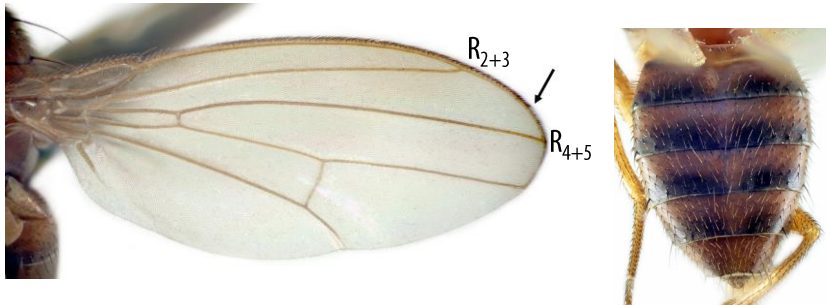


# *Drosophila* Species Key

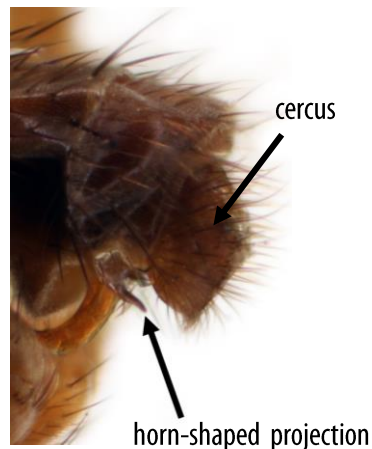




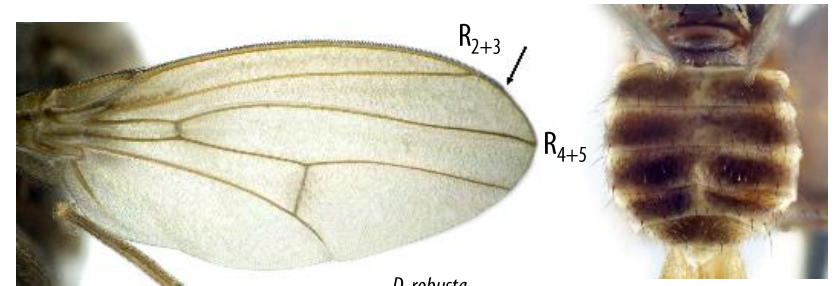
# Drosophila Species Key



lack of long fine setae



**35(34').** Dark setulae on costa extending almost to apex of wing vein  $R_{4+5}$ . Tergites 2-6 dark, with blackish brown posterior bands interrupted at the midline. Male with large, distinct finger-like projection on ventral lobe of epandrium. Males without long, fine setae on inner (medial) surface of antennal pedicel ... ***Drosophila (Drosophila) carsoni* Wheeler**



*D. robusta*

*D. paramelanica*



long fine setae *D. robusta*

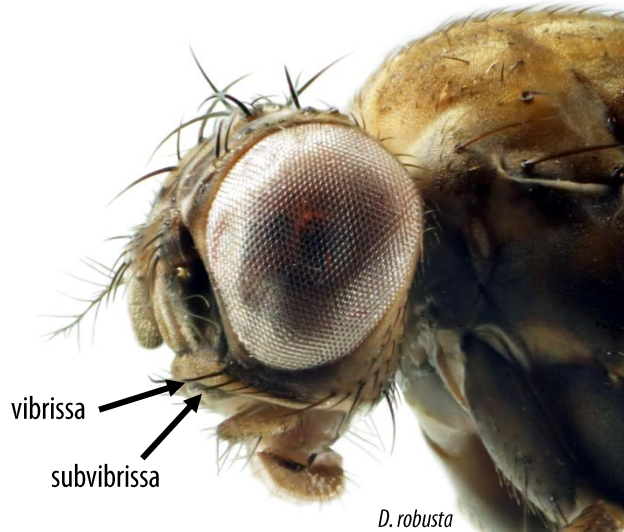


*D. paramelanica*

**35'.** Dark setulae on costa ending just after apex of wing veins  $R_{2+3}$ . Tergites light brown, with dark brown posterior bands interrupted at the midline. Male surstylus without large, horn-shaped projection. Males with long, fine setae on inner (medial surface) of antennal pedicel ... **36.**



# *Drosophila* Species Key



*D. robusta*

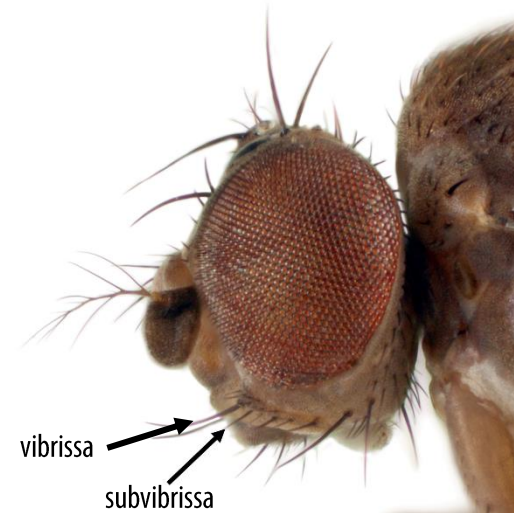


*D. robusta*



*D. colorata*

**36(35').** Large flies (2.5 to 4.2 mm). Subvibrissa at least half as long as vibrissa. Mesonotum unicolourous dark brown or reddish-brown, with diffuse, median dark stripe bordered by faint, variable, reddish-brown, interrupted stripes... **37. (*robusta* species group)**



*D. paramelanica*

**36'.** Small flies (2.2 to 3.5 mm). Subvibrissa less than half as long as vibrissa. Mesonotum always unicolourous brown to blackish brown. Dissection required for identification of male specimens. Females indistinguishable ... **38. (*melanica* species group)**





# *Drosophila* Species Key



carina



gena



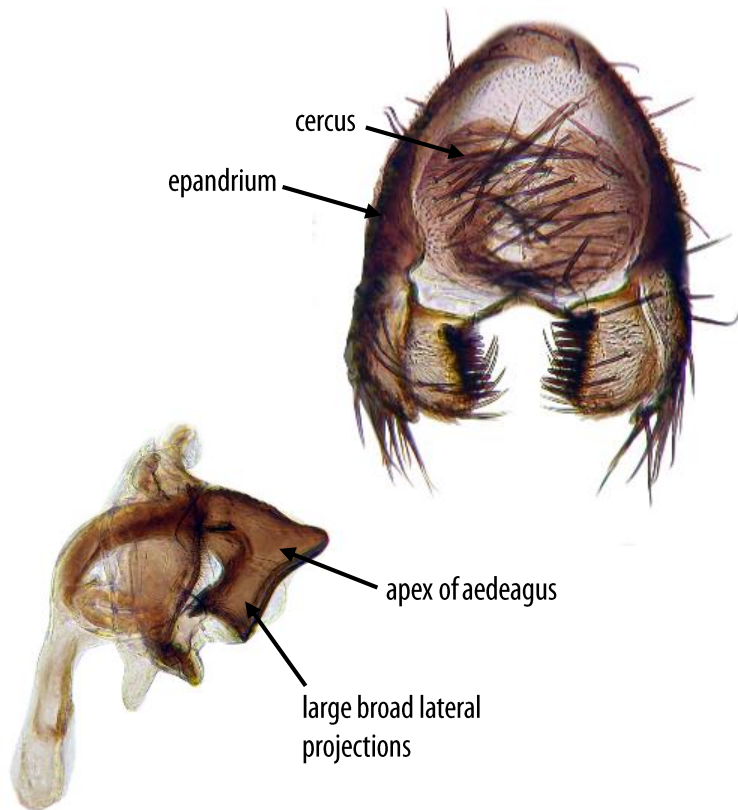
**37(36').** Reddish-brown flies. Facial carina deeply sulcate. Gena broader than in *D. robusta*, 0.17-0.25X diameter of the eye at greatest vertical height. Mesonotum unicolourous dark brown or reddish-brown, with diffuse median dark stripe bordered by faint, variable, reddish-brown interrupted stripes . . . ***Drosophila***  
***(Drosophila) colorata* Walker**



**37'.** Brown flies. Facial carina slightly concave. Gena narrower than in *D. colorata*, 0.10-0.15X diameter of eye at greatest vertical height. Mesonotum brown, sometimes with wide diffuse dark stripe. . . ***Drosophila (Drosophila) robusta* Sturtevant**

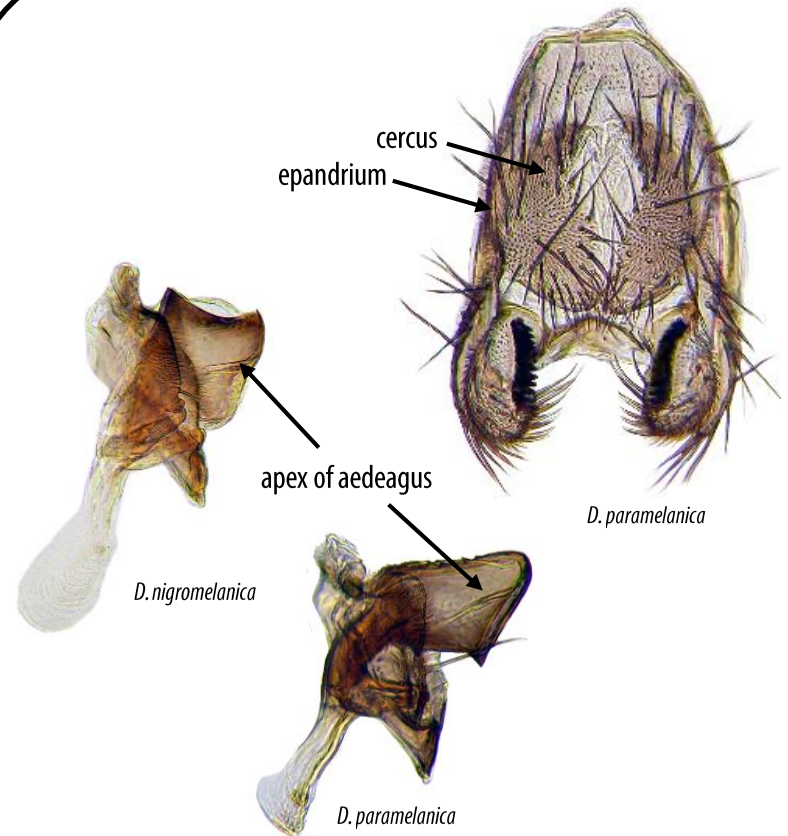


# *Drosophila* Species Key



**38(36')**. Epandrium and cercus dark brown, epandrium with 14-16 lower setae. Surstylus with 9-11 prenisetae arranged in a straight row. Aedeagus with 2 large, broad, apically flattened lateral projections at the apex...

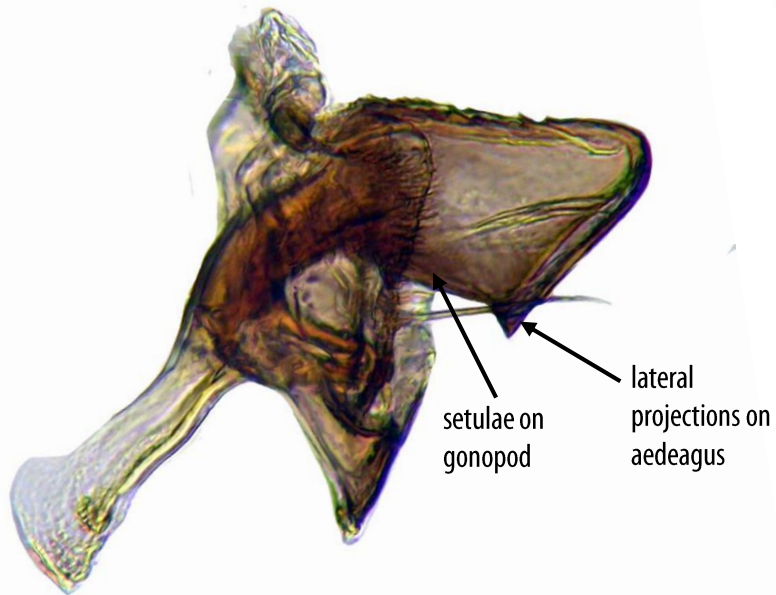
***Drosophila (Drosophila) melanura* Miller**



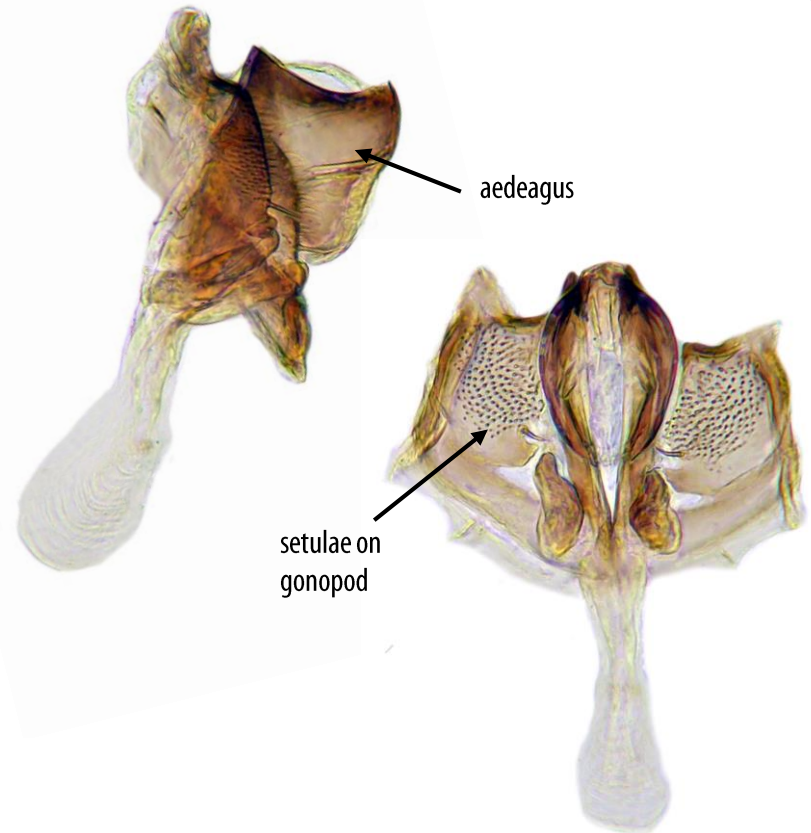
**38'**. Epandrium and cercus light brown; epandrium with 11-14 lower setae. Surstylus with 12-15 prenisetae arranged in a straight or convex row. Apex of aedeagus with two small triangular lateral projections at apex, or without lateral projections... **39.**



# *Drosophila* Species Key



**39(38').** Apex of aedeagus with two small, triangular lateral projections on rounded posteroventral margin. Gonopod with a long setula. . . ***Drosophila (Drosophila) paramelanica* Patterson**

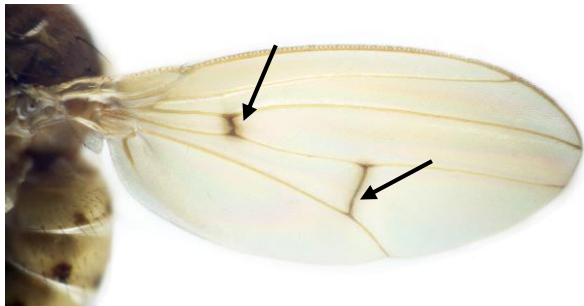


**39'.** Apex of aedeagus not rounded on posterodorsal margin, axe-shaped. Gonopod with a short setula. . . ***Drosophila nigromelanica* Patterson & Wheeler**





# *Drosophila* Species Key



**40(34')**. Thorax reddish brown. Abdomen shiny and polished, with black posterior bands on tergites 1-4, posterior bands taper dorsally and are broken down the midline, tergites 5 & 6 completely dark.

Wing infusate at crossveins only. . .

***Drosophila (Drosophila) cardini* Sturtevant**



[Click for all wing pattern variations](#)



*D. palustris*



*D. deflecta*



*D. rellima*

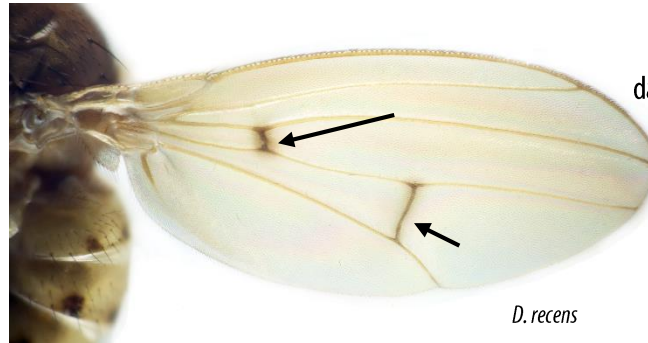


*D. tripunctata*

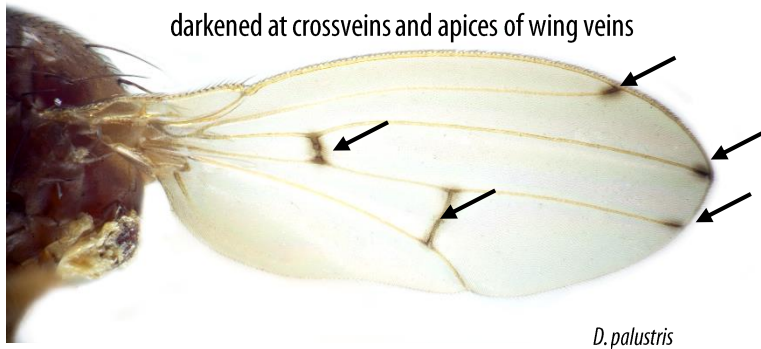
**40'**. Thorax yellowish. Abdomen only slightly shiny with tergites 2-6 with dark posterior bands broken at the midline, tergites pale with black spots or abdomen entirely brown with diffuse pale stripe at the midline. Wings infusate only at crossveins, or at crossveins and elsewhere, with up to 13 dark spots. . . **41.**



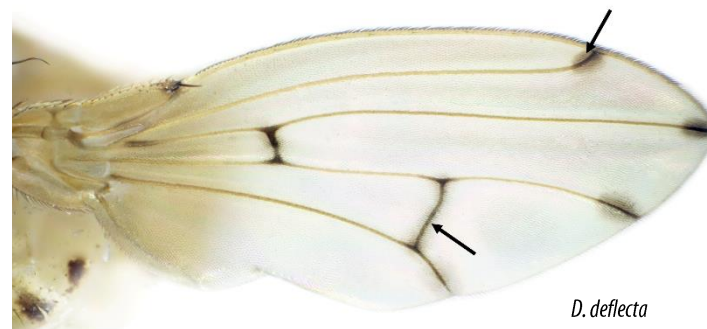
# *Drosophila* Species Key



*D. recens*



*D. palustris*



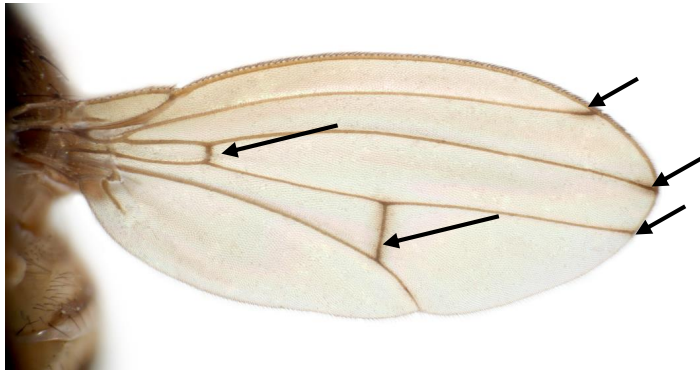
*D. deflecta*



*D. guttifera*



# Drosophila Species Key



**41(40').** Wing infuscated at crossveins and apex of veins. Abdominal tergites 2-3 with dark, narrow, posterior bands broken at the midline, tergites 4-6 each with a dark spot on the midline, forming a dotted line of 3 spots... ***Drosophila (Drosophila) tripunctata* Loew**



[Click for all wing pattern variations](#)



*D. rellima*



*D. palustris*



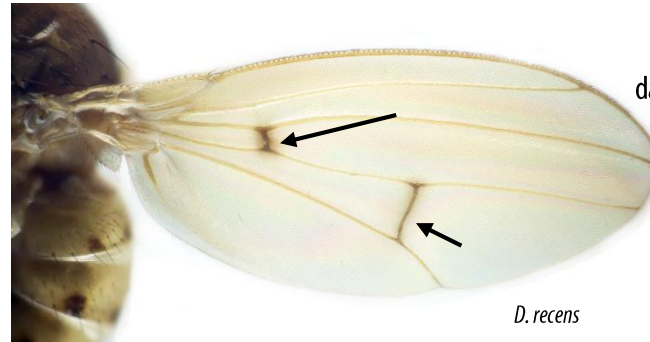
*D. deflecta*

**41'.** Wing infuscated at crossveins, apices of veins, or elsewhere, with up to 13 distinct spots. Tergites 2-6 with dark posterior bands broken at the midline, tergites pale with black spots or abdomen entirely brown with diffuse pale stripe at the midline... **42. (*quinaria* species group)**

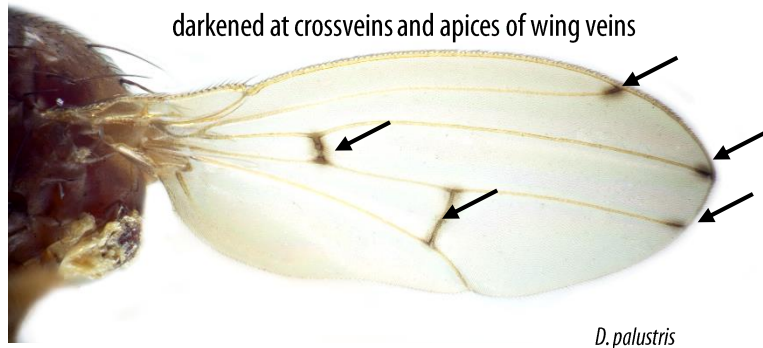




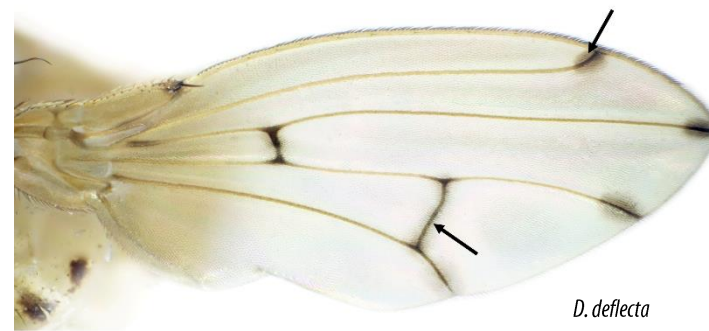
# *Drosophila* Species Key



*D. recens*



*D. palustris*



*D. deflecta*

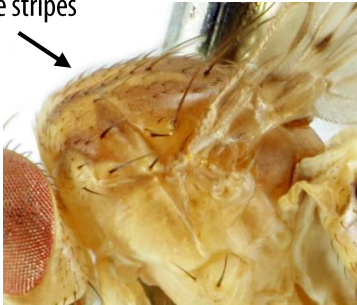


*D. guttifera*



# *Drosophila* Species Key

diffuse stripes



13 spots on wing

**42(41').** Mesonotum with diffuse dark stripes. Wing patterned with dark spots on crossveins and membrane, with up to 13 distinct spots  
... ***Drosophila (Drosophila) guttifera* Walker**



infusate at crossveins

*D. recens*



infusate at crossveins and apices of wing veins

*D. palustris*

**42'.** Thorax unicolourous yellowish brown. Wing infusate at crossveins, with or without infuscation at apices of veins ... **43.**



# *Drosophila* Species Key

infusate at crossveins and apices of wing veins



**43(42')**. Wing crossveins and apices of veins infusate. Tergites 2-6 brownish, broken down the midline, separated by a broad pale area  
... ***Drosophila (Drosophila) palustris* Spencer**



infusate at crossveins

*D. recens*

infusate at crossveins and apices of wing veins



*D. quinaria*



*D. rellima*



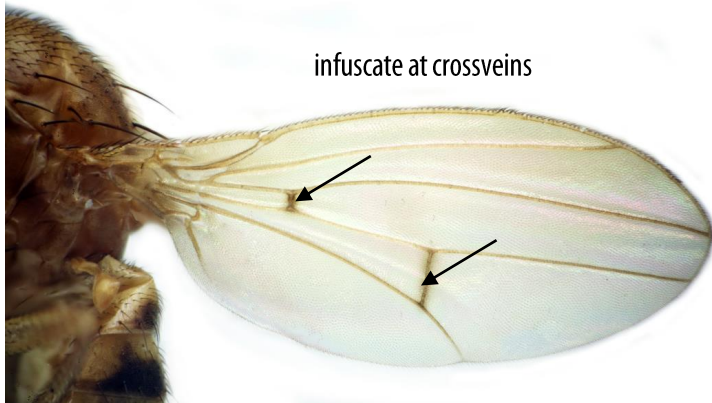
*D. deflecta*

**43'**. Wing crossveins infusate, apices of veins with or without infuscation. Tergites 2-6 pale, with posterior bands forming triangular patches towards the midline, or with pairs of spots... **44.**





# *Drosophila* Species Key



**44(43').** Wing crossveins infusate. Tergites 2-6 with posterior bands forming pairs of triangular patches towards the midline...

***Drosophila (Drosophila) rellima* Wheeler**



**44'. -** Wing crossveins infusate, apices of veins with or without infuscation . Tergites with pairs of dark spots (dissection required if wing features not visible) . . . **45.**



# *Drosophila* Species Key

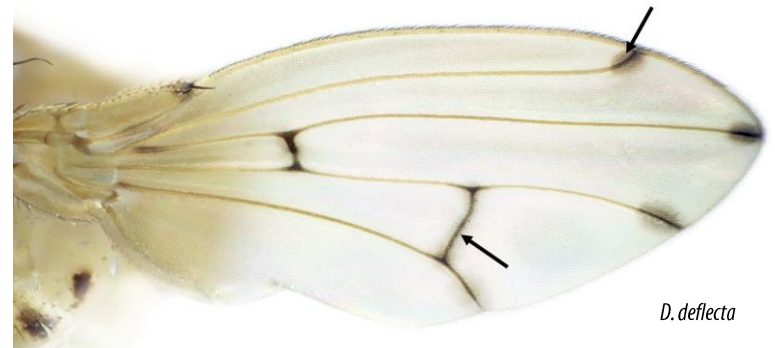


*D. falleni*

**45(46').** Wing crossveins infusate but not vein tips (dissection or high magnification required for species identification) . . . **46.**



*D. quinaria*

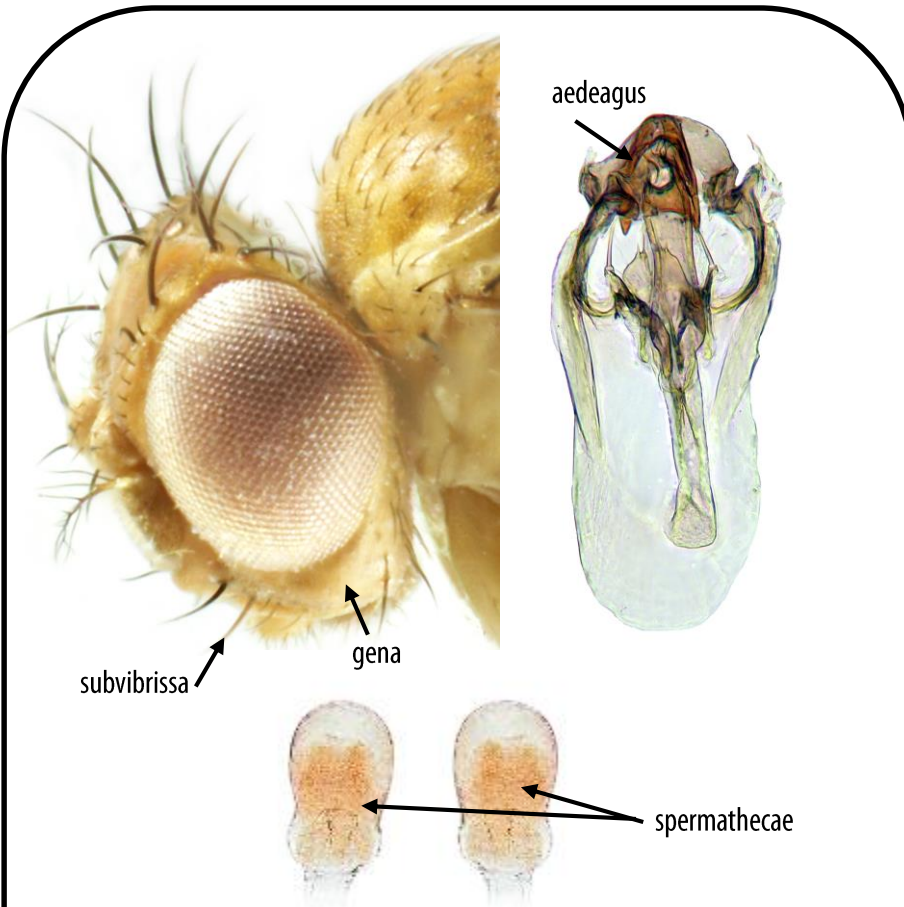


*D. deflecta*

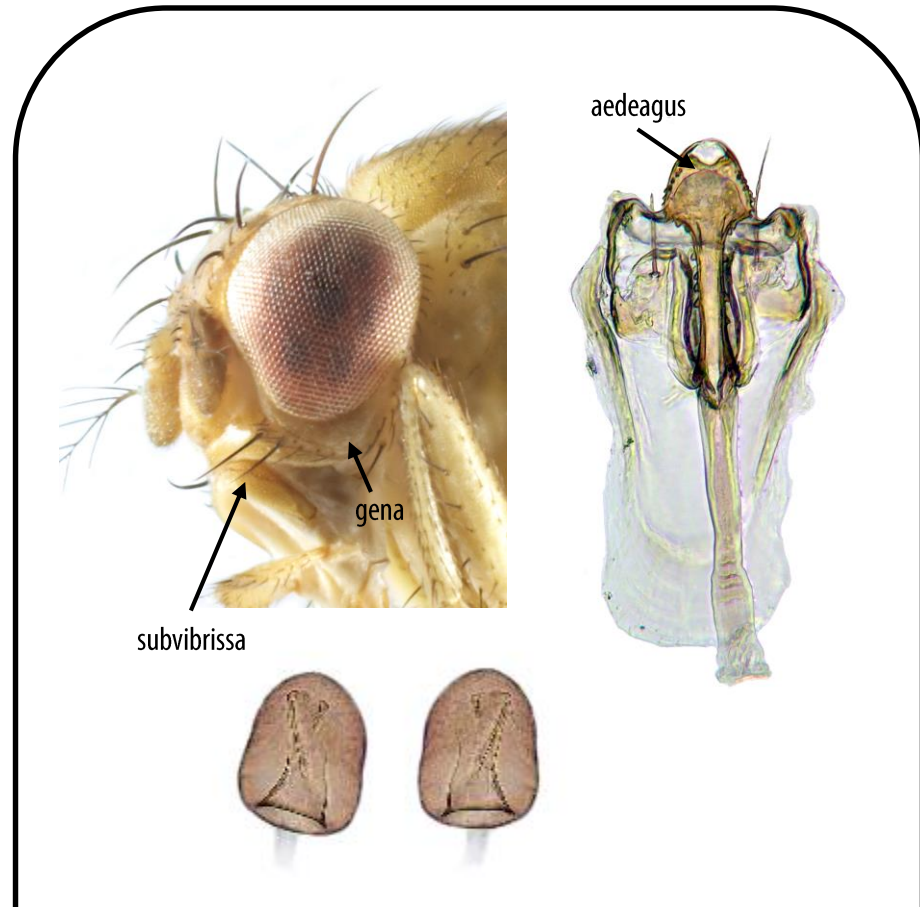
**45'.** Wing crossveins and apices of veins infusate (dissection or high magnification required to identify female specimens) . . . **47.**



# *Drosophila* Species Key



**46(45').** Subvibrissa thinner than vibrissa, slightly shimmering and gold in colour. Apex of aedeagus with two posterior-pointed projections. Spermatheca narrowed medially. . . *Drosophila*  
*(Drosophila) falleni* Wheeler

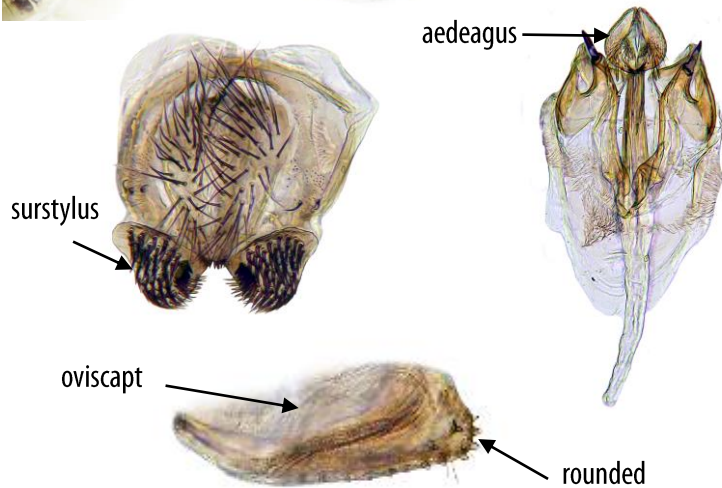
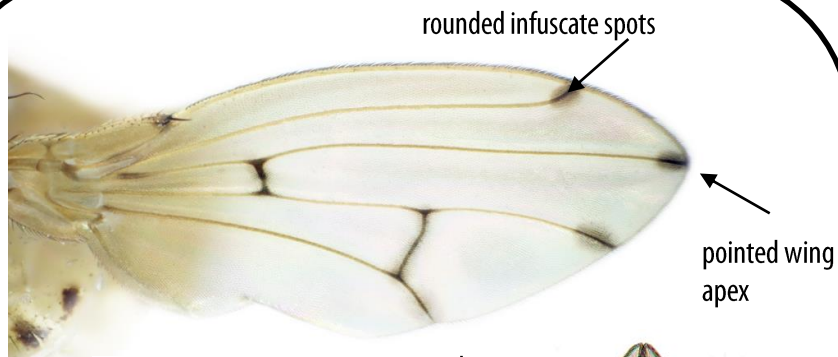


**46'.** Subvibrissa as thick as vibrissa, dark in colour. Apex of aedeagus with small scales on lateral margins. Spermatheca oval ...  
*Drosophila (Drosophila) recens* Wheeler



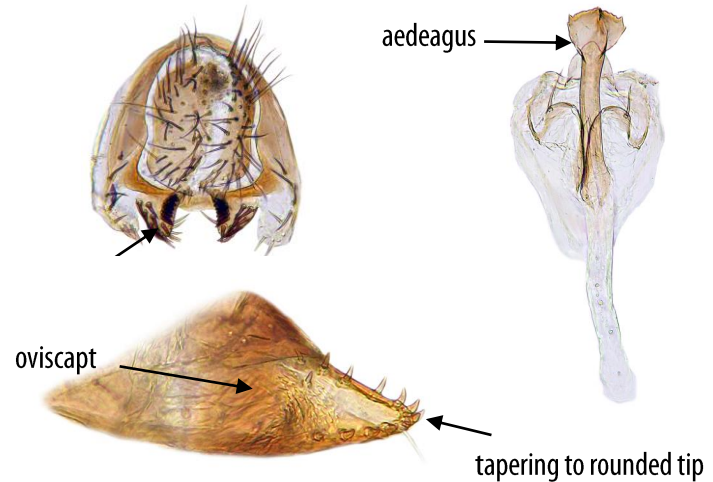
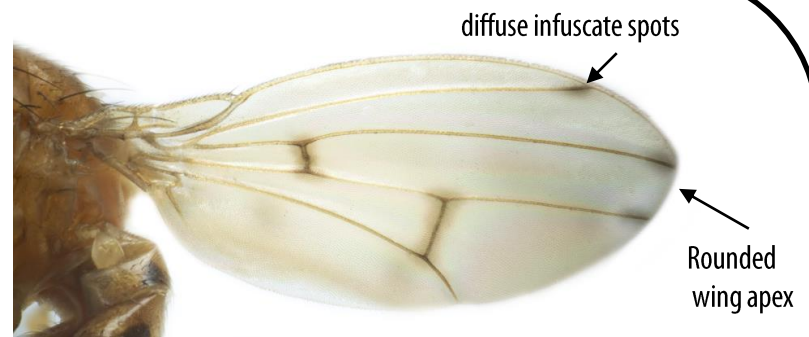


# Drosophila Species Key



**47(45').** Wing crossveins and apices of veins with distinct round, dark spots, crossvein dm-cu distinctly bent. Apex of wing pointed. Surstylus completely covered with dense setae. Aedeagus round at apex, drop-shaped in posterior view. Oviscapt distally rounded . . .

***Drosophila (Drosophila) deflecta* Malloch**



**47'.** Wing crossveins and apices of veins with diffuse infusate spots, crossvein dm-cu relatively straight. Apex of wing rounded. Surstylus with outer setae on lower posterior surface. Aedeagus widening apically, fishtail-shaped at apex. Oviscapt tapering distally to rounded tip. . . ***Drosophila (Drosophila) quinaria* Loew**



# *Drosophila busckii* Coquillett

*Drosophila (Dorsilopha) busckii* Coquillett 1901



**Species Diagnosis:** Yellowish flies, mesonotum and pleuron narrow dark stripes, stripes on mesonotum trident-shaped; prescutellar setae absent. Tergites with dark posterior bands broken at the midline and laterally.



Biology



Key Characters



Distribution



Terminalia



# *Drosophila busckii* Coquillet

## Key Characters



Pleuron with narrow dark stripes.



Mesonotum with narrow dark stripes, stripes on mesonotum trident-shaped; prescutellar setae absent.



Tergites with dark posterior bands broken down the midline and laterally.





# *Drosophila busckii* Coquillet

## Biology

A cosmopolitan species, originally from southeast Asia. Larvae have been reared from a diverse range of rotting organic materials including rotting onions, eggs, milk, potatoes, mushrooms and butternut hulls (Bächli & Burla 1967; Escher et al., 2006; Malloch & McAtee, 1924; Seguy, 1934). Adults can be attracted to fermenting bait traps (Escher et al., 2006). This species can be reared in a laboratory environment on banana-*Opuntia* medium (Markow & O'Grady, 2006) and Wheeler-Clayton medium (University of California, 2015).

Label data in our study, with collection dates from January to December, include records from apple cider vinegar bait traps (in sour cherry, peach, blueberry, blackberry, raspberry and blueberry fields), composter traps, Malaise traps in oak savannah, and rotting organic materials (zucchini, tomatoes, mushrooms, onions, grass silage, red radishes) and under willow bark.

For additional information & photographs see Werner T. & Jaenike J. (2017).



Fruit  
baits



Rotting  
Organics

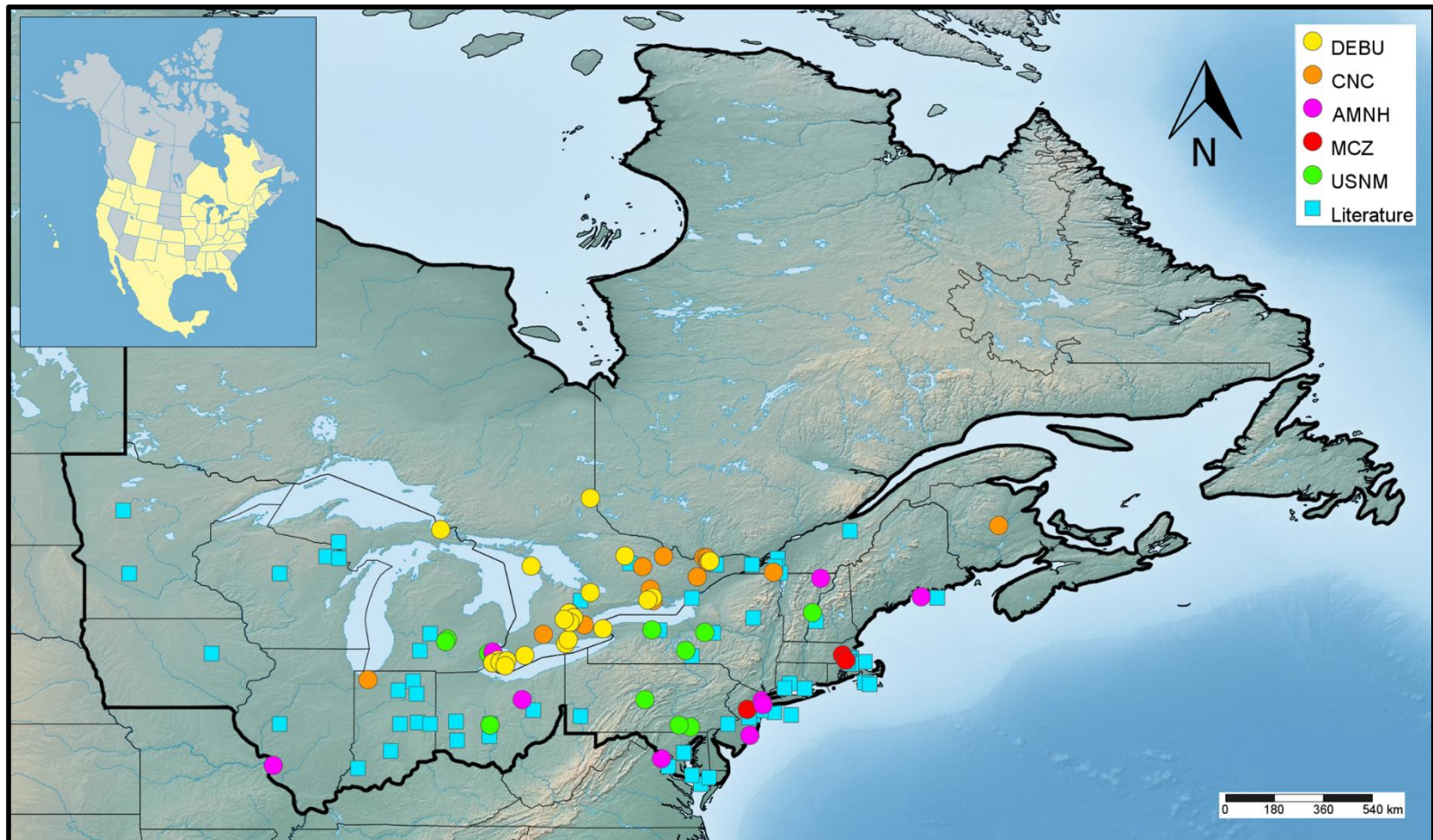


Reared  
in Lab ✓



# *Drosophila busckii* Coquillett

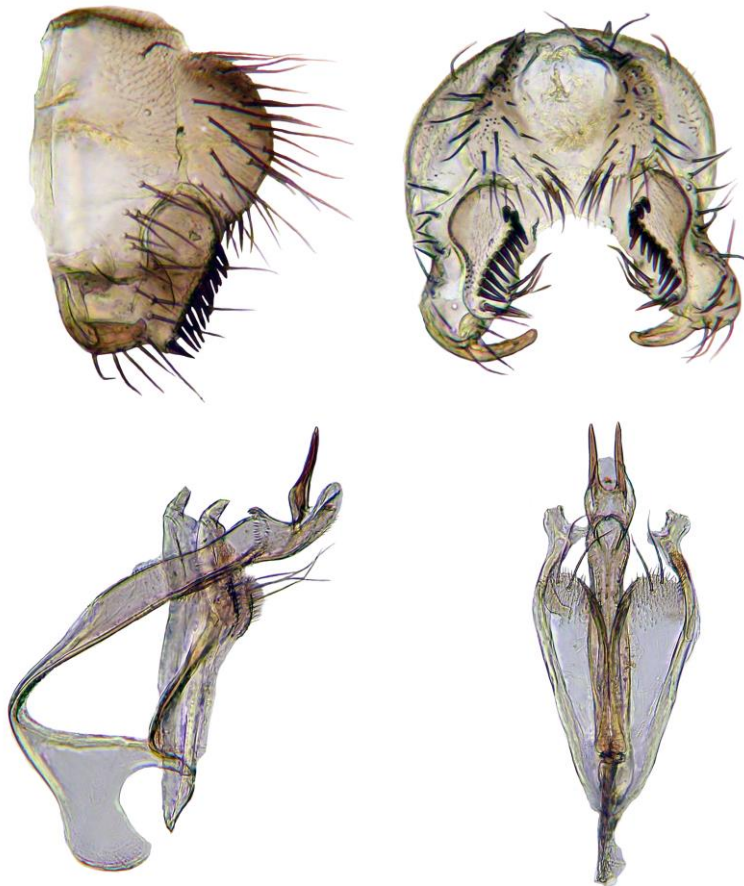
## North American and Northeastern North American Distribution



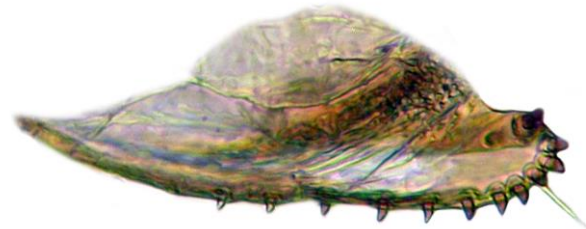


# *Drosophila busckii* Coquillet

## Male Terminalia



## Oviscapt



## Spermathecae







# *Drosophila sigmoides* Loew

*Drosophila (Siphlodora) sigmoides* Loew 1872



**Species Diagnosis:** : Pale, yellow-tan flies. Body length 2.3 -3.0 mm. Eye deeper than broad. Mesonotum reddish-brown with diffuse reddish stripes bordering median yellowish stripe between dorsocentral rows; prescutellar setae visibly enlarged. Wing mostly brown, graded to hyaline towards hind margin. Males with 2 clear or white marks on apical half (1 between  $R_{2+3}$  and  $R_{4+5}$ , and 1 between  $R_{4+5}$  and M), infuscation at apices of veins  $R_{2+3}$  and  $R_{4+5}$  and on crossveins r-m and dm-cu, crossvein dm-cu distinctly sinuate. Abdomen pale yellowish-brown.



Biology



Key Characters



Distribution



Terminalia



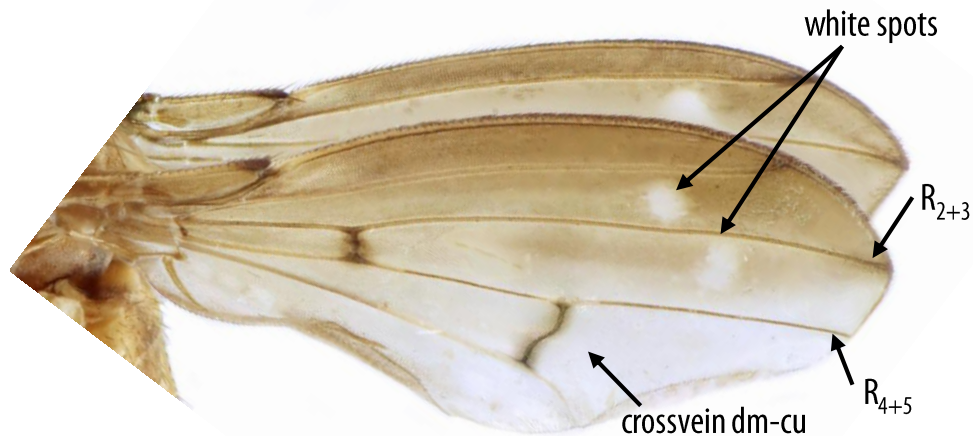


# *Drosophila sigmoides* Loew

## Key Characters



Mesonotum reddish-brown with diffuse reddish stripes bordering median yellowish stripe between dorsocentral rows; prescutellar setae visibly enlarged.



Wing mostly brown, graded to hyaline towards hind margin. Males with 2 clear or white marks on apical half (1 between  $R_{2+3}$  and  $R_{4+5}$ , and 1 between  $R_{4+5}$  and M), infuscation at apices of veins  $R_{2+3}$  and  $R_{4+5}$  and on crossveins r-m and dm-cu, crossvein dm-cu distinctly sinuate.



Abdomen pale yellowish-brown.



# *Drosophila sigmoides* Loew

## Biology

The biology of this species is not well known, but evidence suggests that it is a flower breeder. For example, Butler & Mettler (1963) reared *D. sigmoides* from the flowers of *Tripsacum dactyloides* (a native grass in the eastern United States). This species cannot be reared in the laboratory environment.

Label data in our study, with collection dates from May to November, include records collected from *Sarracenia* pitcher plants, and from Malaise & pan traps in oak savannah habitat.



Flowers



Not reared in  
Lab

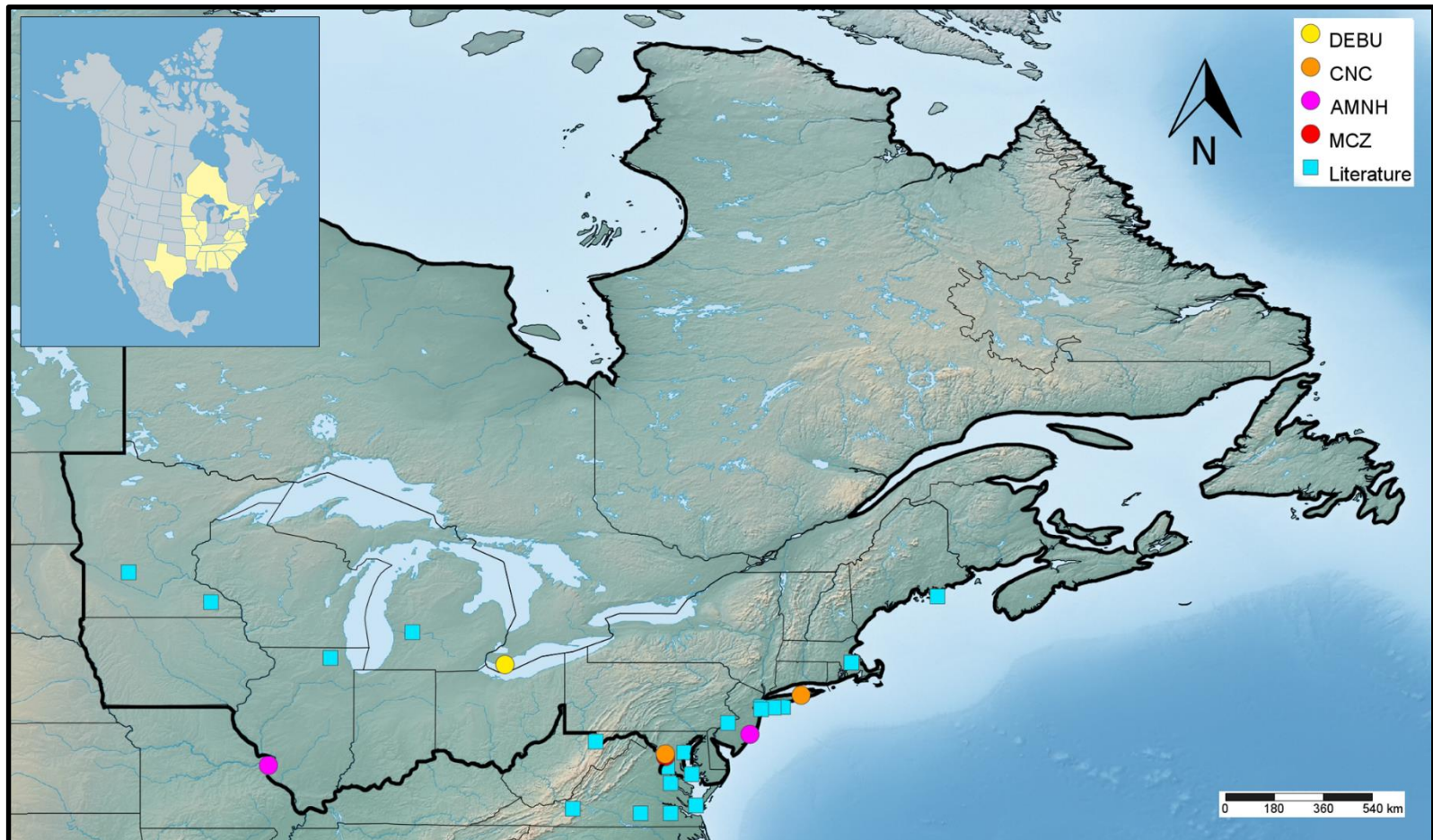






# *Drosophila sigmoides* Loew

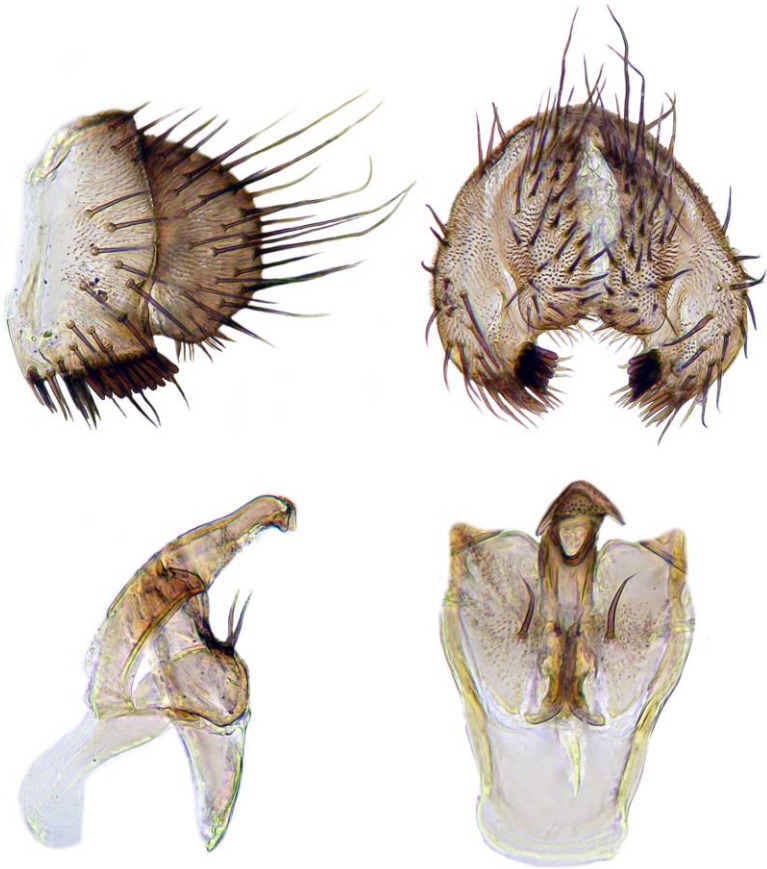
## North American and Northeastern North American Distribution





# *Drosophila sigmoides* Loew

## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila funebris* Fabricius

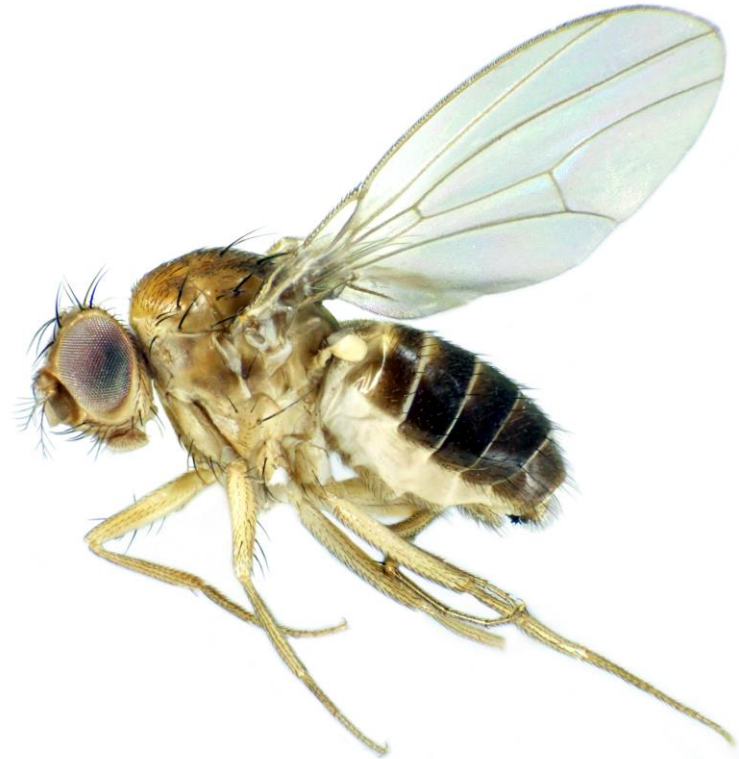
*Drosophila (Drosophila) funebris* (Fabricius, 1787)



## ***Drosophila funebris* species group:**

Reddish-brown flies. Mesonotum unicolourous light to dark brown, acrostichal setulae in approximately 8 rows. Male tergites completely shining blackish-brown; female tergites with dark posterior bands that are narrowly interrupted at the midline.

**Species Diagnosis:** Male cercus with dense series of 12 strong peg-like setae . Aedeagus with a pair of small dorsal processes at the apex. Females are distinguished from *D. macrospina* by a dorsal lobe on the oviscapt.



Biology



Key Characters



Distribution



Terminalia





# *Drosophila funebris* Fabricius

## Key Characters



Male tergites completely shining blackish-brown.



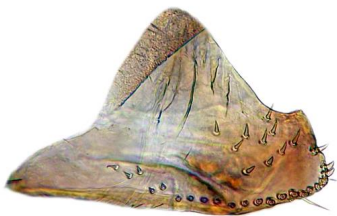
Female tergites with dark posterior bands narrowly interrupted at the midline.



Male cercus with dense series of 12 strong peg-like setae.



Aedeagus with a pair of small dorsal processes at the apex.



Subapical triangular dorsal lobe on the oviscapt.



# *Drosophila funebris* Fabricius

## Biology

*D. funebris* is cosmopolitan species, likely originating in Europe. Commonly collected in buildings, stables and in toilets (Bächli et *al.*, 2004). *D. funebris* has also been collected on fungi, garbage, and fruit baits (Bächli & Burla, 1967; Escher et *al.*, 2006). This species can be reared in the laboratory environment on the standard cornmeal-yeast medium (Bächli et *al.*, 2004; Markow & O'Grady, 2006).

Label data in our study, with collection dates from March to December, include records from sweeps (in *Cornus*, *Clintonia*, *Eurybia*, *Diervilla*, and *Aralia* under *Populus*), from shoreline Malaise traps, from pan traps in compost, from forest dung pans and from emergence traps over freshly cut stumps.



Fruit  
baits



Rotting  
Organics



Fungi



Toilets



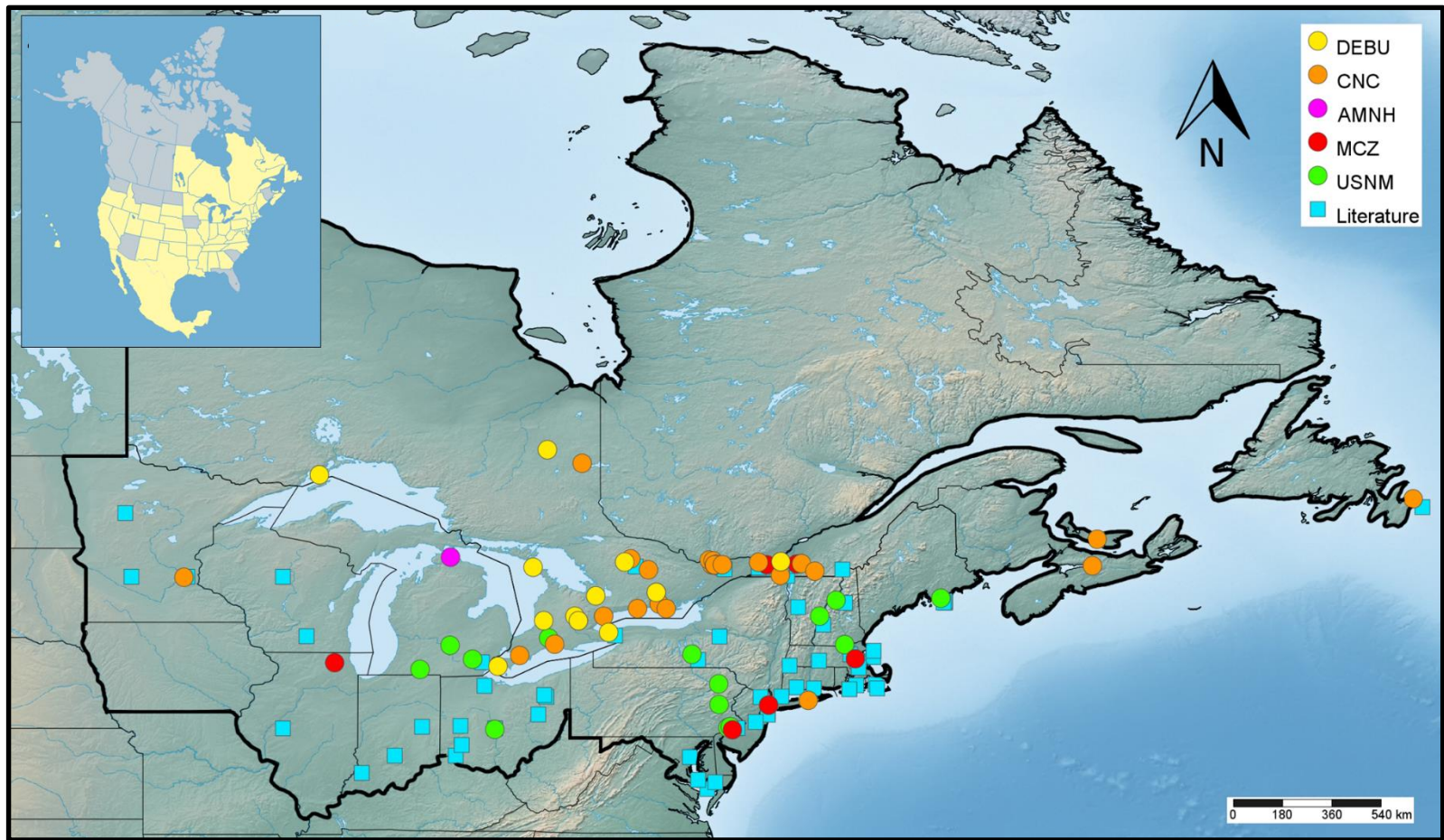
Reared  
in Lab ✓





# *Drosophila funebris* Fabricius

## North American and Northeastern North American Distribution

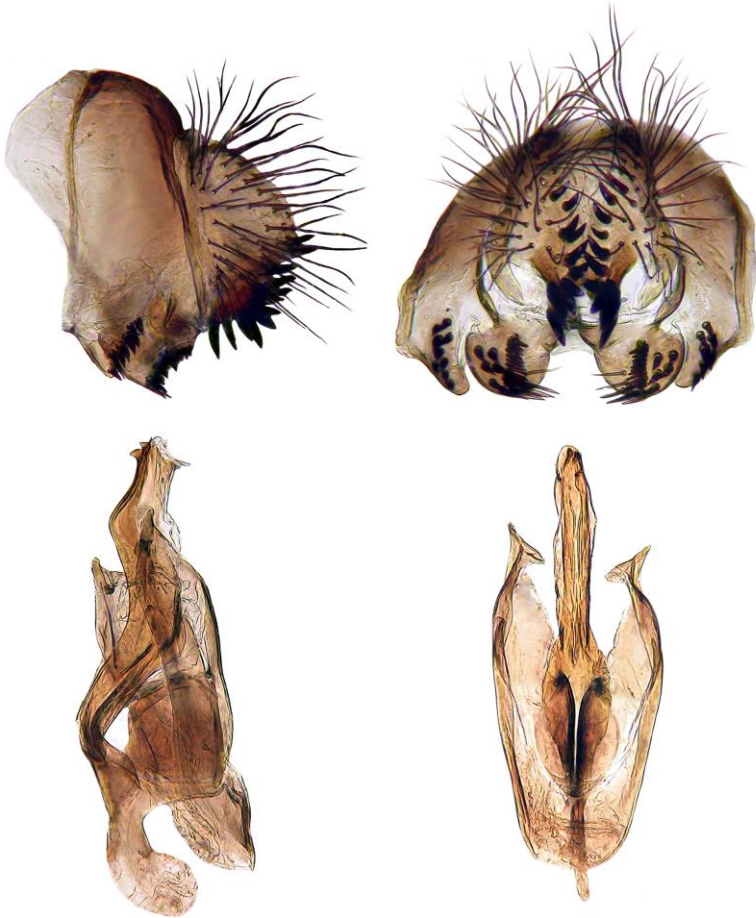






# *Drosophila funebris* Fabricius

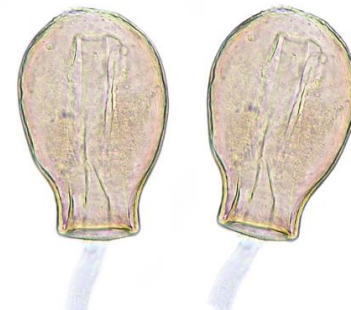
## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila macrospina* Stalker & Spencer

*Drosophila macrospina* Stalker & Spencer 1940



***Drosophila funebris* species group:** Reddish-brown flies. Mesonotum unicolourous light to dark brown, acrostichal setulae in approximately 8 rows. Male tergites completely shining blackish-brown; female tergites with dark posterior bands that are narrowly interrupted at the midline.

**Species Diagnosis:** Male cercus with 1 large and 3 smaller conspicuous peg-like setae near the inner margin. Aedeagus with 2 large broad comb-like processes at apex. Females are distinguished from *D. funebris* by the lack of a dorsal lobe on the oviscapt.



Biology



Key Characters



Distribution



Terminalia



# *Drosophila macrospina* Stalker & Spencer

## Key Characters



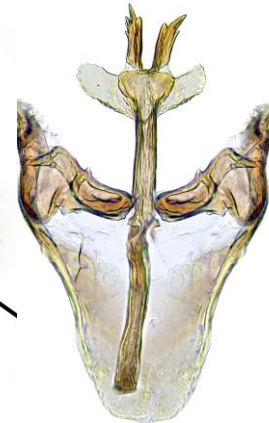
Male tergites completely shining blackish-brown.



Female tergites with dark posterior bands that are narrowly interrupted at the midline.



Male cercus with 1 large and 3 smaller conspicuous peg-like setae near the inner margin.



Aedeagus with 2 large broad comb-like processes at apex.



Oviscapt lacking dorsal lobe.





# *Drosophila macrospina* Stalker & Spencer

## Biology

This species is rarely collected, and its biology is not well known. Dorsey & Carson (1956) were successful in attracting it to both artificial yeast and fungus baits. *Drosophila macrospina* can be successfully reared in the laboratory environment on banana-*Opuntia* medium (Markow & O'Grady 2006).



Fungus &  
yeast baits

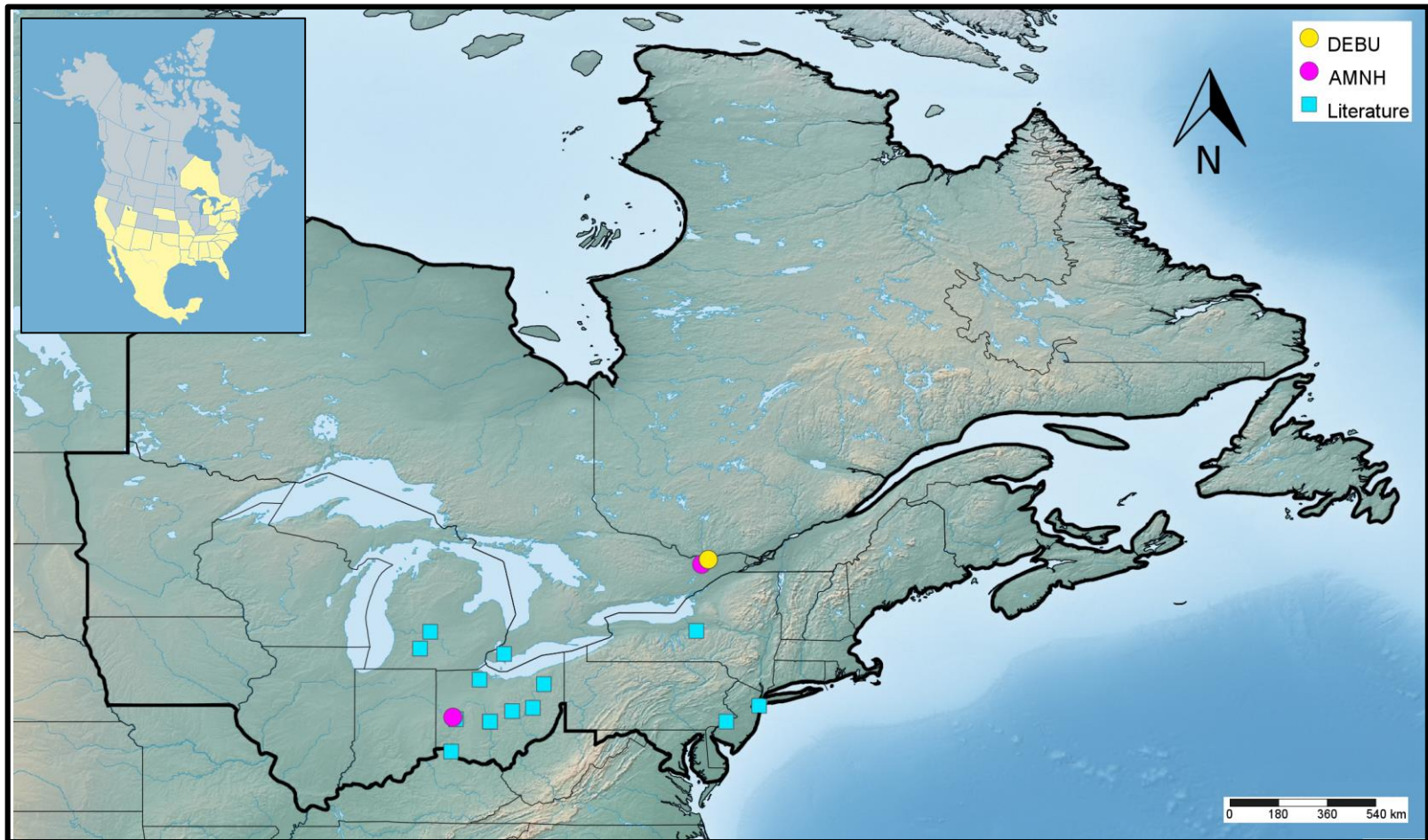


Reared  
in Lab ✓



# *Drosophila macrospina* Stalker & Spencer

## North American and Northeastern North American Distribution





# *Drosophila macrospina* Stalker & Spencer

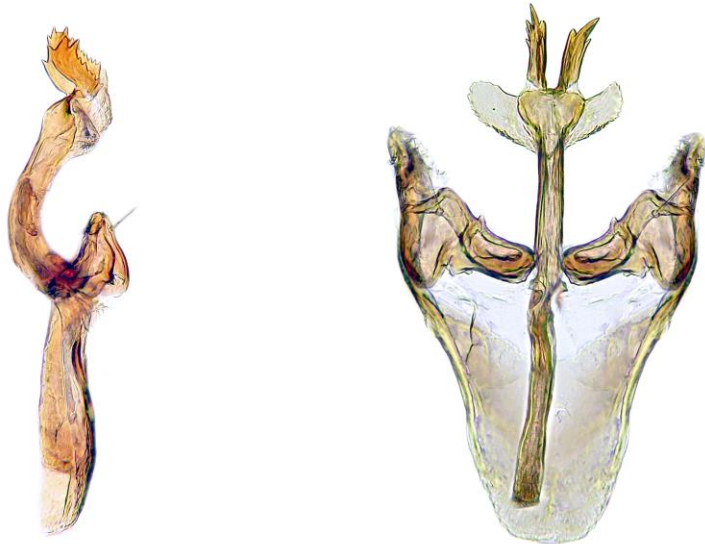
## Male Terminalia



## Oviscapt



## Spermathecae







# *Drosophila paramelanica* Griffen

*Drosophila (Drosophila) paramelanica* Griffen 1942



***Drosophila melanica* species group:** Small black-brown to light brown flies (2.2 to 3.5 mm). Mesonotum unicolourous yellowish-brown to dark brown, acrostichal setulae in approximately 6 rows. Subvibrissa less than half as long as vibrissa. Inner surfaces of antennal pedicel with long, fine hairs in males. Dark setulae on costa ending less than half way between the apices of wing veins  $R_{2+3}$  and  $R_{4+5}$ . Tergites with dark or light brown posterior bands interrupted at the midline.

**Species Diagnosis:** Epandrium with approximately 14 lower setae; surstylus with 12-14 prensisetae arranged in a concave row; aedeagus in lateral view rounded on posterior margin with pair of small triangular projections on posteroventral margin.



Redescription



Biology



Key Characters



Distribution



Terminalia



# *Drosophila paramelanica* Griffen

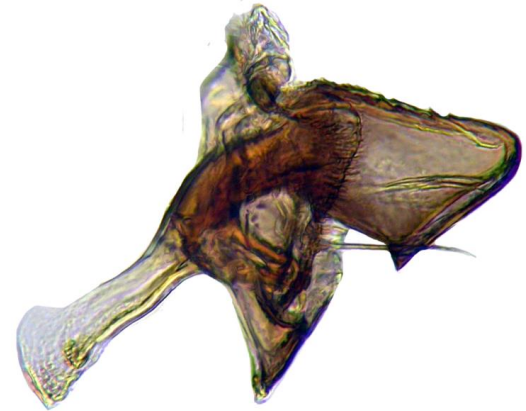
## Key Characters



Subvibrissa less than half as long as vibrissa. Inner surfaces of antennal pedicel with long, fine hairs in males



Tergites with dark brown posterior bands interrupted at the midline.



Aedeagus in lateral view rounded on posterior margin with pair of small triangular projections on posteroventral margin.



Dark setulae on costa ending less than half way between the apices of wing veins  $R_{2+3}$  and  $R_{4+5}$ .



# *Drosophila paramelanica* Griffen

## Biology

Like other members of the *melanica* species group, *D. paramelanica* is commonly found on sap fluxes. This species can be reared in the laboratory environment on banana-Opuntia medium (Markow & O'Grady, 2006) and cornmeal-yeast medium (University of California, 2015).

Label data, with collections between the months of April to September, include records from tree wounds in deciduous forests (e.g. aspen), from composter traps, from apple cider vinegar bait traps (in raspberry fields, blueberry fields, among sea buckthorn and among wild vegetation) and from lights.

For additional information & photographs see Werner T. & Jaenike J. (2017).



Fermenting  
baits



Rotting  
Organics



Sap fluxes



Reared  
in Lab ✓

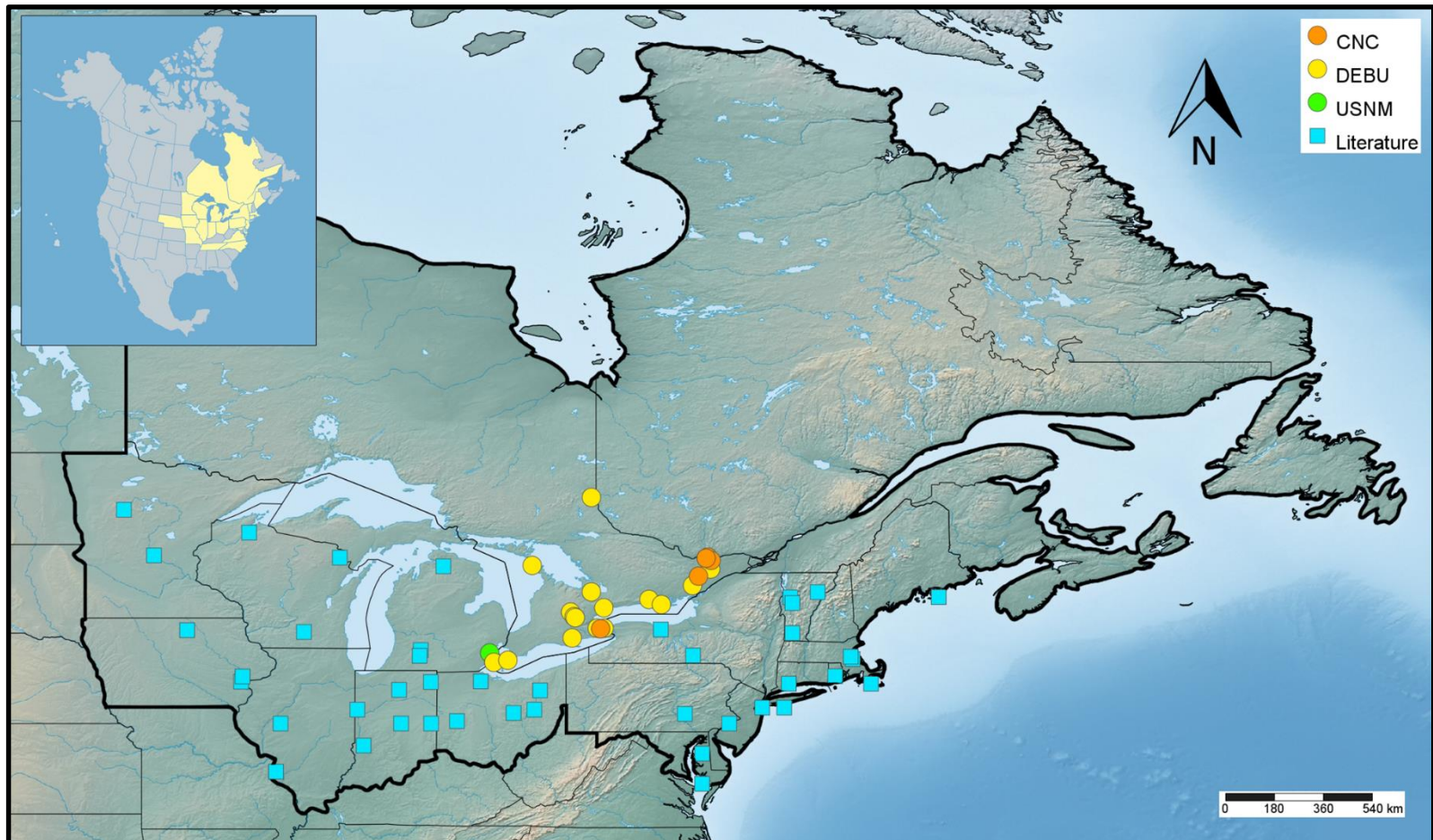






# *Drosophila paramelanica* Griffen

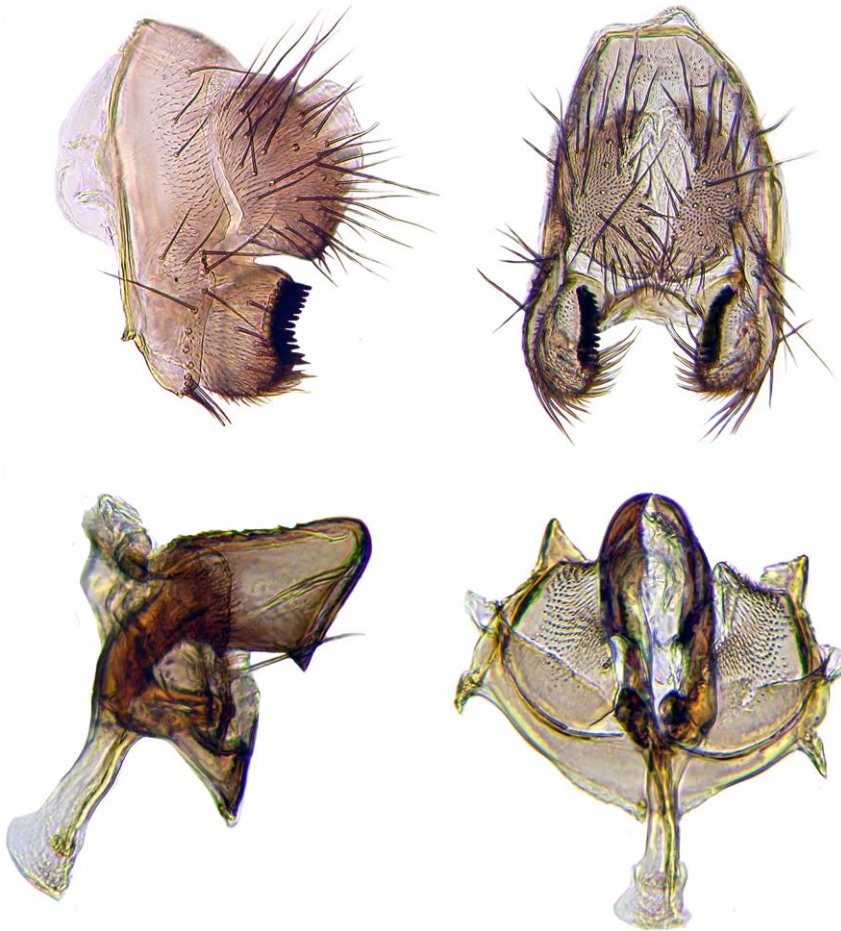
## North American and Northeastern North American Distribution



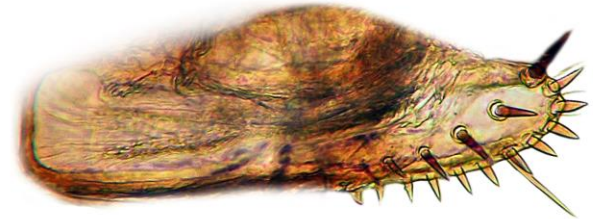


# *Drosophila paramelanica* Griffen

## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila paramelanica* Griffen

## Redescription:

Females indistinguishable from other members of the *melanica* species group with dark posterior bands on tergites. Griffen (1942) included a description of the external characters of the adults, internal male and female reproductive anatomy, eggs and puparia. A complete description of the male and female terminalia is provided below.

♂ **Terminalia:** Epandrium narrow, microtrichose on posterior half, with approximately 14 lower setae on ventral lobe and 4-5 upper setae; ventral lobe microtrichose on posterior half, not covering surstylus. Cercus connected to epandrium, semi-spherical, flattened on ventral margin in lateral view, completely microtrichose, without ventral lobes, covered in long setae. Surstylus microtrichose, elongate and rounded at ventral margin, with a slightly convex row of about 12-14 peg-like prenisetae on mesal surface, 12-14 inner setae and 7 outer peg-like setae, and numerous fine setulae on ventral margin. Gonopod covered in fine setulae, linked to paraphysis with membranous tissue, with a long seta near median inner margin. Aedeagus fused to aedeagal apodeme, widening apically, rounded dorsally, with a small pointed ventral projection. Aedeagal apodeme about one third the length of aedeagus, strongly flattened laterally, widening into a fan-like shape at apex.

♀ **Terminalia:** Valve of oviscapt brownish, tapering distally and rounded, ventrally slightly convex, dorsally slightly concave, with 3-4 large dark discal outer ovisensilla and 14-17 marginal peg-like outer ovisensilla, 3 trichoid-like distally positioned and 1 long curved subterminal inner ovisensilla. Spermatheca round and sclerotized, flattened slightly on ventral surface.





# *Drosophila nigromelanica* Patterson & Wheeler

*Drosophila (Drosophila) nigromelanica* Patterson & Wheeler 1942



***Drosophila melanica* species group:** Small black-brown to light brown flies (2.2 to 3.5 mm). Mesonotum unicolourous yellowish-brown to dark brown, acrostichal setulae in approximately 6 rows. Subvibrissa less than half as long as vibrissa. Inner surfaces of antennal pedicel with long, fine hairs in males. Dark setulae on costa ending less than half way between the apices wing veins  $R_{2+3}$  and  $R_{4+5}$ . Tergites with dark or light brown posterior bands interrupted at the midline.

**Species Diagnosis:** Epandrium with 11-14 lower setae; surstylus with 12-15 prensisetae in a straight row; tip of aedeagus concave in lateral view.



Redescription



Biology



Key Characters



Distribution



Terminalia



# *Drosophila nigromelanica*

Patterson  
& Wheeler

## Key Characters



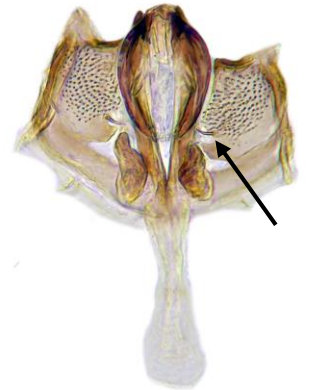
Subvibrissa less than half as long as vibrissa.



Tergites with dark brown posterior bands interrupted at the midline.



Apex of aedeagus concave in lateral view. Gonopod with a short setula.



Dark setulae on costa ending less than half way between the apices of wing veins  $R_{2+3}$  and  $R_{4+5}$ .



# *Drosophila nigromelanica*

Patterson  
& Wheeler

## Biology

Like other members of the *melanica* species group, *D. nigromelanica* is commonly collected on slime and sap fluxes. *Drosophila nigromelanica* can be reared in the laboratory environment on the standard cornmeal-yeast medium (University of California, 2015).

Label data, with collection dates from July to August, include records from tree wounds in deciduous forests (on oak sap) and from apple cider vinegar traps among wild vegetation.



Fermenting  
baits



Sap fluxes



Reared  
in Lab ✓

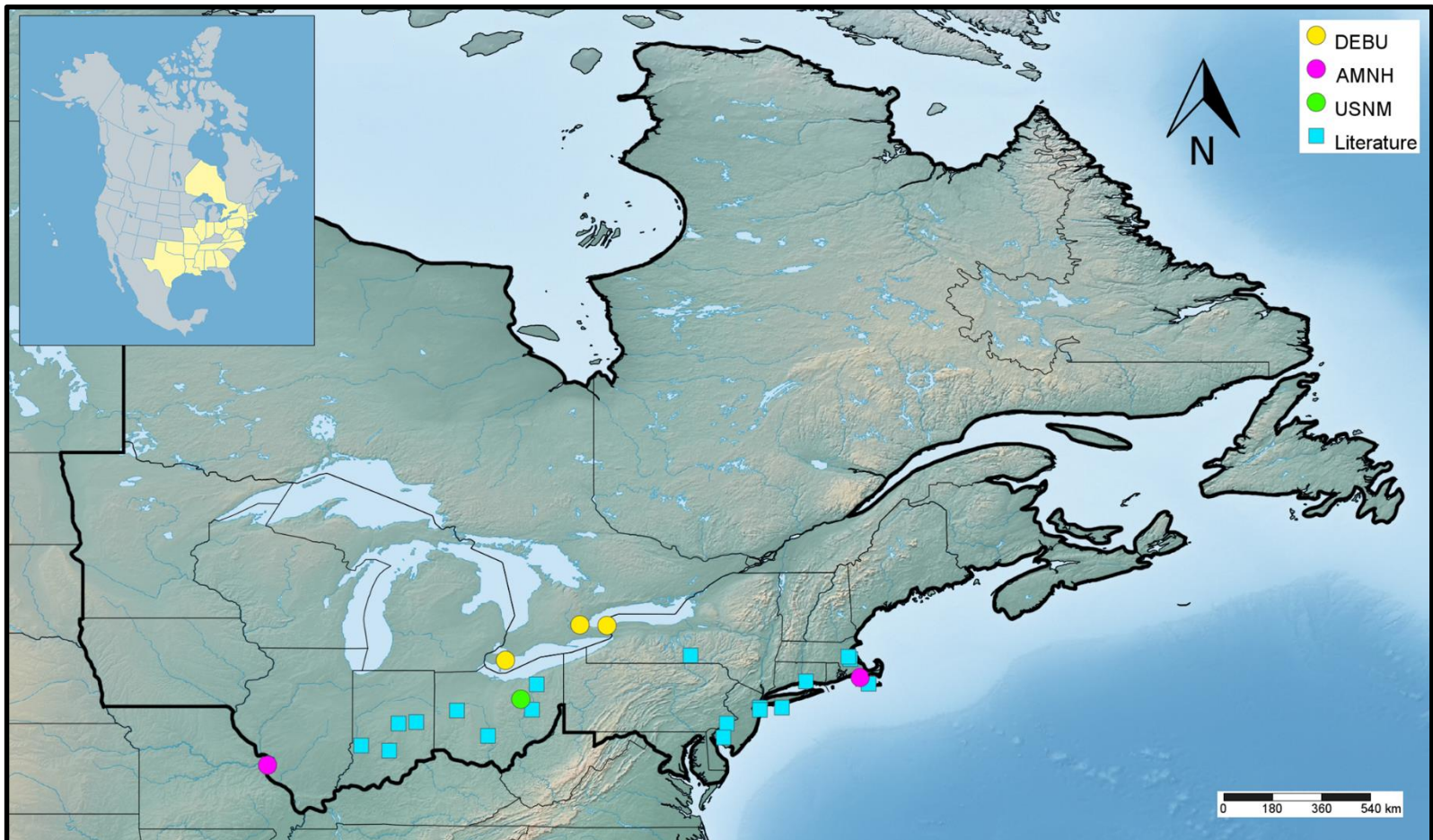






# *Drosophila nigromelanica* Patterson & Wheeler

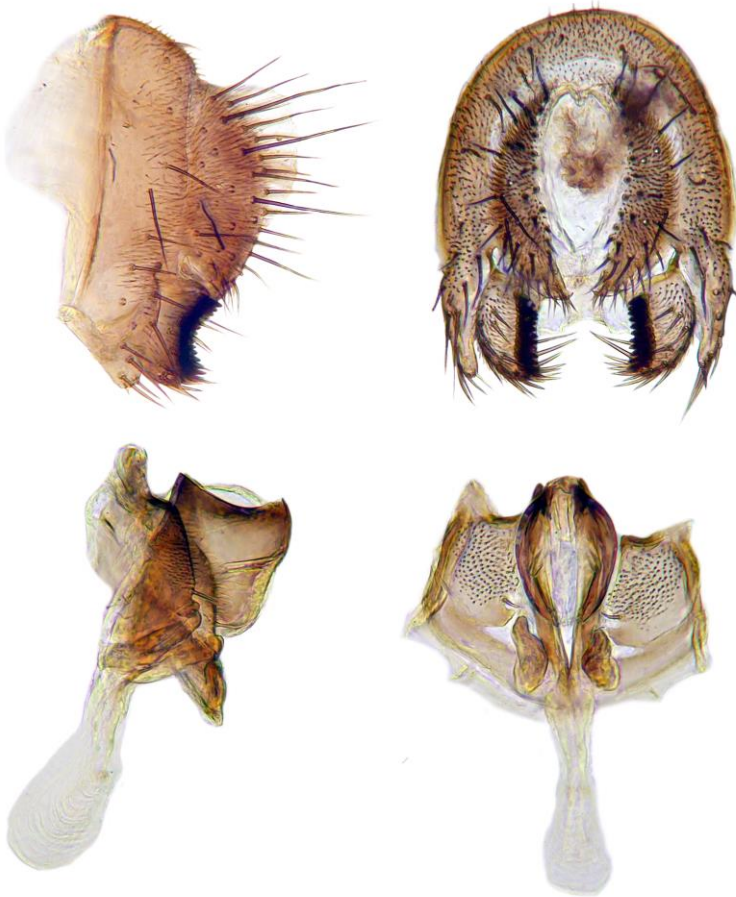
## North American and Northeastern North American Distribution





# *Drosophila nigromelanica* Patterson & Wheeler

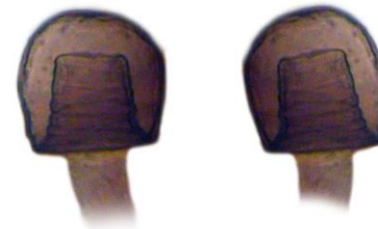
## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila nigromelanica* Patterson & Wheeler

## Redescription:

Patterson & Wheeler (1942) and Patterson (1943) included a description of the external characters of the adults and internal male and female reproductive anatomy. Hsu (1949) provided notes and an illustration of the external male terminalia. A description of the male and female terminalia is provided below.

♂ **Terminalia:** Epandrium as in *D. paramelanica*, except with 6-7 upper setae and 11-14 lower setae. Cercus as in *D. paramelanica*. Surstylus as in *D. paramelanica*, except typically with 12-15 prenisetae in a straight row. Gonopod as in *D. paramelanica* except that setae near median inner margin short. Aedeagus fused to aedeagal apodeme, apically concave in lateral view. Aedeagal apodeme approximately equal in length to aedeagus, strongly flattened laterally, widening into a fan-like apex with diffuse membranous edges.

♀ **Terminalia:** Same as in *D. paramelanica*.





# *Drosophila melanura* Miller

*Drosophila (Drosophila) melanura* Miller 1944

**🔍 *Drosophila melanica* species group:** Small black-brown to light brown flies (2.2 to 3.5 mm). Mesonotum unicolourous yellowish-brown to dark brown, acrostichal setulae in approximately 6 rows. Subvibrissa less than half as long as vibrissa. Inner surfaces of antennal pedicel with long, fine hairs in males. Dark setulae on costa ending less than half way between the apices wing veins  $R_{2+3}$  and  $R_{4+5}$ . Tergites with dark or light brown posterior bands interrupted at the midline.

**Species Diagnosis:** Broad epandrium with 14-16 lower setae, epandrium and cercus dark; surstylus with 9-11 prenisetae arranged in a straight row. Aedeagus with 2 large, broad, apically flattened projections near the apex.



Redescription



Biology



Key Characters



Distribution



Terminalia



# *Drosophila melanura* Miller

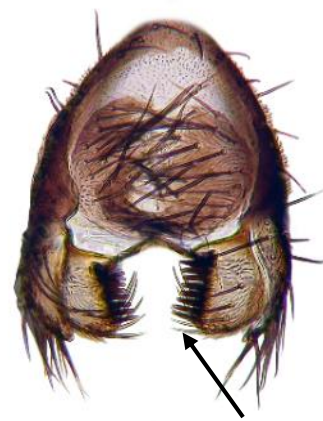
## Key Characters



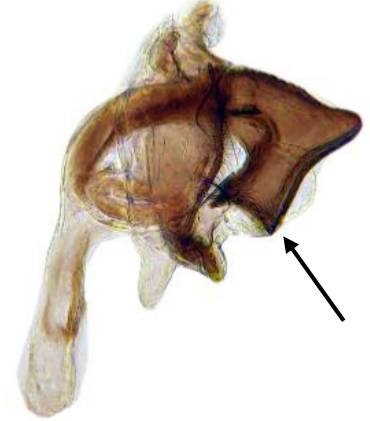
Subvibrissa less than half as long as vibrissa.



Tergites with dark brown posterior bands interrupted at the midline.



Broad epandrium with 14-16 lower setae, epandrium and cercus dark; surstylus with 9-11 prenisetae arranged in a straight row. Aedeagus with 2 large, broad, apically flattened projections near the apex



Dark setulae on costa ending less than half way between the apices of wing veins  $R_{2+3}$  and  $R_{4+5}$ .



# *Drosophila melanura* Miller

## Biology

Like other members of the *melanica* species group, *D. melanura* is commonly found on sap and slime fluxes. Stalker (1965) noted that stocks of this species are hard to maintain in the laboratory environment. Neither Markow & O'Grady (2006) nor the University of California (2015) list a standard medium for laboratory stocks.

Label data in our study, with collection dates from June to September, include records from sweeps in *Sagittaria*, from composter traps, and from apple cider vinegar bait traps.



Fermenting  
baits



Sap fluxes



Not reared in  
Lab

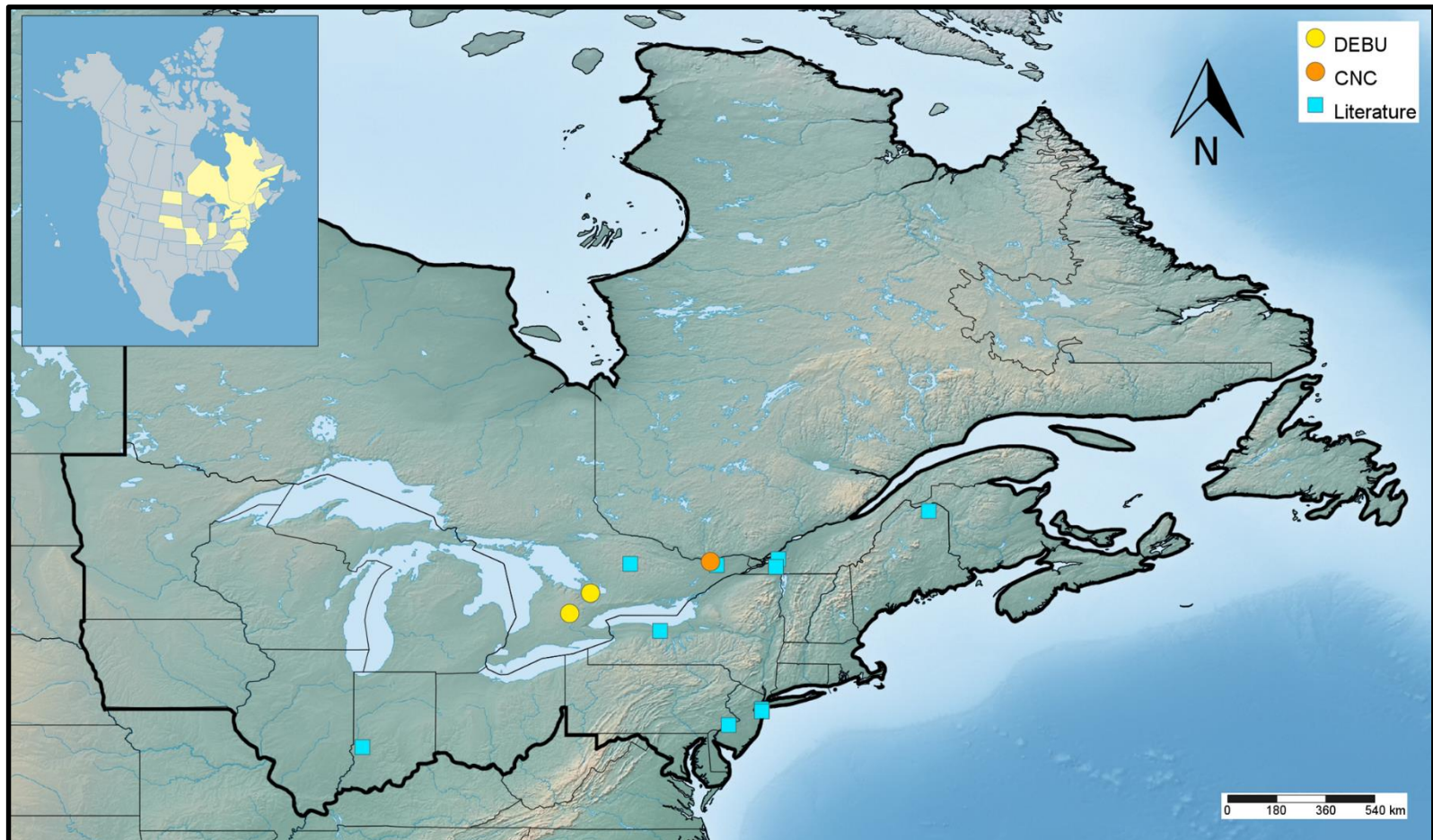






# *Drosophila melanura* Miller

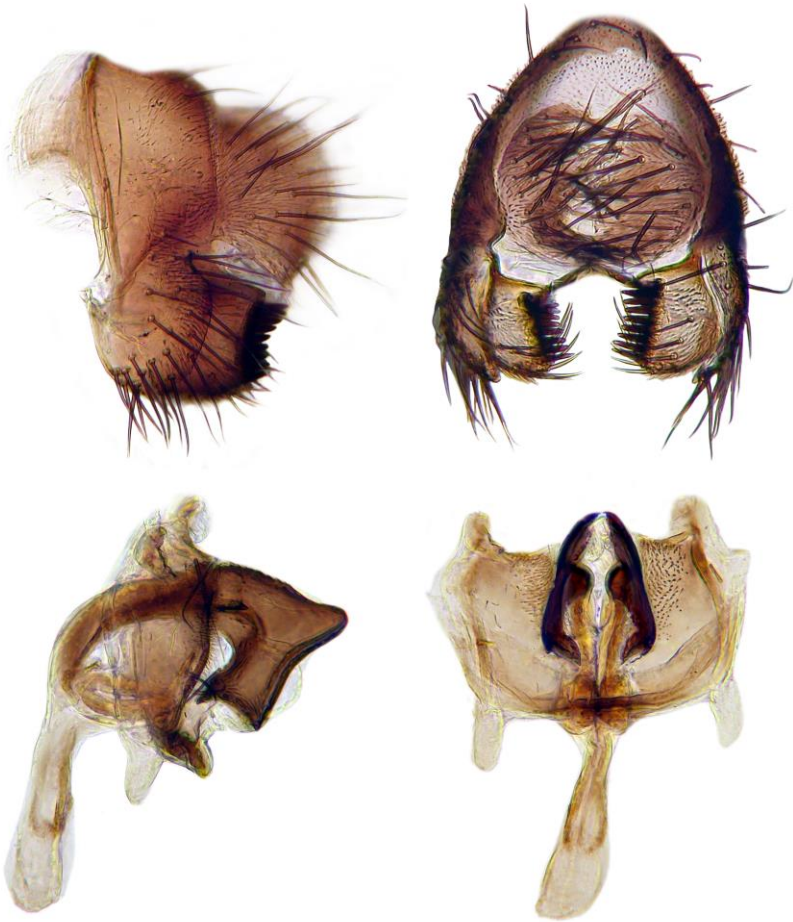
## North American and Northeastern North American Distribution



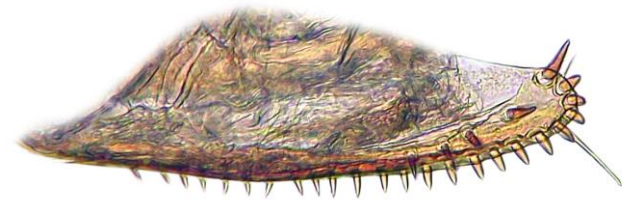


# *Drosophila melanura* Miller

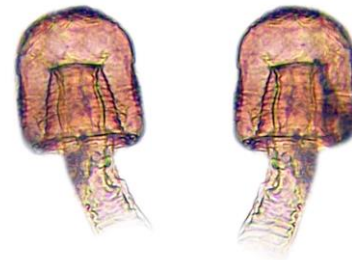
## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila melanura* Miller

## Redescription:

Females are indistinguishable from other members of the *melanica* species group with dark posterior bands on tergites. Miller (1944) included a description of the external characters of adults, internal male and female reproductive anatomy, puparia and egg. Hsu (1949) included notes and an illustration of the external male terminalia. A complete description of the male and female terminalia is provided below.

♂ **Terminalia:** Epandrium as in *D. paramelanica*, except with 14-16 lower setae. Cercus as in *D. paramelanica*. Surstylus as in *D. paramelanica* except with 9-11 prenisetae in a straight row and approximately 3 outer setae. Gonopod as in *D. paramelanica*. Aedeagus fused to aedeagal apodeme, with 2 long lateral projections deeply incised into two pointed lobes. Aedeagal apodeme approximately equal in length to aedeagus, strongly flattened laterally, widening into a fan-like apex.

♀ **Terminalia:** Same as in *D. paramelanica* except with approximately 24 marginal peg-like outer ovisensilla.





# *Drosophila hydei* Sturtevant

*Drosophila (Drosophila) hydei* Sturtevant 1921



***Drosophila repleta* species group:** Ground color of scutum pale but with dark brown, irregular pattern of dark spots at the base of setae and setulae. Tergites pale with dark posterior bands that are broken at the midline. Both species found in northeastern North America are ubiquitous, cosmopolitan commensals of humans. The *repleta* species group is indigenous to the New World.

**Species Diagnosis:** Tergites with dark posterior bands broken at the midline, without pale areas on lateral surfaces. Male fore tarsus with elongate setae. Apical part of first costal sector pale.



Biology



Key Characters



Distribution



Terminalia



# *Drosophila hydei* Sturtevant

## Key Characters



Ground color of scutum pale but with dark brown, irregular pattern of dark spots at the base of setae and setulae.



Apical part of first costal sector pale.



Male fore tarsus with elongate setae.



Tergites pale with dark posterior bands that are broken at the midline, without pale areas on lateral surface.



# *Drosophila hydei* Sturtevant

## Biology

The larvae of *D. hydei* are commonly found in rotting fruit (Bächli et al., 2004). This species can be reared in the laboratory on the standard banana-*Opuntia* medium (Markow & O'Grady, 2006) and standard cornmeal-yeast medium (University of California, 2015).

Label data in this study, with collection dates from January to December, include records from composter traps, from Malaise traps in a pine forest, from apple cider vinegar traps (in raspberry, peach, sour cherry, blackberry and straw).



Fermenting  
baits



Rotting  
Organics



Reared  
in Lab ✓

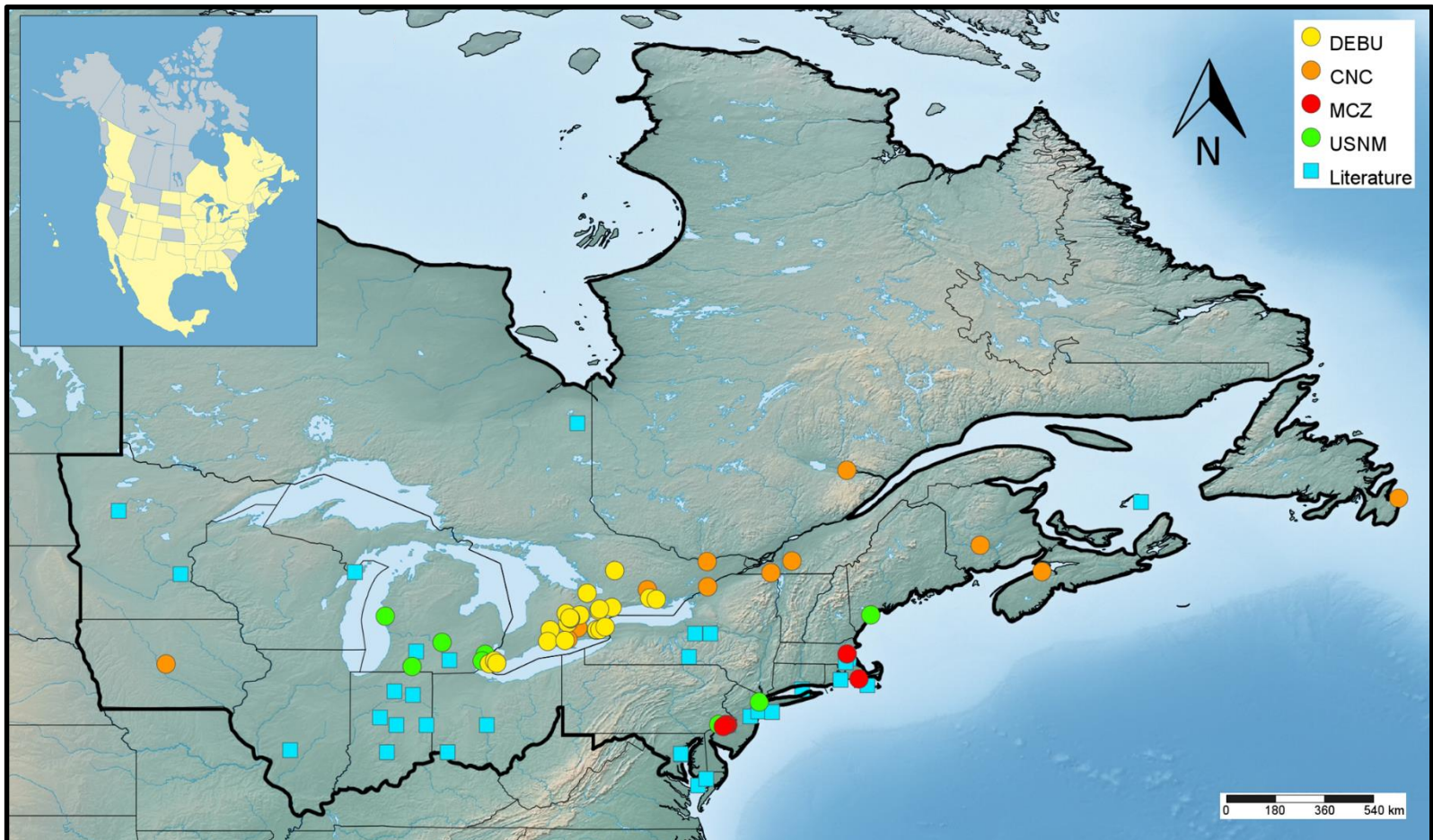
For additional information & photographs see Werner T. & Jaenike J. (2017).





# *Drosophila hydei* Sturtevant

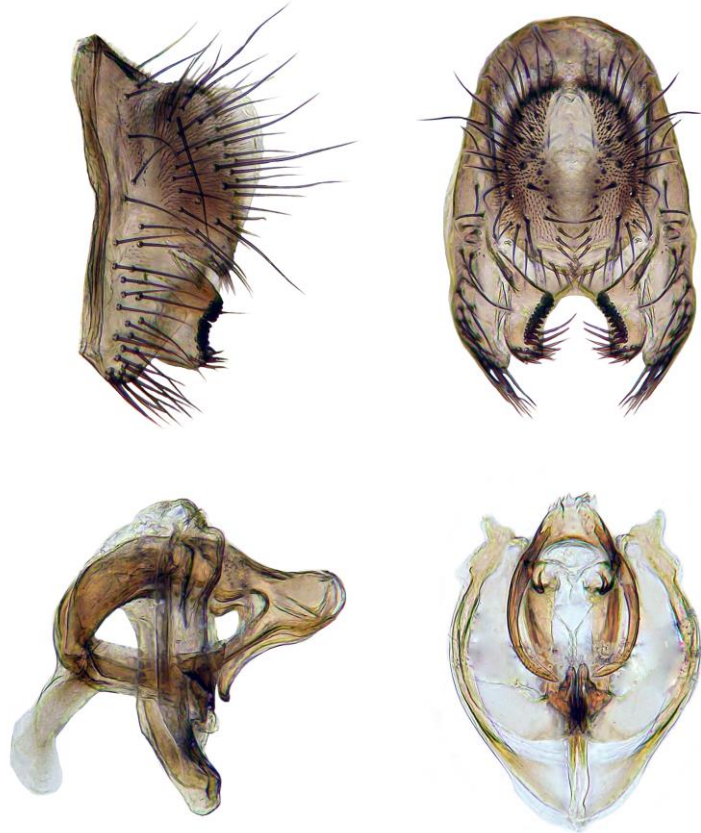
## North American and Northeastern North American Distribution



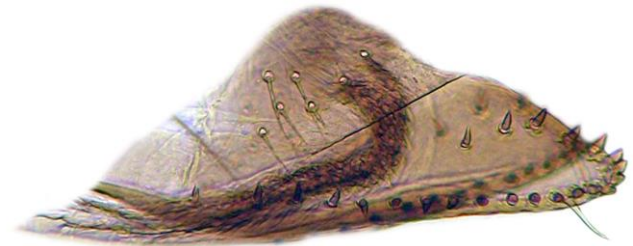


# *Drosophila hydei* Sturtevant

## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila repleta* Wollaston

*Drosophila (Drosophila) repleta* Wollaston 1858



***Drosophila repleta* species group:** Ground color of scutum pale but with dark brown, irregular pattern of dark spots at the base of setae and setulae. Tergites pale with dark posterior bands that are broken at the midline. Both species found in northeastern North America are ubiquitous, cosmopolitan commensals of humans. The *repleta* species group is indigenous to the New World.

**Species Diagnosis:** Tergites with dark posterior bands that are broken at the midline, with pale areas on lateral surface. Male fore tarsus without elongate setae. Apical part of first costal sector darkened.



Biology



Key Characters



Distribution



Terminalia





# *Drosophila repleta* Wollaston

## Key Characters



Ground color of scutum pale but with dark brown, irregular pattern of dark spots at the base of setae and setulae.



Apical part of first costal sector darkened.



Male fore tarsus without elongate setae.



Tergites pale with dark posterior bands that are broken at the midline, with pale areas on lateral surface.



# *Drosophila repleta* Wollaston

## Biology

The larvae of *D. repleta* are commonly found in rotting organic materials, indoors in bathroom stalls and urinals, and in stables (Bächli et al., 2004). Malloch & McAtee (1924) noted that *D. repleta* has been reared from butternut hulls and water lily stems, and that the species is attracted to beer. This species can be reared in the laboratory environment on banana-*Opuntia* medium (University of California, 2015).

Label data in this study, with collection dates from February to December, include records from apple cider vinegar bait traps in a raspberry field, from composter traps, from a shoreline Malaise trap, from a hog barn, from cellar refuse in a seed store and indoors.



Fermenting  
baits



Rotting  
Organics



Toilets

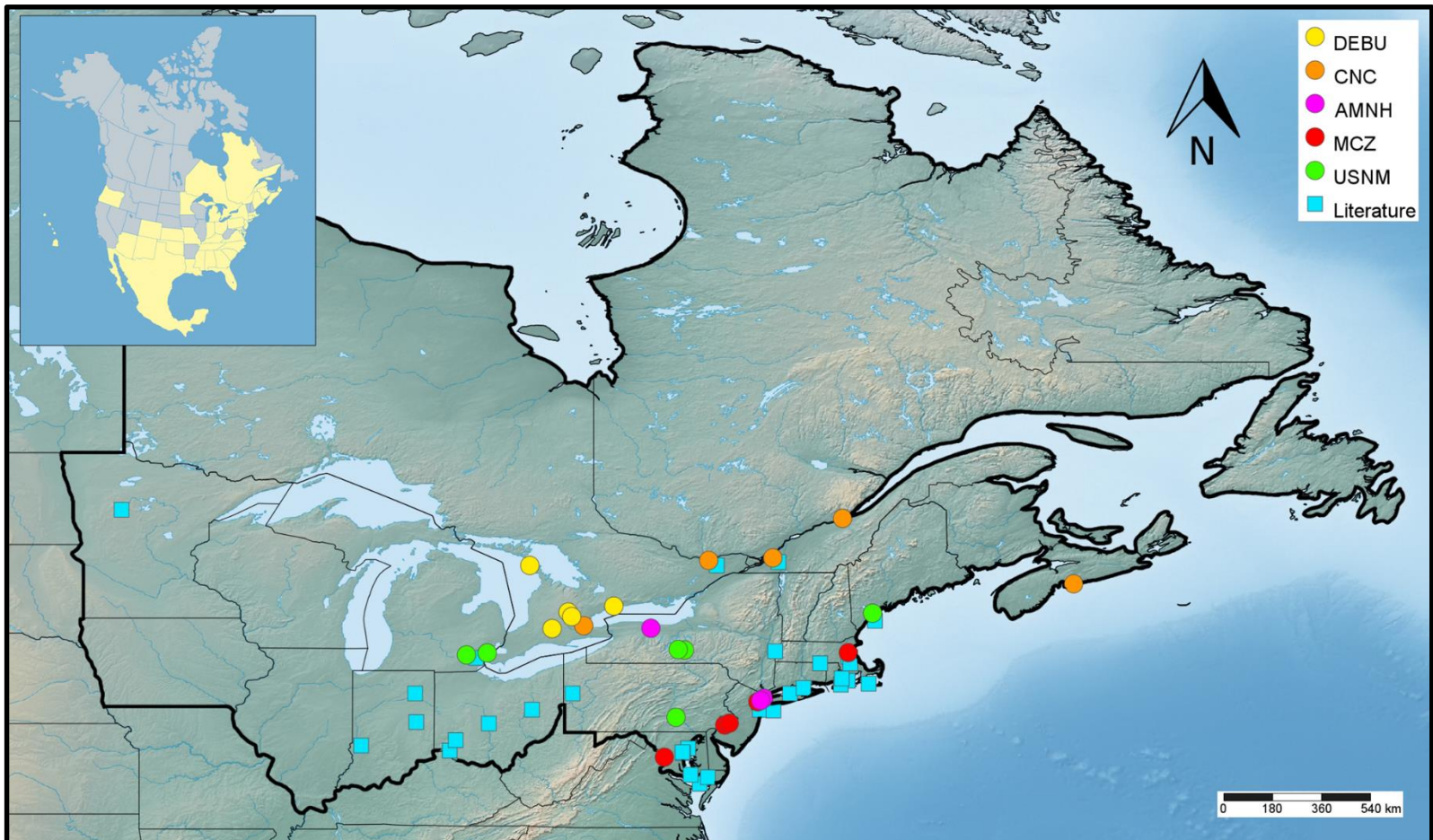


Reared  
in Lab ✓



# *Drosophila repleta* Wollaston

## North American and Northeastern North American Distribution

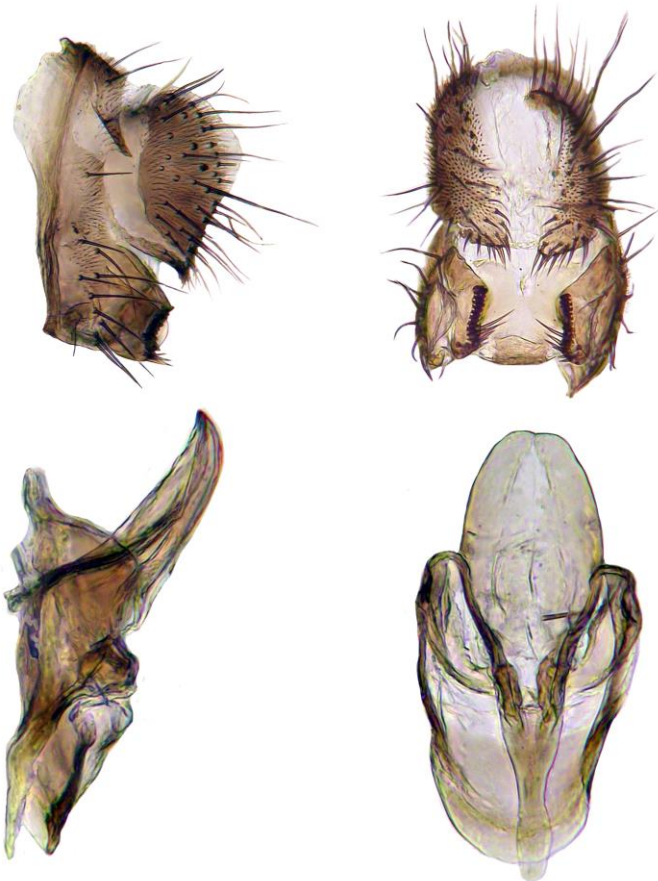




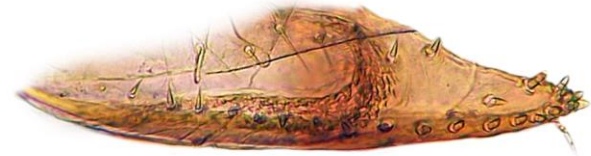


# *Drosophila repleta* Wollaston

## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila colorata* Walker

*Drosophila (Drosophila) colorata* Walker 1849



***Drosophila robusta* species group:** Large dark brown flies (2.5 to 4.2 mm). Subvibrissa at least half as long as vibrissa. Acrostichal setulae in approximately 6 rows. Dark setulae on costa ending less than half way between the apices of wing veins  $R_{2+3}$  and  $R_{4+5}$ . Tergites with dark brown posterior bands interrupted at the midline.

**Species Diagnosis:** Reddish-brown flies. Body length 2.7 to 4.2 mm. Wing 2.5 to 3.6 mm. Facial carina broad, distinctly sulcate. Gena broader than in *D. robusta*, 0.17-0.25X diameter of the eye at greatest vertical height. Mesonotum unicolourous dark brown or reddish-brown, with median dark stripe bordered by diffuse, reddish-brown, interrupted stripes. Wing slightly darkened slightly fuscous. Aedeagus dorsoventrally flattened, scoop-shaped in lateral view, with one pointed projection at tip; spermathecae with basal collar.



Redescription



Biology



Key Characters



Distribution



Terminalia



# *Drosophila colorata* Walker

## Key Characters



Subvibrissa at least half as long as vibrissa.



Facial carina distinctly sulcate.



Dark setulae on costa ending less than half way between the apices of wing veins  $R_{2+3}$  and  $R_{4+5}$ .



Gena broader than in *D. robusta*, 0.17-0.25X diameter of the eye at greatest vertical height.



Tergites with dark brown posterior bands interrupted at the midline.



Mesonotum unicolourous dark brown or reddish-brown, with median dark stripe bordered by a pattern of indefinite and variable reddish-brown interrupted stripes.





# *Drosophila colorata* Walker

## Biology

Like the other members of the *robusta* species group, *D. colorata* is commonly found on slime and sap fluxes in temperate woodlands (Malloch & McAtee, 1924). Malloch & McAtee (1924) also noted that it was more commonly collected in early spring. This species has not been reared in the laboratory environment.

Label data in this study, with collection dates from April to October, include records from pan traps (in a hemlock-hardwood forest, in clubmoss and on a lakeshore), from Malaise traps (in sphagnum bogs), from sap on tree wounds (white birch, maple stumps and oak), from sweeps under porch lights and in a dry stream bed, upon emergence from hemlock and indoors.



Sap fluxes



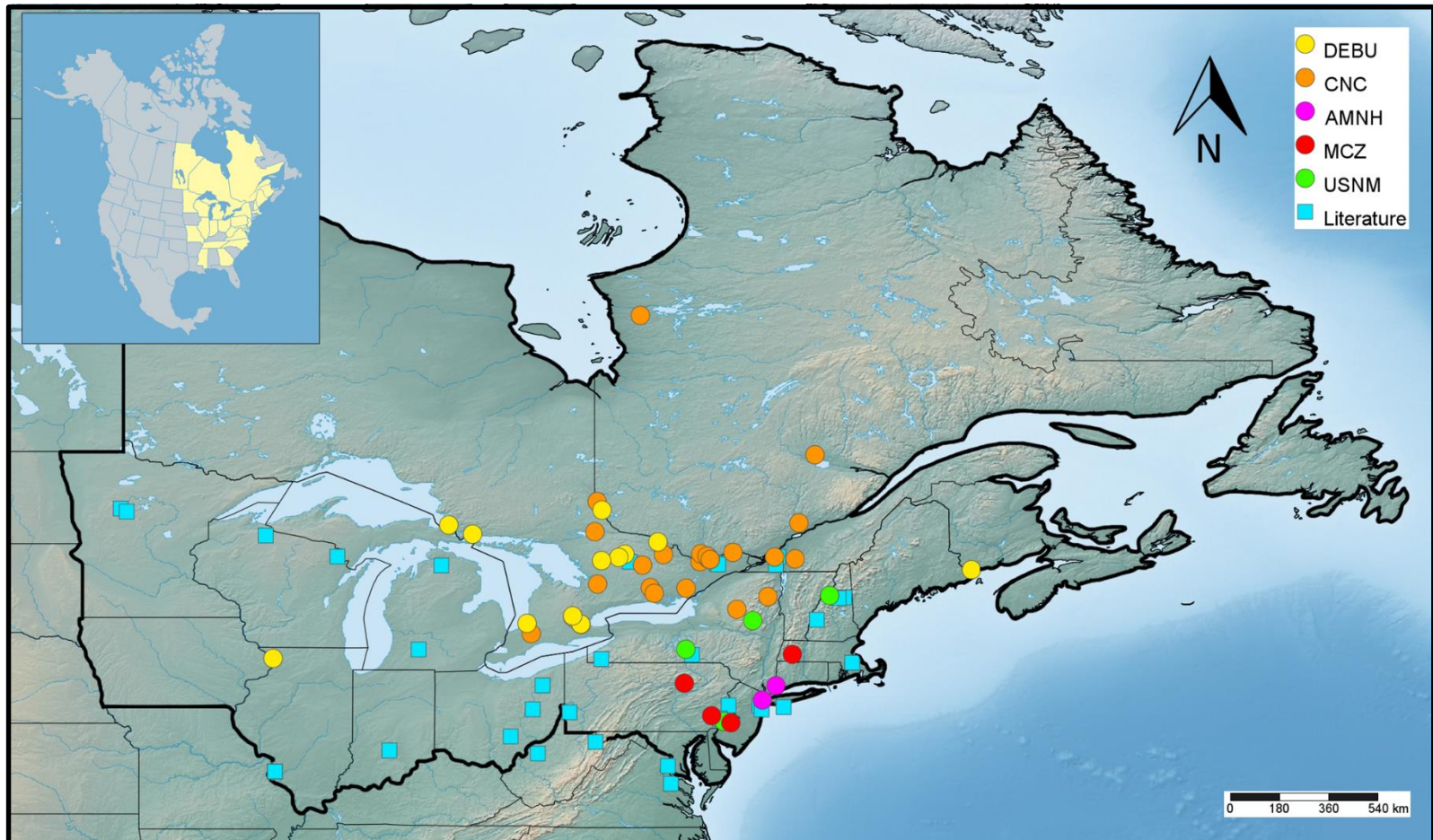
Not reared in  
Lab





# *Drosophila colorata* Walker

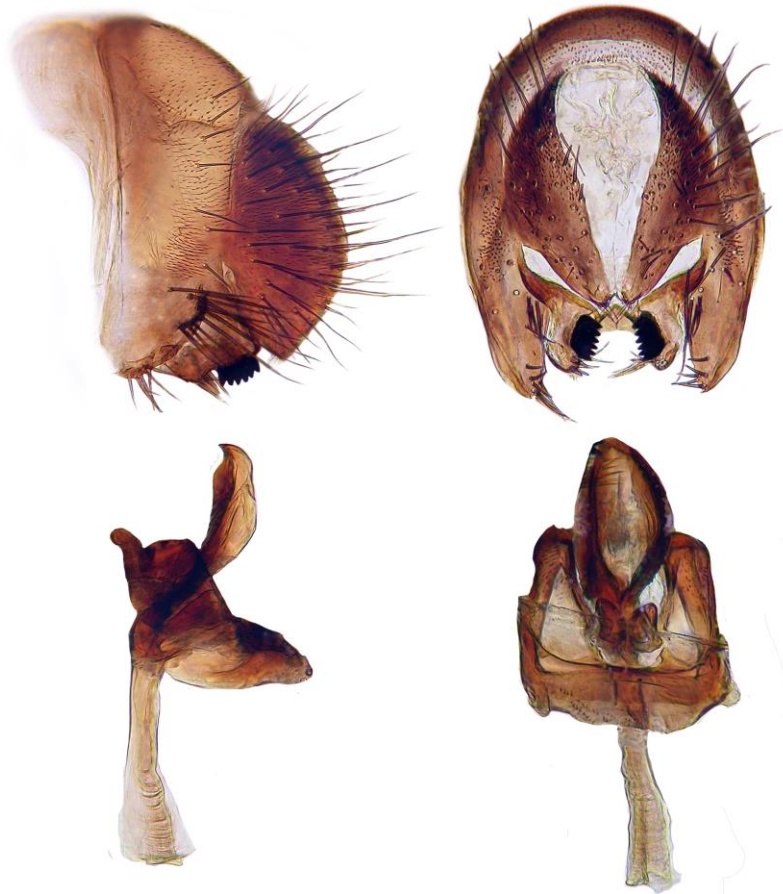
## North American and Northeastern North American Distribution





# *Drosophila colorata* Walker

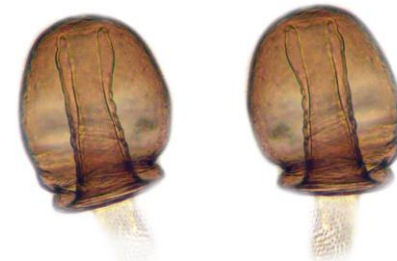
## Male Terminalia



## Oviscapt



## Spermathecae







# *Drosophila colorata* Walker

## Redescription:

Hsu (1949) includes notes and an illustration of the external male terminalia. A redescription of male and female terminalia is provided below.

♂ **Terminalia:** Epandrium broad, distally microtrichose on posterior half, with 16-17 lower setae (approximately 10 on posterior surface of ventral lobe, 6-7 at apex of ventral lobe), 6 upper setae; ventral lobe dorsally broad, not microtrichose, not covering surstylus. Cercus large, microtrichose, oval in shape, fused to epandrium, narrowed ventrally, with fine setae at ventral margin. Surstylus small, not microtrichose, with a straight row of 6-7 peg-like prenisetae, approximately 7 inner and no outer setae. Hypandrium shorter than epandrium, anterior margin with convex. Gonopod connected to paraphysis by membranous tissue, 1 seta near median margin. Paraphysis reduced. Aedeagus fused to aedeagal apodeme, dorsoventrally flattened, scoop-shaped in lateral view, with one pointed projection at tip. Aedeagal apodeme same length as aedeagus, fan-shaped.

♀ **Terminalia:** Valve of oviscapt brownish, distally rounded, ventrally slightly convex, with 3-4 discal and 19-22 marginal, sharp, peg-like outer ovisensilla, 3 thin trichoid-like and 1 long, curved, subterminal inner ovisensilla. Spermatheca sclerotized, ovoid, with basal collar, introvert extending nearly entire length into capsule.



# *Drosophila robusta* Sturtevant

*Drosophila (Drosophila) robusta* Sturtevant 1916



***Drosophila robusta* species group:** Large dark brown flies (2.5 to 4.2 mm). Subvibrissa at least half as long as vibrissa. Acrostichal setulae in approximately 6 rows. Dark setulae on costa ending less than half way between the apices of wing veins  $R_{2+3}$  and  $R_{4+5}$ . Tergites with dark brown posterior bands interrupted at the midline.

**Species Diagnosis:** Brownish flies. Body length 2.5 to 3.9 mm. Wing 2.3 to 3.4 mm. Facial carina broad, slightly concave. Gena narrower than in *D. colorata*, 0.14-0.11X diameter of the eye at greatest vertical height. Mesonotum brown, sometimes with diffuse dark stripe down the center of the mesonotum. Wing hyaline. Aedeagus bulbous in lateral view (vs. scoop-shaped); spermatheca with apical collar.



Redescription



Biology



Key Characters



Distribution



Terminalia



# *Drosophila robusta* Sturtevant

## Key Characters



Subvibrissa at least half as long as vibrissa. Gena broader than in *D. robusta*, 0.17-0.25X diameter of the eye at greatest vertical height.



Dark setulae on costa ending less than half way between the apices of wing veins  $R_{2+3}$  and  $R_{4+5}$ .



Tergites with dark brown posterior bands interrupted at the midline.



Facial carina slightly concave.



Mesonotum brown, sometimes with diffuse dark stripe.





# *Drosophila robusta* Sturtevant

## Biology

*Drosophila robusta* is commonly found on rotting fruit, and on slime or sap fluxes (Sturtevant, 1916). This species can be reared in the laboratory environment on the standard banana-*Opuntia* medium (Markow & O'Grady, 2006, University of California, 2015).

Label data in this study, with collection dates from April to October, include records from Malaise intercept traps in oak forests, from composter traps and pans in compost, from apple cider vinegar bait traps (in raspberry, cherry, wine grape and peach fields, in sea buckthorn and among wild vegetation), from sweeps over compost, from maple and oak sap fluxes, from dead and fresh maple stumps, and having emerged from rotting potatoes.



Fermenting  
baits



Rotting  
Organics



Sap fluxes



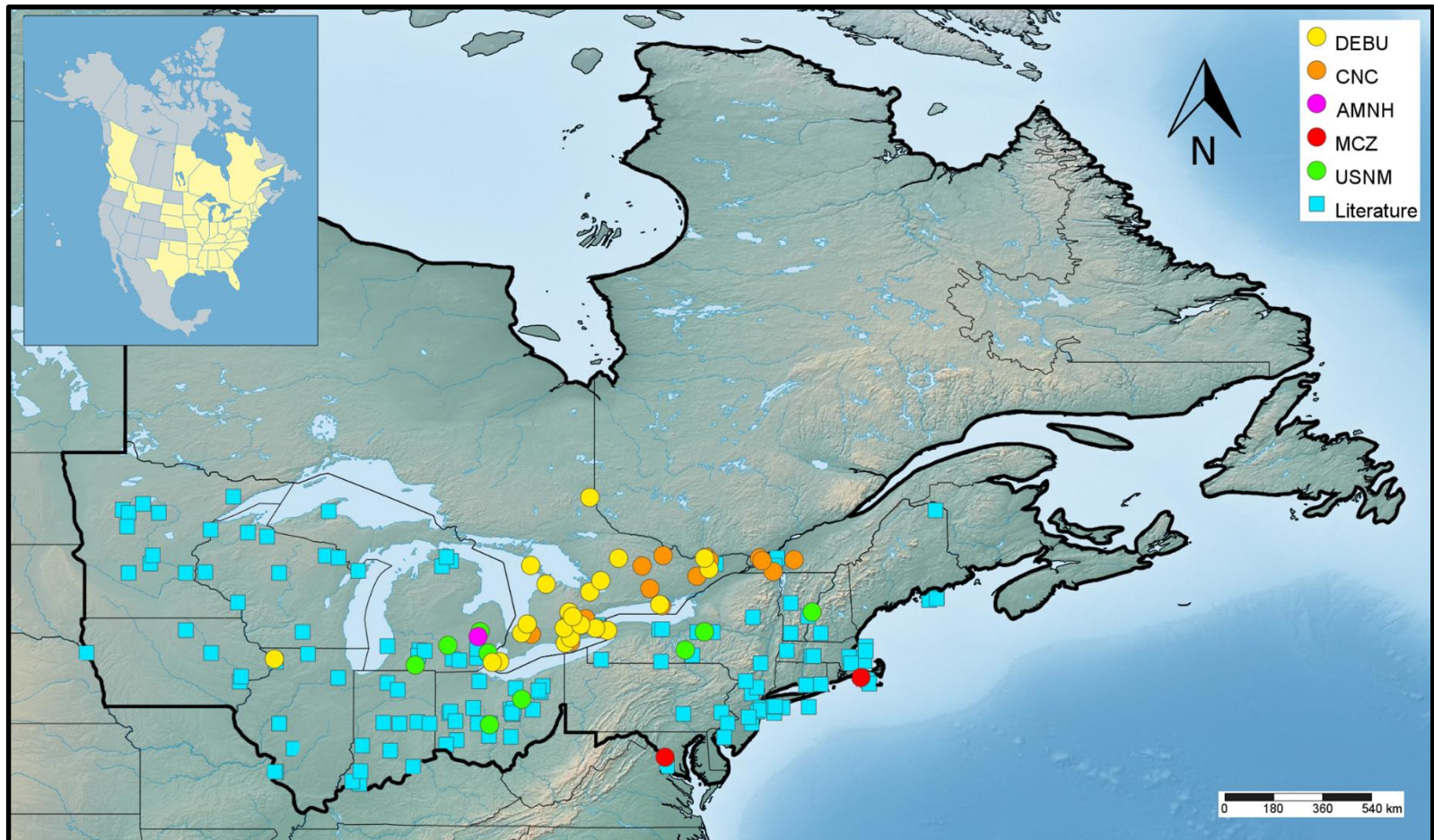
Reared  
in Lab ✓

For additional information & photographs see Werner T. & Jaenike J. (2017).



# *Drosophila robusta* Sturtevant

## North American and Northeastern North American Distribution



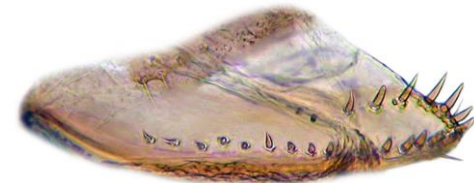


# *Drosophila robusta* Sturtevant

## Male Terminalia



## Oviscapt



## Spermathecae







# *Drosophila robusta* Sturtevant

## Redescription:

Patterson (1943) and Sturtevant (1921) include a description of the external characters of the adults, internal male and female reproductive anatomy, eggs and puparia. Hsu (1949) includes notes and an illustration of the external male terminalia. A description of the male and female terminalia is provided below.

♂ **Terminalia:** Epandrium as in *D. colorata*, except narrow and with 4-5 upper setae and ventral lobe microtrichose on posterior one half. Cercus anteriorly fused to epandrium, oval, completely microtrichose, without ventral lobe, connected to surstylus by membranous tissue. Surstylus microtrichose, with a row of 8-10 peg-like prenisetae, approximately 6 inner and 3 outer setae. Hypandrium shorter than epandrium. Paraphysis reduced to dorsal pointed projections, with 1 setula near dorsal margin. Gonopod absent. Aedeagus fused to aedeagal apodeme, dorsoventrally flattened, triangular in lateral view. Aedeagal apodeme about half the length of aedeagus, strongly flattened laterally blunt at apex.

♀ **Terminalia:** Oviscapt as in *D. colorata*. Spermathecae sclerotized, cylindrical, vase shaped, with a round cap-like structure on the dorsal surface.



# *Drosophila americana* Spencer

*Drosophila (Drosophila) americana* Spencer 1938



***Drosophila virilis* species group:** Dark brown to light brown flies. Body length 2.0 to 3.2 mm. Wing approximately 2.3 to 2.9 mm. Facial carina broad, triangular ventrally, longitudinal groove at midline. Basal scutellar setae always divergent; acrostichal setae in 6 rows. Wing with infuscate areas at crossveins. Tergites completely dark. Epandrium connected laterally to cerci. Dissection required for identification of male specimens, females indistinguishable.

**Species Diagnosis:** Males usually with 6-7 prenisetae on surstylus (usually 6); gonopod and edge of hypandrium membranous and rounded at apex, gonopod slightly triangular. Aedeagus scoop-shaped with 2 large fine, hooked projections laterally near apex with emarginate dorsolateral margins; aedeagal apodeme narrow.



Biology



Key Characters



Distribution



Terminalia



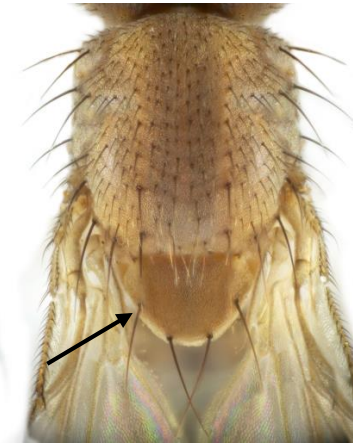
# *Drosophila americana* Spencer

## Key Characters

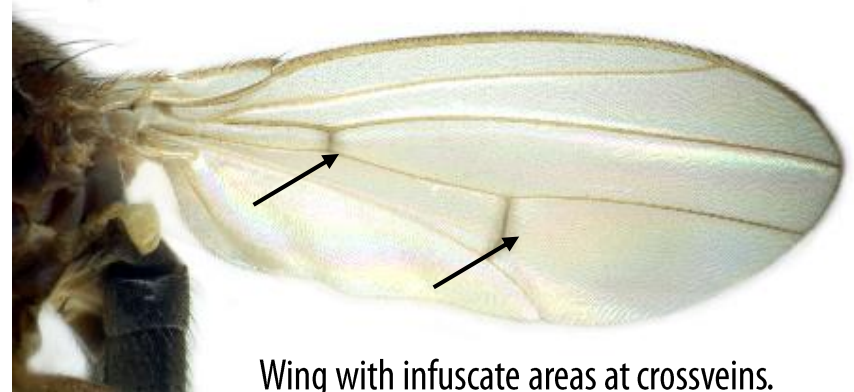


Facial carina broad, triangular ventrally, longitudinal groove at midline.

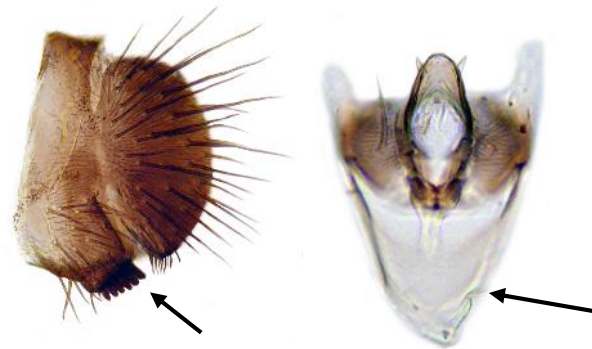
Tergites completely dark.



Basal scutellar setae always divergent; acrostichal setae in 6 rows.



Wing with infusate areas at crossveins.



Males usually with 6-7 prenisetae on surstylus (usually 6); gonopod and edge of hypandrium membranous and rounded at apex, gonopod slightly triangular. Aedeagus scoop-shaped with 2 large fine, hooked projections laterally near apex with emarginate dorsolateral margins; aedeagal apodeme narrow.





# *Drosophila americana* Spencer

## Biology

Like other members of the *virilis* group, *D. americana* is associated with riverbanks and slime and sap fluxes. This species can be reared in the laboratory environment on the standard cornmeal-yeast medium (Markow & O'Grady, 2006, University of California, 2015).



Riverbanks



Sap fluxes



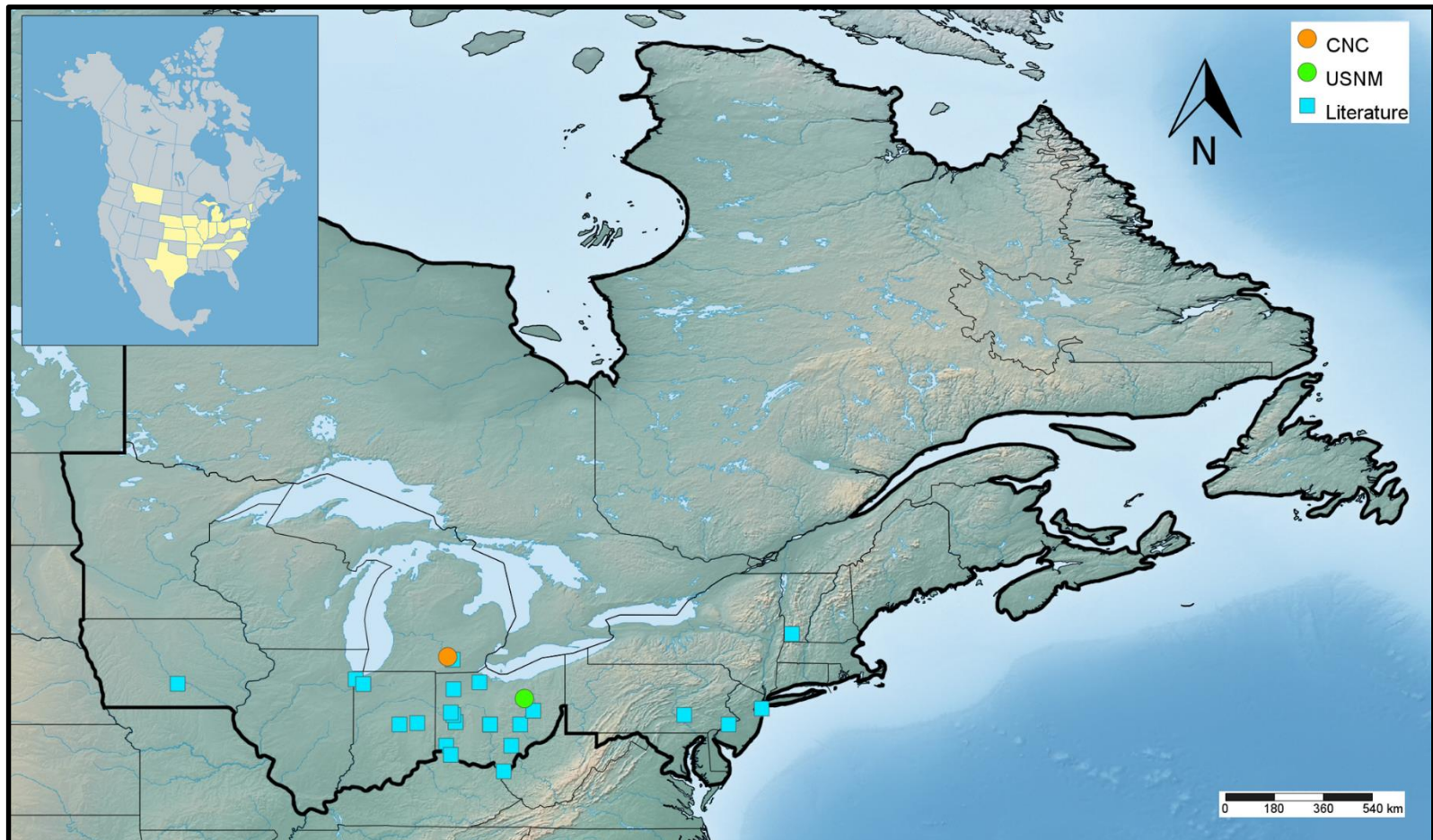
Reared  
in Lab ✓





# *Drosophila americana* Spencer

## North American and Northeastern North American Distribution



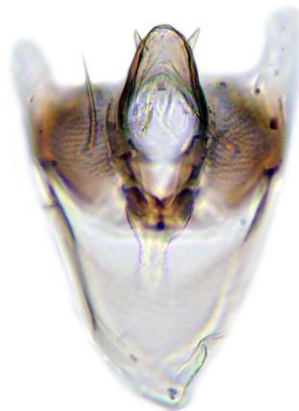
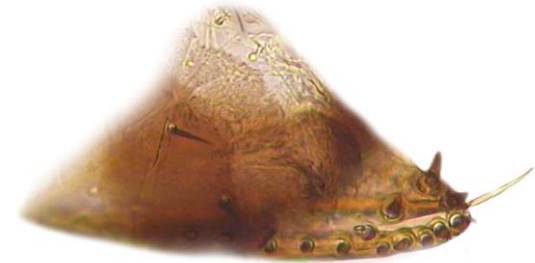


# *Drosophila americana* Spencer

## Male Terminalia



## Oviscapt



## Spermathecae







# *Drosophila borealis* Patterson

*Drosophila (Drosophila) borealis* Patterson 1952



***Drosophila virilis* species group:** Dark brown to light brown flies. Body length 2.0 to 3.2 mm. Wing approximately 2.3 to 2.9 mm. Facial carina broad, triangular ventrally, longitudinal groove at midline. Basal scutellar setae always divergent; acrostichal setae in 6 rows. Wing with infusate areas at crossveins. Tergites completely dark. Epandrium connected laterally to cerci. Dissection required for identification of male specimens, females indistinguishable.

**Species Diagnosis:** Males typically with 5-7 prenisetae (usually 6) on surstylus, gonopod and hypandrium sclerotized, posterolateral projection of hypandrium peg-like and blunt at apex; gonopod rounded. Aedeagus only slightly scoop-shaped, with 2 hooked apical projections, dorsolateral margins not emarginated; aedeagal apodeme narrow.



Biology



Key Characters



Distribution



Terminalia



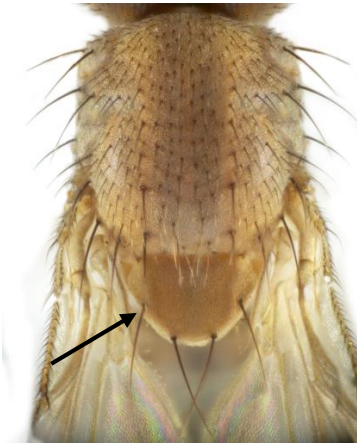
# *Drosophila borealis* Patterson

## Key Characters

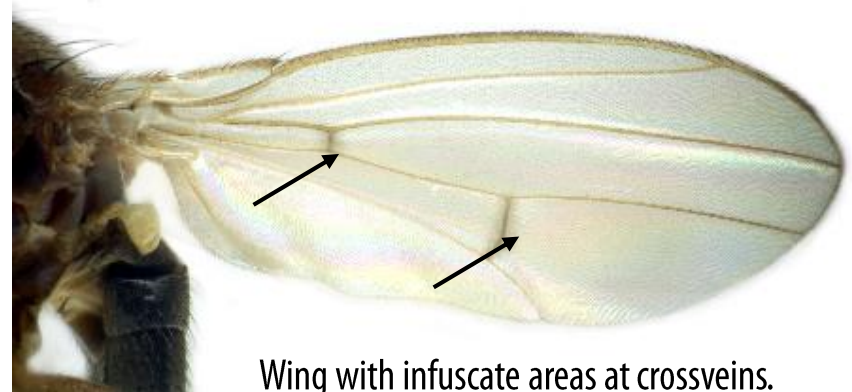


Facial carina broad, triangular ventrally, longitudinal groove at midline.

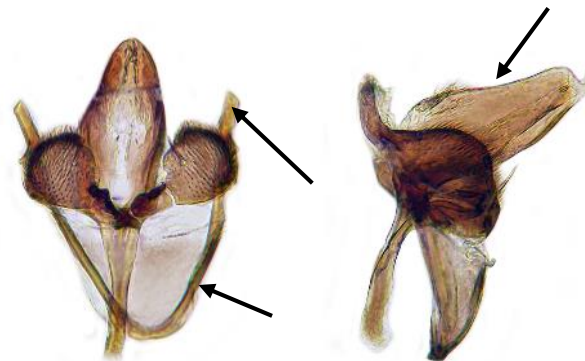
Tergites compl dark.



Basal scutellar setae always divergent; acrostichal setae in 6 rows.



Wing with infusate areas at crossveins.



Males typically with 5-7 prenisetae (usually 6) on surstylus, gonopod and hypandrium sclerotized, posterolateral projection of hypandrium peg-like and blunt at apex; gonopod rounded. Aedeagus only slightly scoop-shaped, with 2 hooked apical projections, dorsolateral margins not emarginated; aedeagal apodeme narrow.



# *Drosophila borealis* Patterson

## Biology

Like other members of the *virilis* group, *D. borealis* is associated with riverbanks and slime and sap fluxes. Patterson (1952) noted that this species has been reared from phloem tissue of aspen. This species can be reared in the laboratory environment on the standard cornmeal-yeast medium (University of California, 2015).



Riverbanks



Sap fluxes



Reared  
in Lab ✓

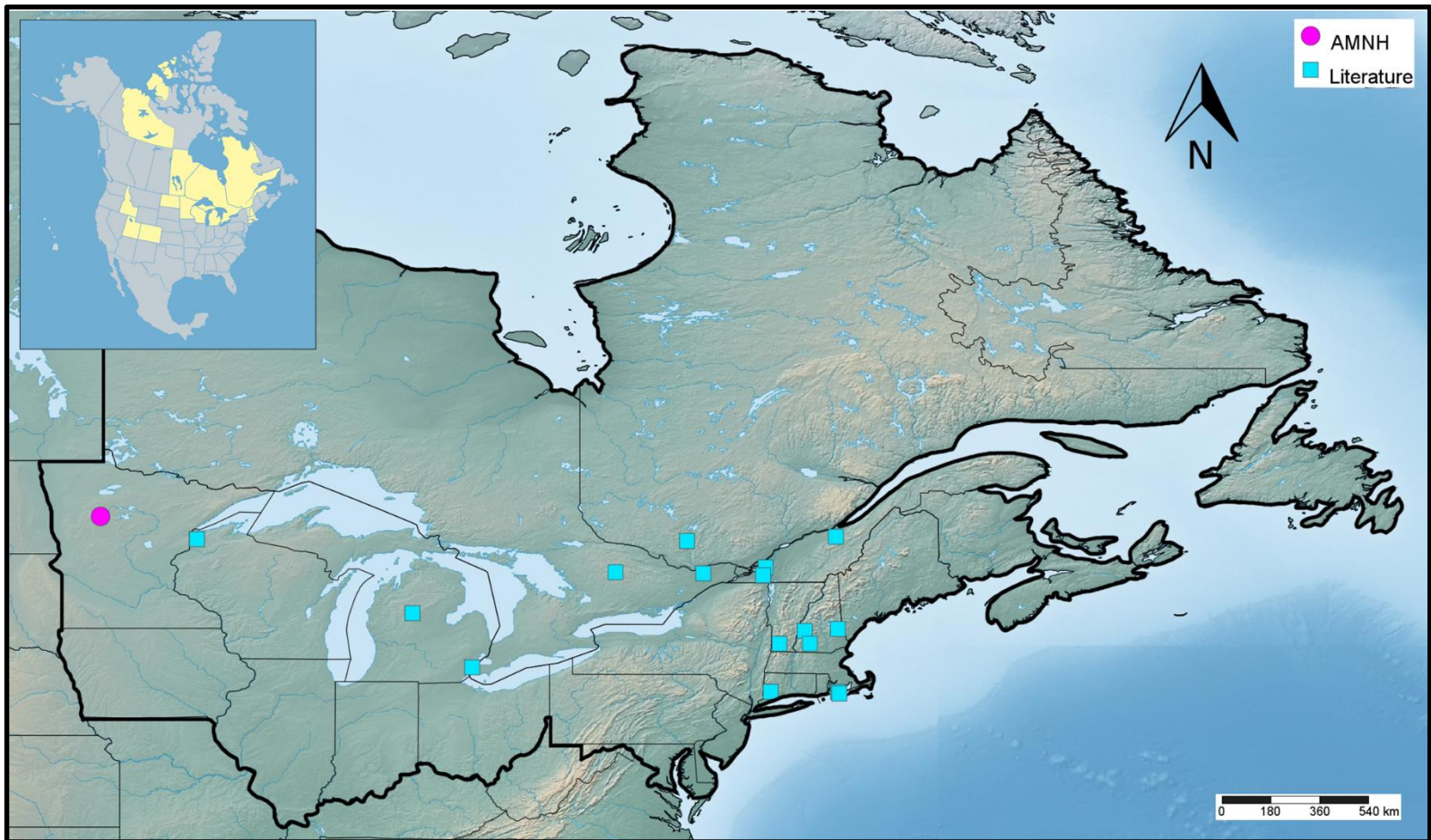






# *Drosophila borealis* Patterson

## North American and Northeastern North American Distribution





# *Drosophila borealis* Patterson

## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila lacicola* Patterson

*Drosophila (Drosophila) lacicola* Patterson 1944



***Drosophila virilis* species group:** Dark brown to light brown flies. Body length 2.0 to 3.2 mm. Wing approximately 2.3 to 2.9 mm. Facial carina broad, triangular ventrally, longitudinal groove at midline. Basal scutellar setae always divergent; acrostichal setae in 6 rows. Wing with infusate areas at crossveins. Tergites completely dark. Epandrium connected laterally to cerci. Dissection required for identification of male specimens, females indistinguishable.

**Species Diagnosis:** Males typically with 5-6 prenisetae (usually 5) on surstylus. Gonopod and edge of hypandrium rounded at apex, gonopod slightly triangular. Aedeagus scoop-shaped, slender in dorsal/ventral views, with 2 large fine, hooked projections laterally near apex with emarginate dorsolateral margins; aedeagal apodeme narrow.



Biology



Key Characters



Distribution



Terminalia





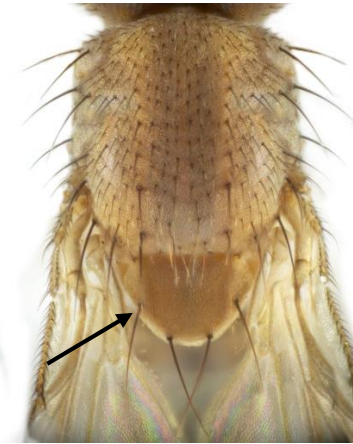
# *Drosophila lacicola* Patterson

## Key Characters

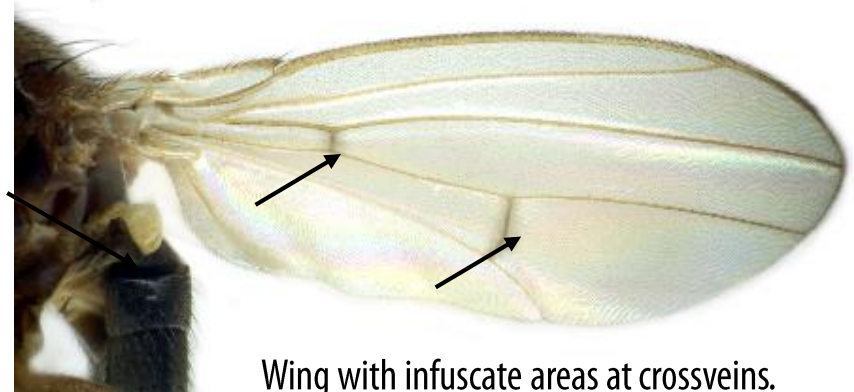


Facial carina broad, triangular ventrally, longitudinal groove at midline.

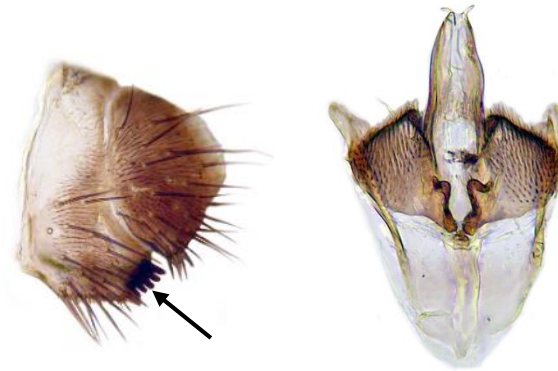
Tergites completely dark.



Basal scutellar setae always divergent; acrostichal setae in 6 rows.



Wing with infusate areas at crossveins.



Males typically with 5-6 prenisetae (usually 5) on surstylus. Gonopod and edge of hypandrium membranous and rounded at apex, gonopod slightly triangular. Aedeagus scoop-shaped, slender in dorsal/ventral views, with 2 large fine, hooked projections laterally near apex with emarginate dorsolateral margins; aedeagal apodeme narrow.



# *Drosophila lacicola* Patterson

## Biology

Like other members of the *virilis* group, *D. lacicola* is associated with riverbanks and slime and sap fluxes. Patterson (1952) noted that this species has been reared from phloem tissue of aspen. This species can be reared in the laboratory environment on the standard cornmeal-yeast medium (University of California, 2015).



Riverbanks



Sap fluxes



Reared  
in Lab ✓





# *Drosophila lacicola* Patterson

## North American and Northeastern North American Distribution

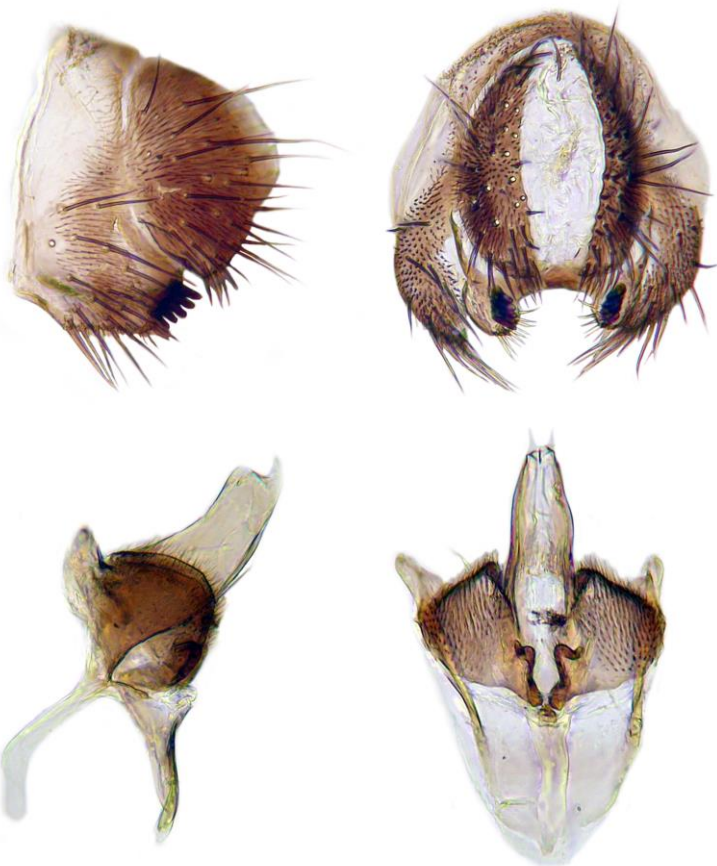






# *Drosophila lacicola* Patterson

## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila virilis* Sturtevant

*Drosophila (Drosophila) virilis* Sturtevant 1916



***Drosophila virilis* species group:** Dark brown to light brown flies. Body length 2.0 to 3.2 mm. Wing approximately 2.3 to 2.9 mm. Facial carina broad, triangular ventrally, longitudinal groove at midline. Basal scutellar setae always divergent; acrostichal setae in 6 rows. Wing with infusate areas at crossveins. Tergites completely dark. Epandrium connected laterally to cerci. Dissection required for identification of male specimens, females indistinguishable.

**Species Diagnosis:** Epandrium, cercus as in *D. americana*. 5-7 prenisetae on surstylus (usually 6). Gonopod and edge of hypandrium membranous, apex of gonopod membranous and rounded at apex, with large apical seta. Aedeagus broad and short in lateral view; hooked apical projections small; aedeagal apodeme broad, fan-like.



Biology



Key Characters



Distribution



Terminalia



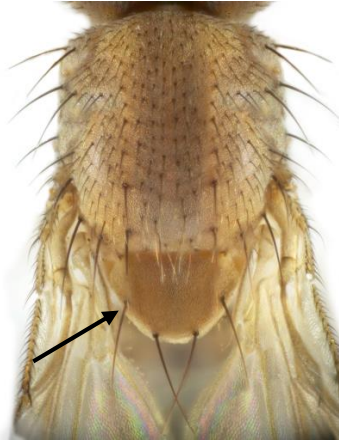
# *Drosophila virilis* Sturtevant

## Key Characters

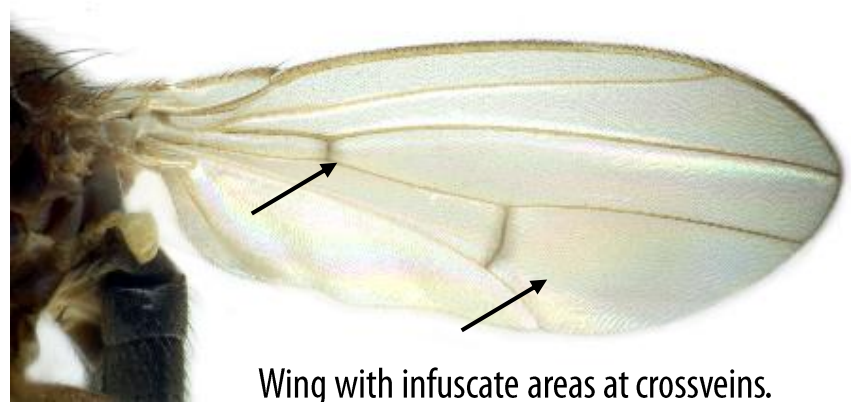


Facial carina broad, triangular ventrally, longitudinal groove at midline.

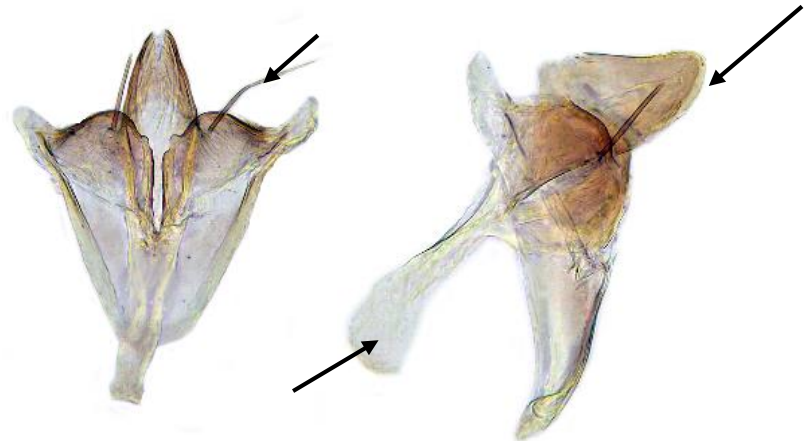
Tergites completely dark.



Basal scutellar setae always divergent; acrostichal setae in 6 rows.



Wing with infusate areas at crossveins.



5-7 prensisetæ on surstylus (usually 6). Gonopod and edge of hypandrium membranous, apex of gonopod membranous and rounded at apex, with large apical setae. Aedeagus broad and short in lateral view; hooked apical projections small; aedeagal apodeme broad, fan-like.





# *Drosophila virilis* Sturtevant

## Biology

The cosmopolitan *D. virilis* has been associated with wine production facilities and breweries (Bächli et al., 2004). This species can be reared in the laboratory environment on the standard cornmeal-yeast medium (Markow & O'Grady, 2006).



Beer & Wine  
facilities



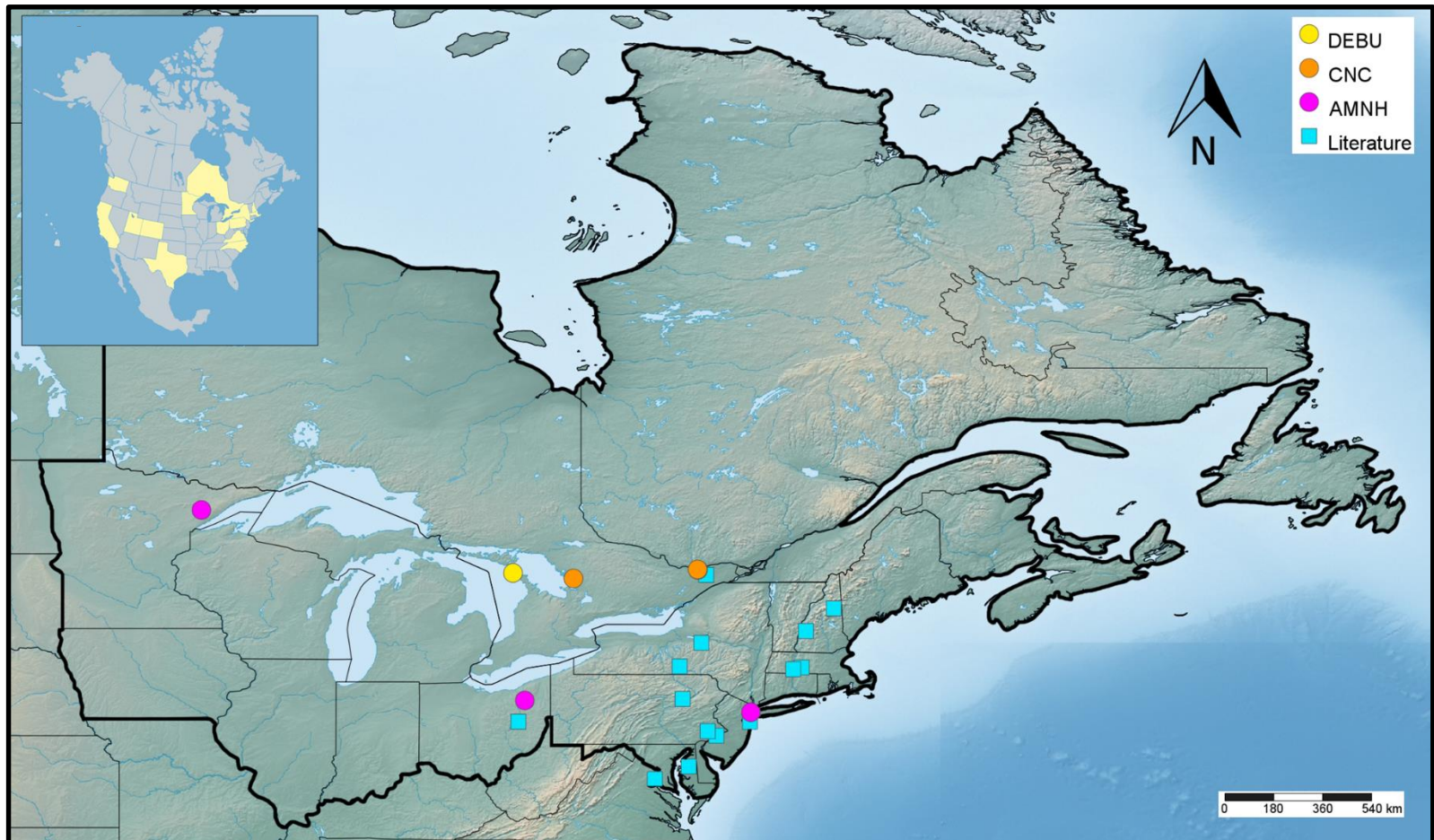
Reared  
in Lab ✓





# *Drosophila virilis* Sturtevant

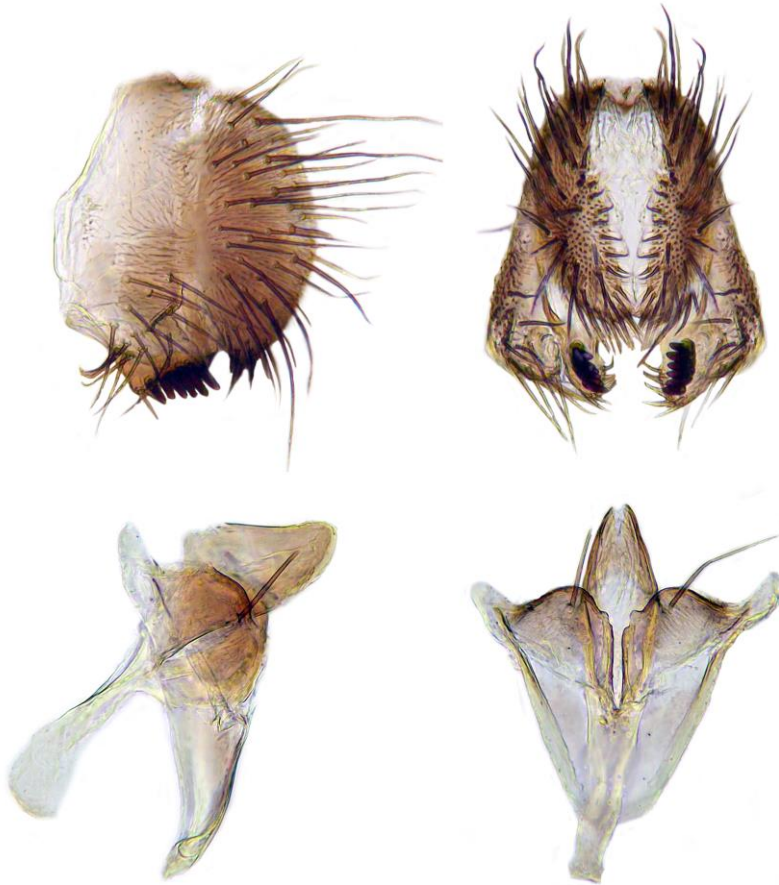
## North American and Northeastern North American Distribution



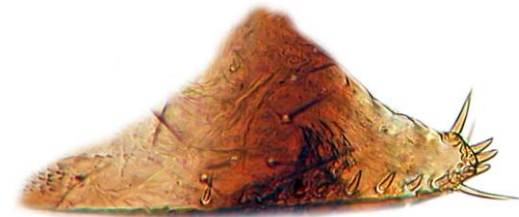


# *Drosophila virilis* Sturtevant

## Male Terminalia



## Oviscapt



## Spermathecae







# *Drosophila carsoni* Wheeler

*Drosophila (Drosophila) carsoni* Wheeler 1957



## ***Drosophila carsoni* species group:**

The *carsoni* species group is monotypic, containing only one species (*D. carsoni* Wheeler).

**Species Diagnosis:** Dark flies. Body length 2.3 to 3.6 mm. Wing 2.5 to 3.5 mm. Mesonotum dark brown. Wing hyaline, without infuscation over crossveins; dark setulae on costa ending more than half way between the apices of veins  $R_{2+3}$  and  $R_{4+5}$ . Tergites dark, with almost black posterior bands interrupted at the midline. Cercus connected laterally to epandrium. Male with large, distinct finger-like projection on ventral lobe of epandrium. Aedeagus sclerotized, hooked in lateral view.



Redescription



Biology



Key Characters



Distribution



Terminalia



# *Drosophila carsoni* Wheeler

## Key Characters



Wing hyaline; dark setulae on costa ending more than half way between the apices of wing veins  $R_{2+3}$  and  $R_{4+5}$ .



Tergites dark, with almost black posterior bands interrupted at the midline.



Lack of long fine setae on pedicel.



Male with large, distinct finger-like projection on ventral lobe of epandrium.



# *Drosophila carsoni* Wheeler

## Biology

Starmer (1981) suggested that *D. carsoni* may be associated with deciduous sap fluxes of elm, oak, aspen, and cottonwood. This species cannot be reared in the laboratory environment, and is rarely collected in the wild (Markow & O'Grady, 2006).



Sap fluxes



Not reared in  
Lab

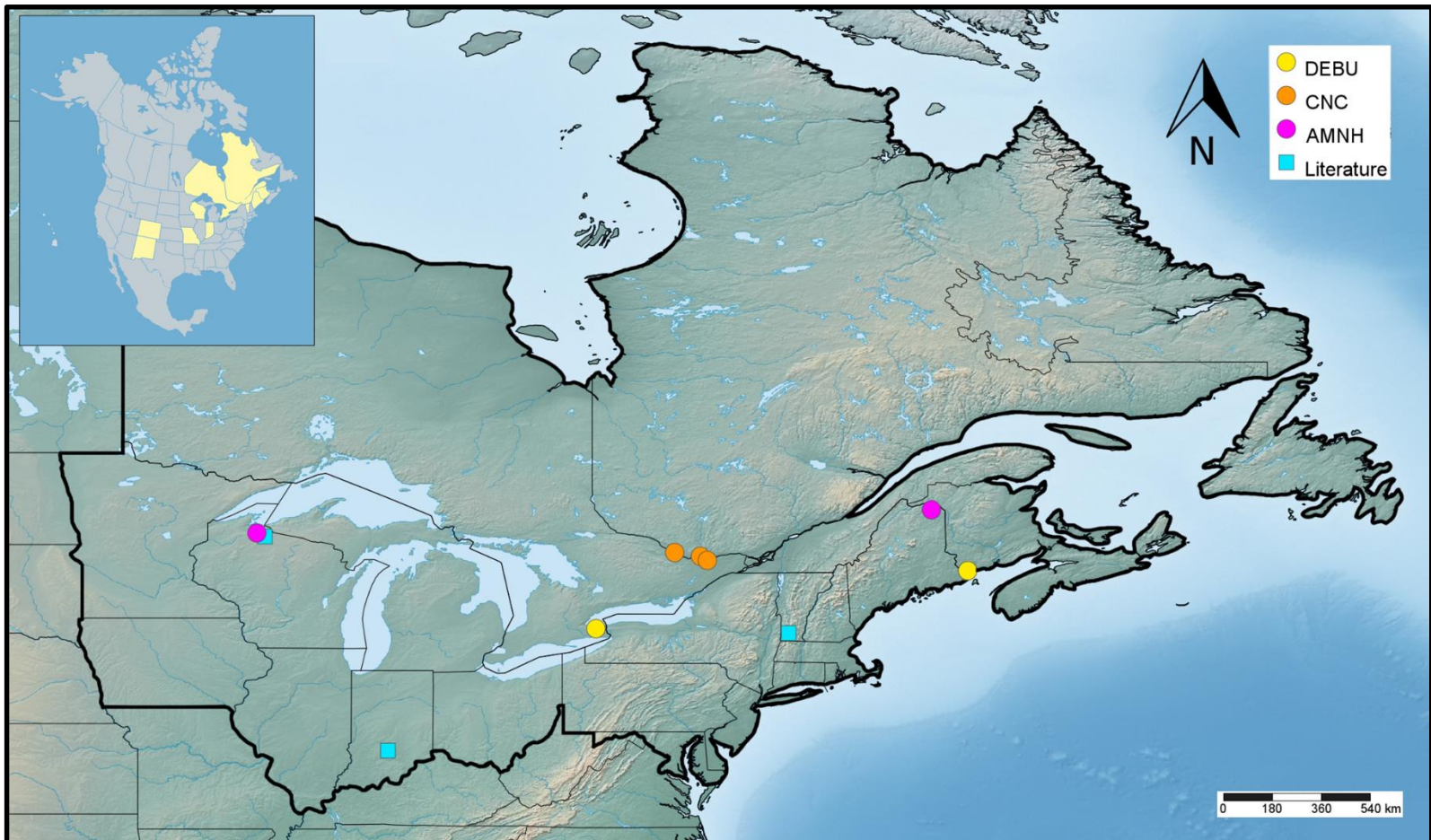






# *Drosophila carsoni* Wheeler

## North American and Northeastern North American Distribution



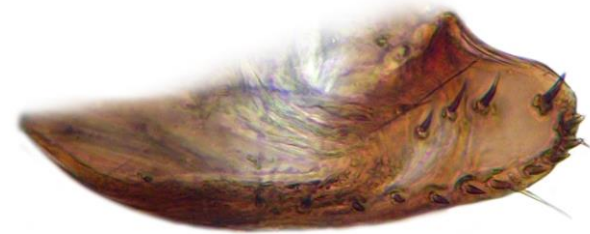


# *Drosophila carsoni* Wheeler

## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila carsoni* Wheeler

## Redescription:

Dark flies. Body length 2.3 to 3.6 mm. Wing 2.5 to 3.5 mm. Mesonotum dark brown. Wing hyaline, without infuscation over crossveins ; dark setulae on costa ending more than half way between the apices of wing veins  $R_{2+3}$  and  $R_{4+5}$ . Tergites dark, with almost black posterior bands interrupted at the midline. Male surstylus with distinct horn-shaped large projection. Wheeler (1957) includes a description of the external characters of the adult and the egg. A redescription of the male and female terminalia is provided below.

♂ **Terminalia:** Epandrium distally microtrichose, with approximately 10 lower and 3 upper setae; ventral lobe not microtrichose, with a sclerotized finger-like projection partially covering surstylus. Cercus anteriorly fused to epandrium, oval in shape, completely microtrichose, without ventral lobe, covered in long setae. Surstylus not microtrichose, with a sulcate row of approximately 16 peg-like prensisetae, 5 inner and no outer setae. Hypandrium shorter than epandrium, membranous. Paraphysis reduced to dorsal pointed projections. Gonopod curving inward, towards tip of aedeagus. Aedeagus fused to aedeagal apodeme, dorsoventrally flattened, with two pointed lobes at apex. Aedeagal apodeme same length as aedeagus.

♀ **Terminalia :** Valve of oviscapt distally rounded, ventrally slightly convex, with approximately 4 discal and 12 marginal, peg-like sharp outer ovisensilla; 3 thin discal positioned and 1 long, curved subterminal; spermathecae sclerotized, wrinkled, slightly bell shaped with rounded ventral margin.





# *Drosophila cardini* Sturtevant

*Drosophila (Drosophila) cardini* Sturtevant 1916



***Drosophila cardini* species group:** With the exception of the widespread species *Drosophila cardini*, this group of approximately 16 species is otherwise Neotropical, about half of them island endemics in the Caribbean. Species in this group generally have a yellowish thorax and a boldly-patterned to virtually all dark abdomen that is polished (vs. pollinose/dull in other groups). New records reported here from northern New Jersey and southern Ontario are the northern-most records of the species (the previous one being Tennessee).

**Species Diagnosis:** Yellowish flies. Body length 2.6 to 3.1 mm. Thorax reddish-brown; wing infusate at crossveins; abdomen with shining black posterior bands on each tergite, bands taper dorsally and are broken down the midline on tergites 2 to 4.



Biology



Key Characters



Distribution



Terminalia



# *Drosophila cardini* Sturtevant

## Key Characters

Thorax reddish-brown.



Wing infusate at crossveins.

Abdomen with shining black posterior bands on each tergite, bands taper dorsally, broken down the midline on tergites 2 to 4.



# *Drosophila cardini* Sturtevant

## Biology

*Drosophila cardini* is typically associated with rotting fruit (Sturtevant, 1916) and occasionally with mushrooms (Starmer, 1981). This species can be reared in the laboratory environment on the standard banana-*Opuntia* medium (Markow & O'Grady, 2006; University of California, 2015). Label data from our study includes records from apple cider vinegar traps (in raspberry, cherry and peach fields) collected in September, and on *Phallus rivenellii* fungus collected in summer.



Fermenting  
baits



Rotting  
Organics



Fungi



Reared  
in Lab ✓

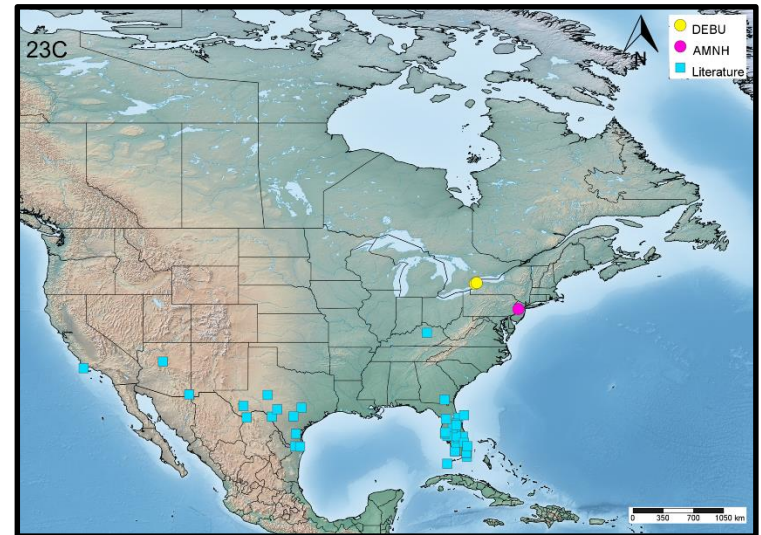
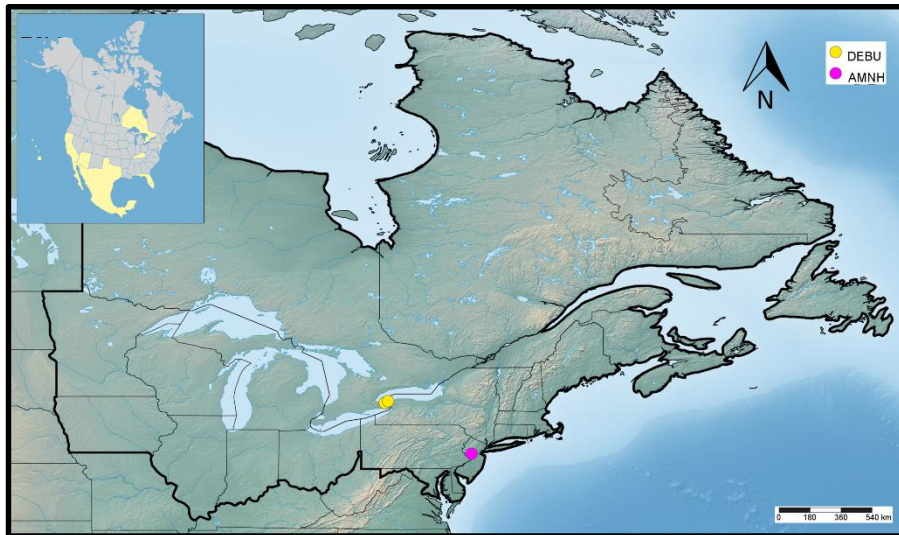






# *Drosophila cardini* Sturtevant

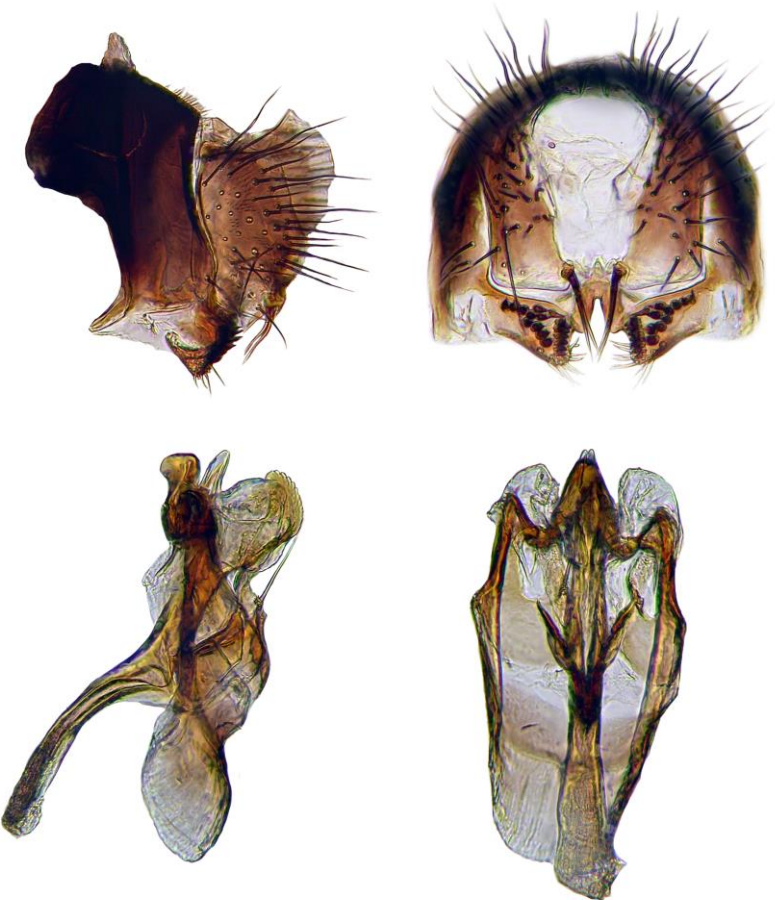
## North American and Northeastern North American Distribution





# *Drosophila cardini* Sturtevant

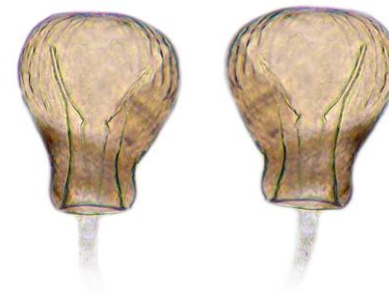
## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila immigrans* Sturtevant

*Drosophila (Drosophila) immigrans* Sturtevant 1921



## ***Drosophila immigrans* species group:**

A large Asian species group, of which *Drosophila immigrans* is the most widespread introduced species.



## **Species Diagnosis:** Robust, yellowish flies.

Fore femur with inside surface having a row of small, spinule-like setae; male fore tarsus with thick brush of fine ventral setae.

Tergites pale with diffuse triangular posterior bands that do not reach the lateral margin; apical tergites almost completely dark.



Biology



Key Characters



Distribution



Terminalia

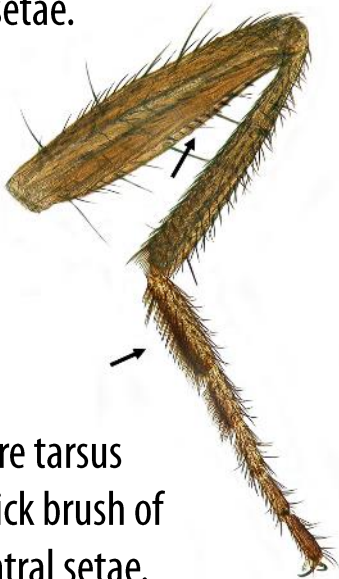




# *Drosophila immigrans* Sturtevant

## Key Characters

Fore femur with inside surface having a row of small, spinule-like setae.



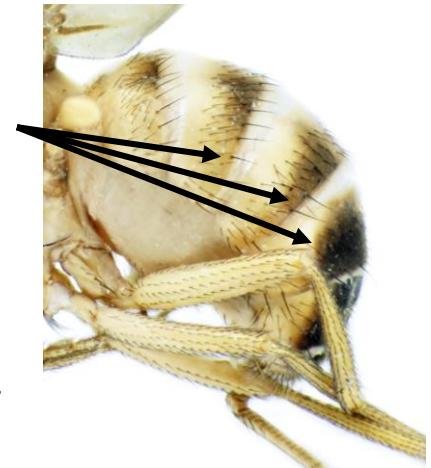
Male fore tarsus with thick brush of fine ventral setae.



Wings infusate at crossveins and apices of wing veins.



Tergites pale with diffuse triangular posterior bands that do not reach the lateral margin; apical tergites almost completely dark.





# *Drosophila immigrans* Sturtevant

## Biology

*Drosophila immigrans* is typically found on rotting organic materials (produce etc.), and is also associated with flowers in tropical regions (Bächli et al., 2004; Brncic, 1987). This species can be reared in the laboratory environment on the standard cornmeal-yeast medium (Markow & O'Grady, 2006; University of California, 2015).

Label data in this study, with collection dates from June to December, include records from composter traps, from apple cider vinegar bait traps (in blueberry fields, raspberry fields, and wild vegetation), from rotting apples and from an inky mushroom cap at the edge of a grass lawn.



Fermenting  
baits



Rotting  
Organics



Flowers



Reared  
in Lab ✓

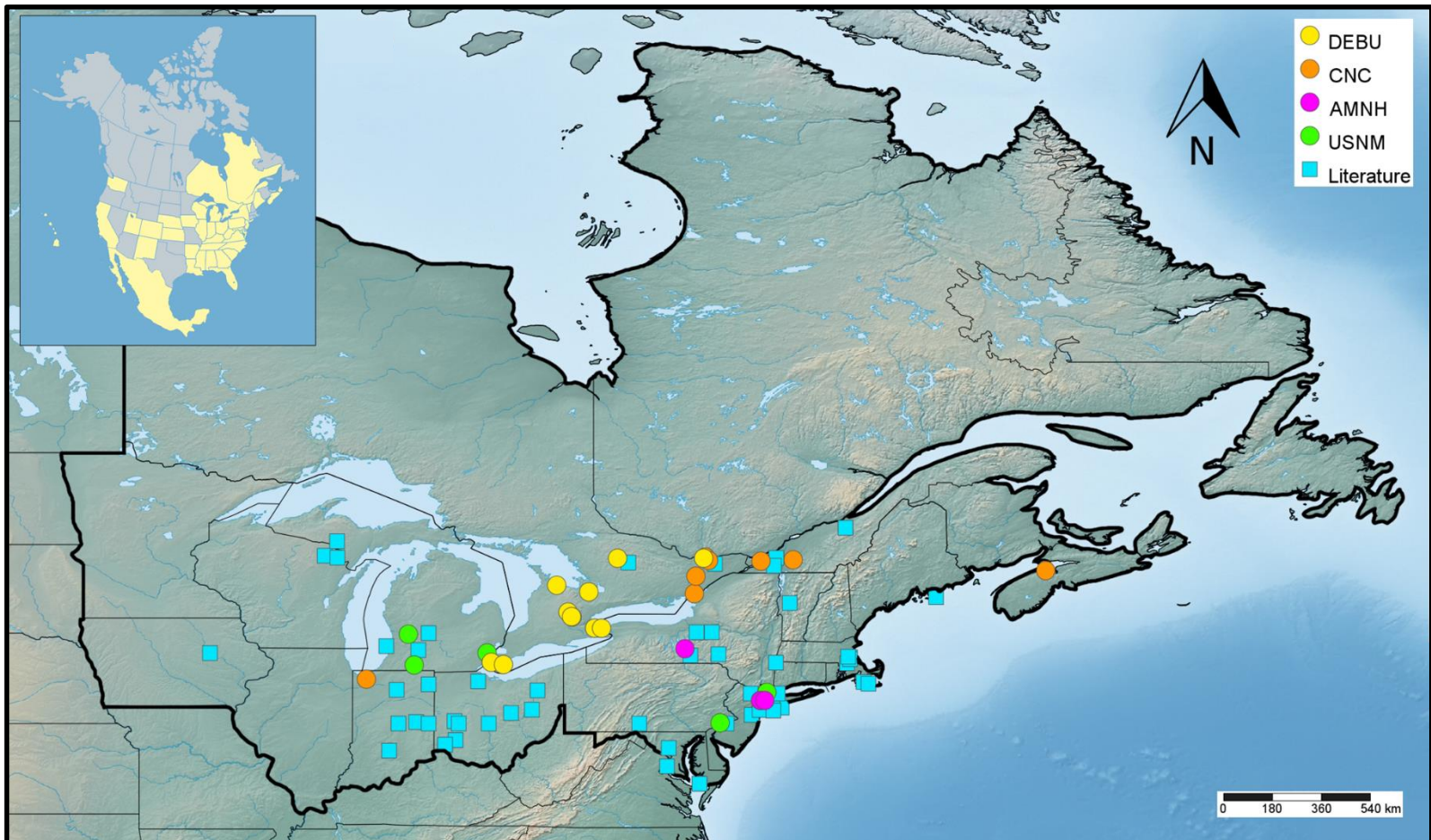


For additional information & photographs see Werner T. & Jaenike J. (2017).



# *Drosophila immigrans* Sturtevant

## North American and Northeastern North American Distribution





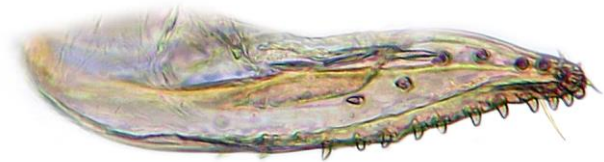


# *Drosophila immigrans* Sturtevant

## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila deflecta* Malloch

*Drosophila (Drosophila) deflecta* Malloch 1924



***Drosophila quinaria* species group:** Yellowish flies with wing infusate/spotted at crossveins and/or wing tips, with up to 13 distinct dark spots. Tergites yellowish with 4 circular blackish-brown spots on each tergite; or light brown with a diffuse pale area down the midline; or pale with posterior bands, forming triangular patches towards the midline. Male terminalia with dorsal "hood" over distiphallus. Eggs with three filaments.

**Species Diagnosis:** Apices of wing veins with round-oval infusate spots; crossvein dm-cu slightly kinked; wing tip acute, slightly pointed. Tergites pale yellow, each with 4 dark spots; surstylus with crowded spicule-like prensisetae.



Biology



Key Characters



Distribution

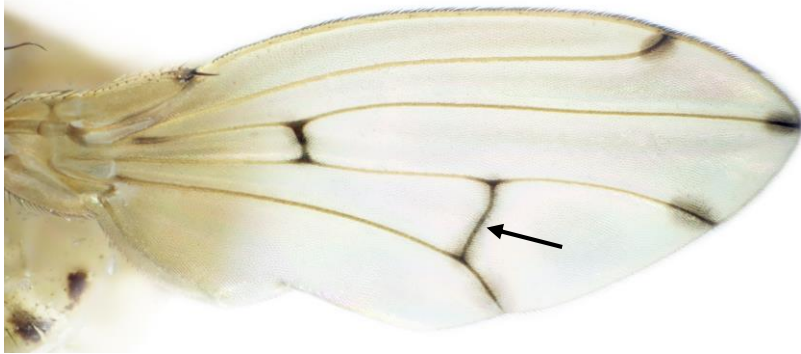


Terminalia

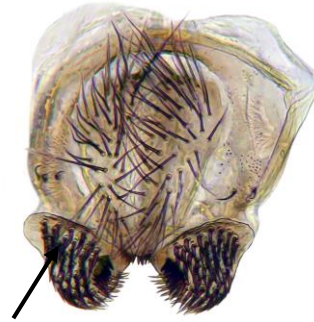


# *Drosophila deflecta* Malloch

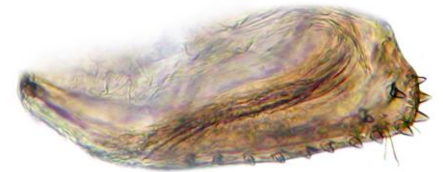
## Key Characters



Apices of wing veins with round-oval infusate spots; crossvein dm-cu slightly kinked; wing tip acute, slightly pointed.

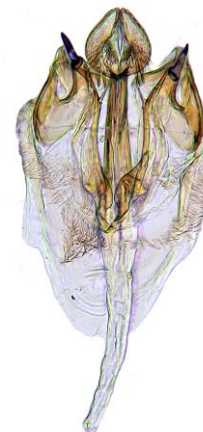


Surstylus crowded with spicule-like prensisetae.



Oviscapt distally rounded.

Tergites pale yellow, each with 4 dark spots.



Aedeagus round at apex, teardrop-shaped in posterior view.





# *Drosophila deflecta* Malloch

## Biology

*D. deflecta* typically breeds on semi-aquatic plants. This species can be reared in the laboratory environment on the standard banana-*Opuntia* medium (Markow & O'Grady, 2006).

Label data from this study, with collection dates from May to September, include records from Malaise and pan traps in a wooded area, on *Nuphar polysepala* (yellow pond lily) and bred on *Sagittaria* (arrowhead).



Semi-Aquatic  
Plants



Reared  
in Lab ✓

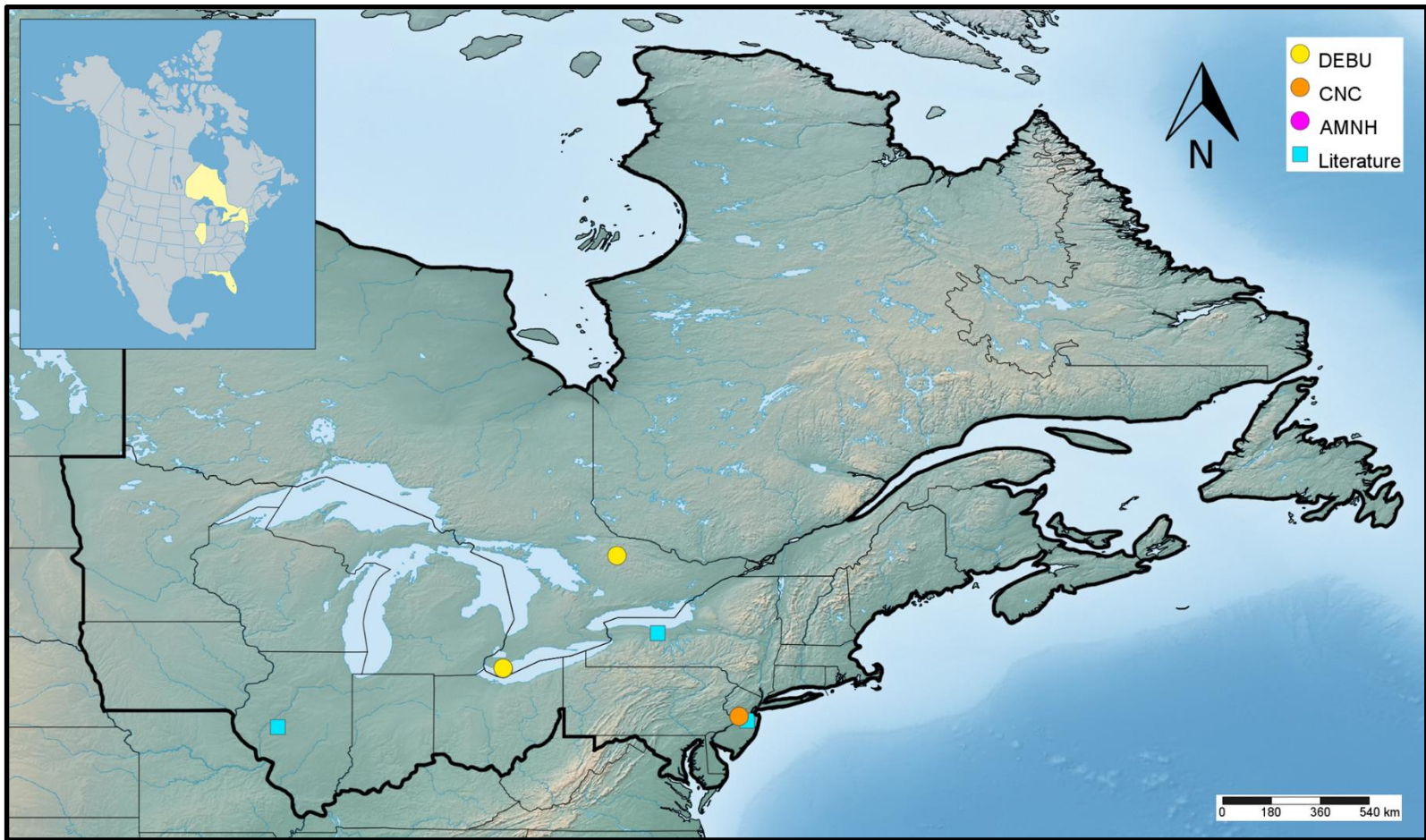


For additional information & photographs see Werner T. & Jaenike J. (2017).



# *Drosophila deflecta* Malloch

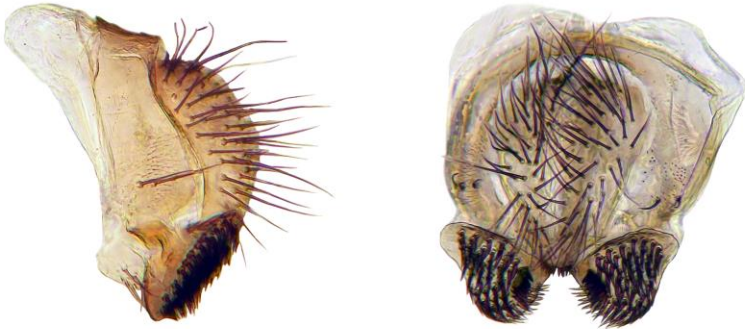
## North American and Northeastern North American Distribution



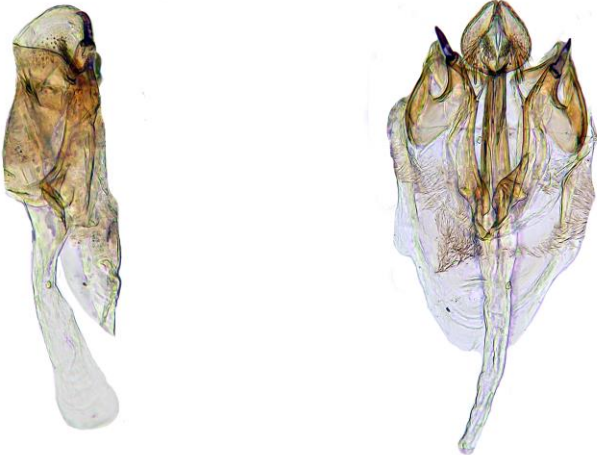
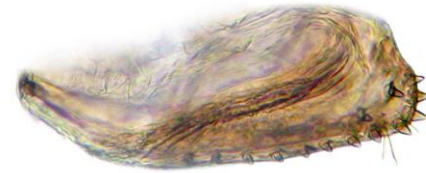


# *Drosophila deflecta* Malloch

## Male Terminalia



## Oviscapt



## Spermathecae







# *Drosophila falleni* Wheeler

*Drosophila (Drosophila) falleni* Wheeler 1960



***Drosophila quinaria* species group:** Yellowish flies with wing infusate/spotted at crossveins and/or wing tips, with up to 13 distinct dark spots. Tergites yellowish with 4 circular blackish-brown spots on each tergite; or light brown with a diffuse pale area down the midline; or pale with posterior bands, forming triangular patches towards the midline. Male terminalia with dorsal "hood" over distiphallus. Eggs with three filaments.

**Species Diagnosis:** Very similar externally to *D. recens*, distinguished by gena narrower than in *D. falleni*, 0.10-0.17X diameter of eye at greatest vertical height; subvibrissa thinner than vibrissa, slightly shimmering and gold in colour. Tergites pale to deep yellow, each with 4 dark spots ranging from separated to coalesced. Wing infusate at crossveins, cross-vein dm-cu approximately perpendicular to veins  $M_1$  and  $CuA_1$ .



Biology



Key Characters



Distribution



Terminalia



# *Drosophila falleni* Wheeler

## Key Characters



Gena narrower than in *D. recens*, 0.10-0.17X diameter of the eye at greatest vertical height; subvibrissa thinner than vibrissa, slightly shimmering and gold in colour.



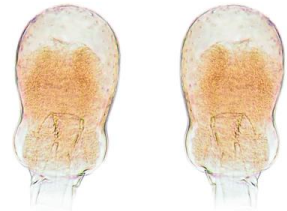
Wing infusate at crossveins, cross-vein dm-cu approximately perpendicular to veins  $M_1$  and  $cuA_1$ .



Apex of aedeagus rounded, with two posterior pointed projections.



Tergites pale yellow, each with 4 dark spots, ranging from separated to coalesced.



Spermathecae bulbous, narrowed medially.



# *Drosophila falleni* Wheeler

## Biology

Like other members of the *quinaria* species group, *D. falleni* is associated with fungi (Jaenike, 1978). This species can be reared in the laboratory environment on the Wheeler-Clayton medium and in the standard mushroom medium (Markow & O'Grady, 2006).

Label data in this study, with collection dates from April to November, include records from traps in deciduous, boreal and mixed forests (Malaise, yellow pans, pitfalls, mushroom baited, moose dung baited and moose antler baited), from composter traps, from apple cider vinegar traps (in peach, blueberry, grape, raspberry and cherry fields, and among wild hosts), from mushrooms (*Armillaria mellea*, *Pleurotus ostreatus*, *Pleurotus sp*, *Amanita spp*, etc.), from sweeps in trail-side vegetation, from wood (overwintering as adults), and upon emergence from a hemlock stump. This is probably the most common species of the *quinaria* group in northeastern North America.



Fermenting  
baits



Rotting  
Organics



Fungi



Reared  
in Lab ✓



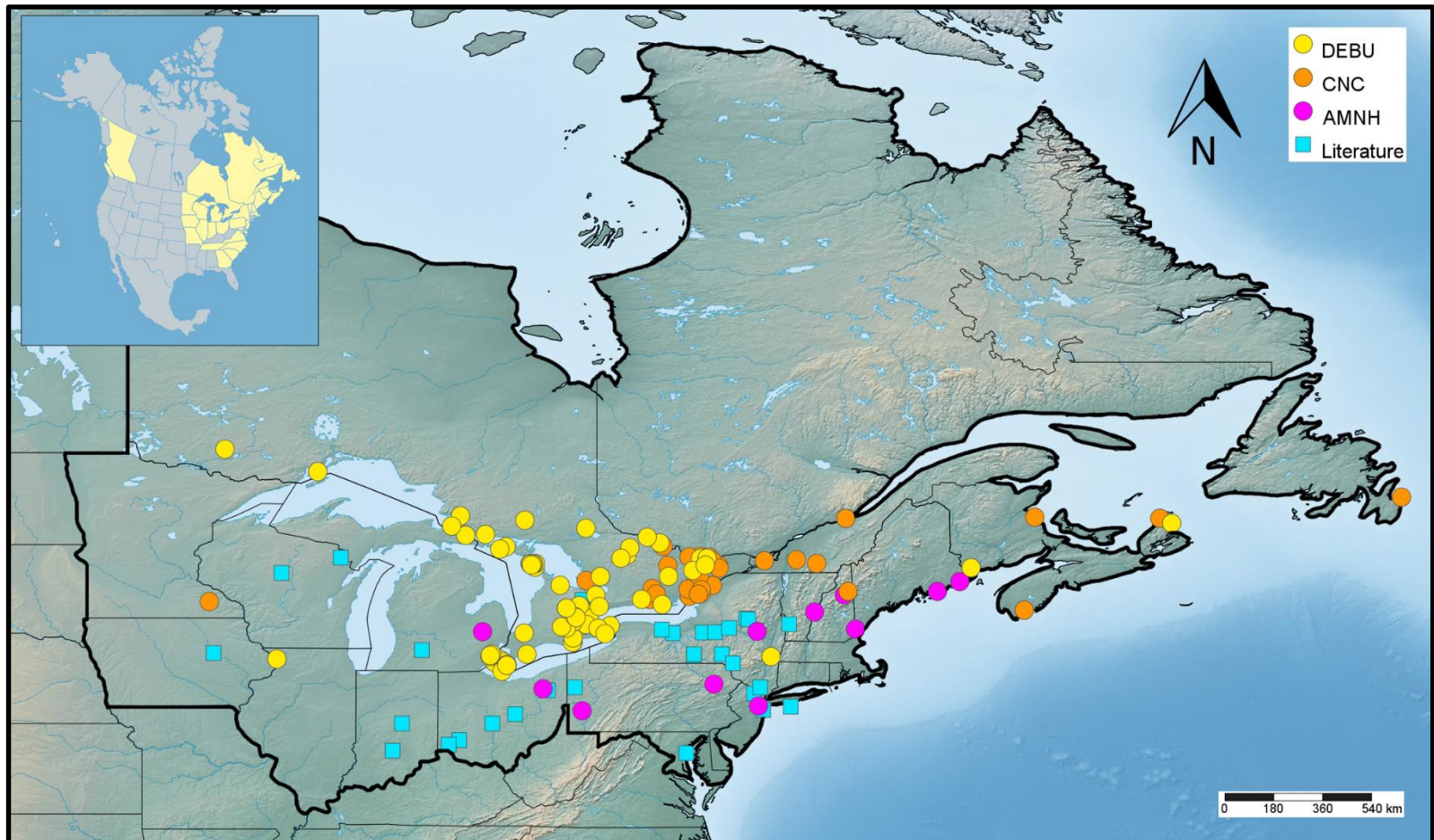
For additional information & photographs see Werner T. & Jaenike J. (2017).





# *Drosophila falleni* Wheeler

## North American and Northeastern North American Distribution



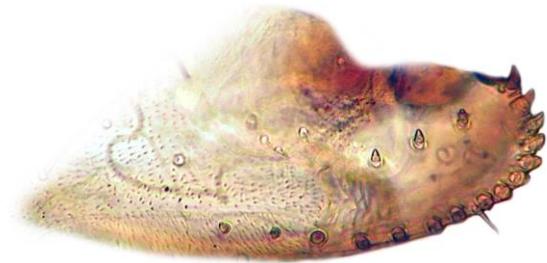


# *Drosophila falleni* Wheeler

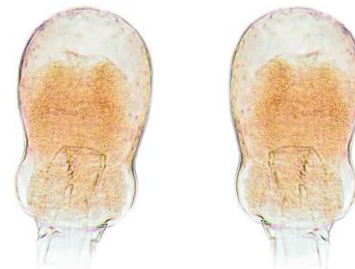
## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila guttifer* Walker

*Drosophila (Drosophila) guttifer* Walker 1849



***Drosophila quinaria* species group:** Yellowish flies with wing infusate/spotted at crossveins and/or wing tips, with up to 13 distinct dark spots. Tergites yellowish with 4 circular blackish-brown spots on each tergite; or light brown with a diffuse pale area down the midline; or pale with posterior bands, forming triangular patches towards the midline. Male terminalia with dorsal "hood" over distiphallus. Eggs with three filaments.

**Species Diagnosis:** Immediately distinctive for the patterned wing, with 13 dark/infusate spots at/near tips of veins and crossveins and especially along vein  $R_{4+5}$ . Tergites pale yellow to light brown, each with 4 dark spots. .



Biology



Key Characters



Distribution



Terminalia





# *Drosophila guttifera* Walker

## Key Characters



Tergites pale yellow to light brown, each with 4 dark spots.



Immediately distinctive for the patterned wing, with 13 dark/infuscate spots at/near tips of veins and crossveins and especially along vein R<sub>4+5</sub>.



# *Drosophila guttifera* Walker

## Biology

Like other members of the *quinaria* species group, *D. guttifera* is associated with fungi. This species can be successfully reared in the laboratory environment on the standard banana-*Opuntia* medium, the Wheeler-Clayton medium and the standard mushroom medium (Markow & O'Grady, 2006).

Label data in this study, with collection dates from March to October, include records from yellow pans in tallgrass prairie, as well as from various types of mushrooms. This species prefers habitats with sandy soils and is more abundant in the southern U.S.



Fungi



Reared  
in Lab ✓

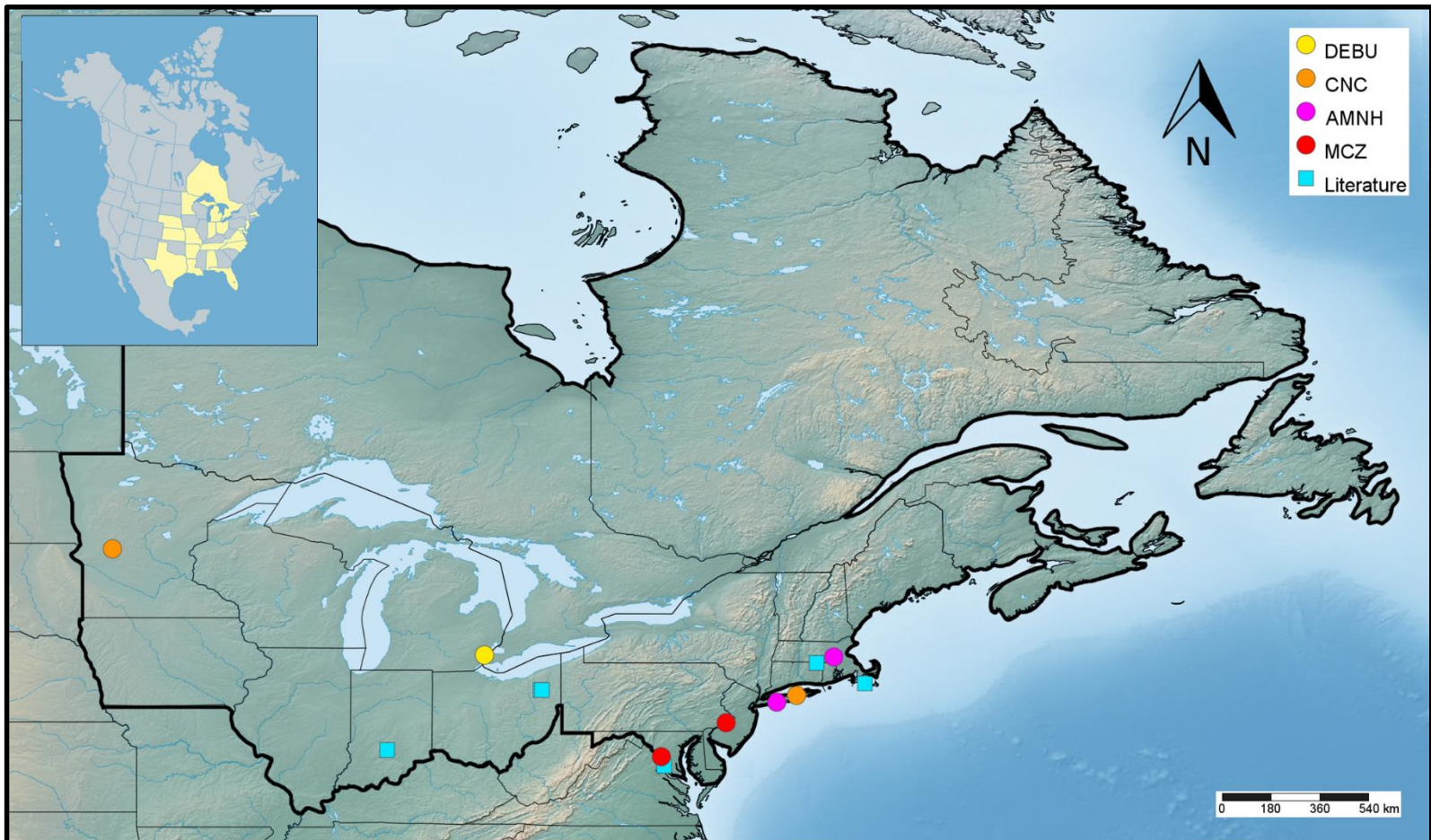


For additional information & photographs see Werner T. & Jaenike J. (2017).



# *Drosophila guttifer* Walker

## North American and Northeastern North American Distribution







# *Drosophila guttifer* Walker

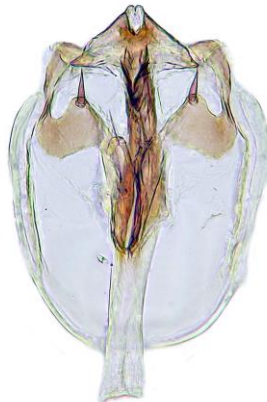
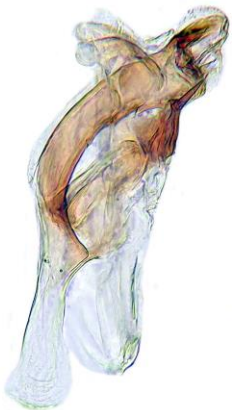
## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila palustris* Spencer

*Drosophila (Drosophila) palustris* Spencer 1942



***Drosophila quinaria* species group:** Yellowish flies with wing infusate/spotted at crossveins and/or wing tips, with up to 13 distinct dark spots. Tergites yellowish with 4 circular blackish-brown spots on each tergite; or light brown with a diffuse pale area down the midline; or pale with posterior bands, forming triangular patches towards the midline. Male terminalia with dorsal "hood" over distiphallus. Eggs with three filaments.

**Species Diagnosis:** Wing crossveins and apices of wing veins infusate. Tergites usually evenly light brown with a broad pale area down the midline.



Biology



Key Characters



Distribution



Terminalia



# *Drosophila palustris* Spencer

## Key Characters



Tergites usually evenly light brown, with a broad pale area down the midline.



Wing crossveins and apices of wing veins infusate.





# *Drosophila palustris* Spencer

## Biology

*D. palustris* typically breeds in semi-aquatic plants. Label data in this study, with collection dates from April to October, include records from Malaise and pan traps in wooded areas, from mushroom traps in a tamarack bog, from sweeps in *Eupatorium*, from sweeps in a fen and from a wet sedge meadow. It has been reared from eastern skunk cabbage (*Symplocarpus foetida*: Araceae) and arrowhead (*Sagittaria latifolia*: Araceae).



Semi-Aquatic  
Plants



Reared  
in Lab ✓

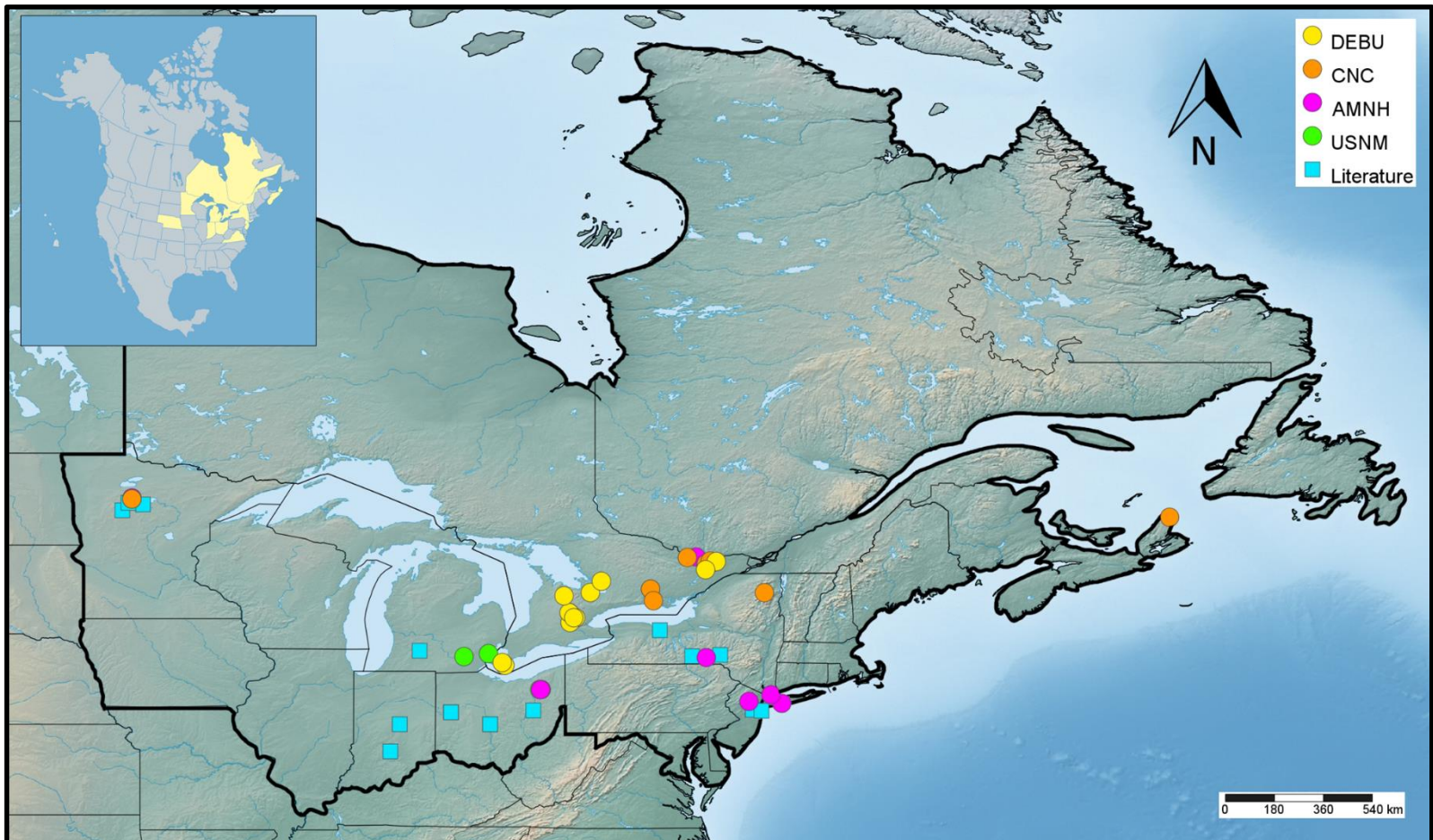


For additional information & photographs see Werner T. & Jaenike J. (2017).



# *Drosophila palustris* Spencer

## North American and Northeastern North American Distribution





# *Drosophila palustris* Spencer

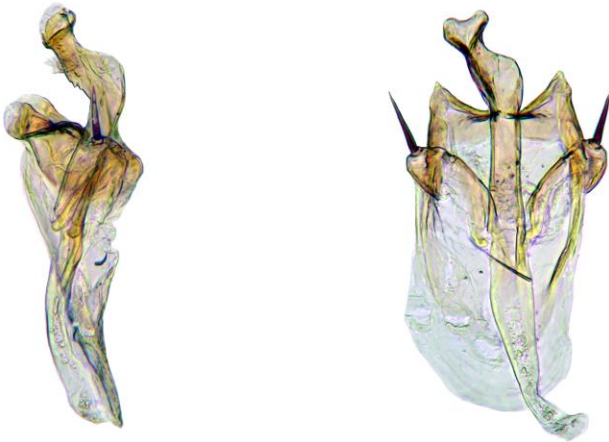
## Male Terminalia



## Oviscapt



## Spermathecae







# *Drosophila quinaria* Loew

*Drosophila (Drosophila) quinaria* Loew 1866



***Drosophila quinaria* species group:** Yellowish flies with wing infusate/spotted at crossveins and/or wing tips, with up to 13 distinct dark spots. Tergites yellowish with 4 circular blackish-brown spots on each tergite; or light brown with a diffuse pale area down the midline; or pale with posterior bands, forming triangular patches towards the midline. Male terminalia with dorsal "hood" over distiphallus. Eggs with three filaments.

**Species Diagnosis:** Apices of wing veins with diffuse infusate areas; crossvein dm-cu not distinctly bent like in *D. deflecta*. Tergites pale yellow, each with 4 dark spots.



Biology



Key Characters



Distribution



Terminalia



# *Drosophila quinaria* Loew

## Key Characters



Apices of wing veins with diffuse infuscate areas;  
crossvein dm-cu not distinctly bent like in *D. deflecta*.



Oviscapt tapering  
distally to pointed tip.



Tergites pale  
yellow, each with  
4 dark spots.



Aedeagus widening  
apically, fishtail-  
shaped at apex.



# *Drosophila quinaria* Loew

## Biology

*D. quinaria* is associated with semi-aquatic plants. Malloch & McAtee (1924) note that this species is attracted to lights, and has been collected on rotting squash. This species can be reared in the laboratory environment on banana-*Opuntia* medium (University of California, 2015).

Label data, with collection dates from April to November, include records from pans near a river, from apple cider vinegar traps in a raspberry field, from sweeps over compost, from a meadow, from a cultivated garden and from rotting cucumber.



Semi-Aquatic  
Plants



Fermenting  
baits



Rotting  
Organics



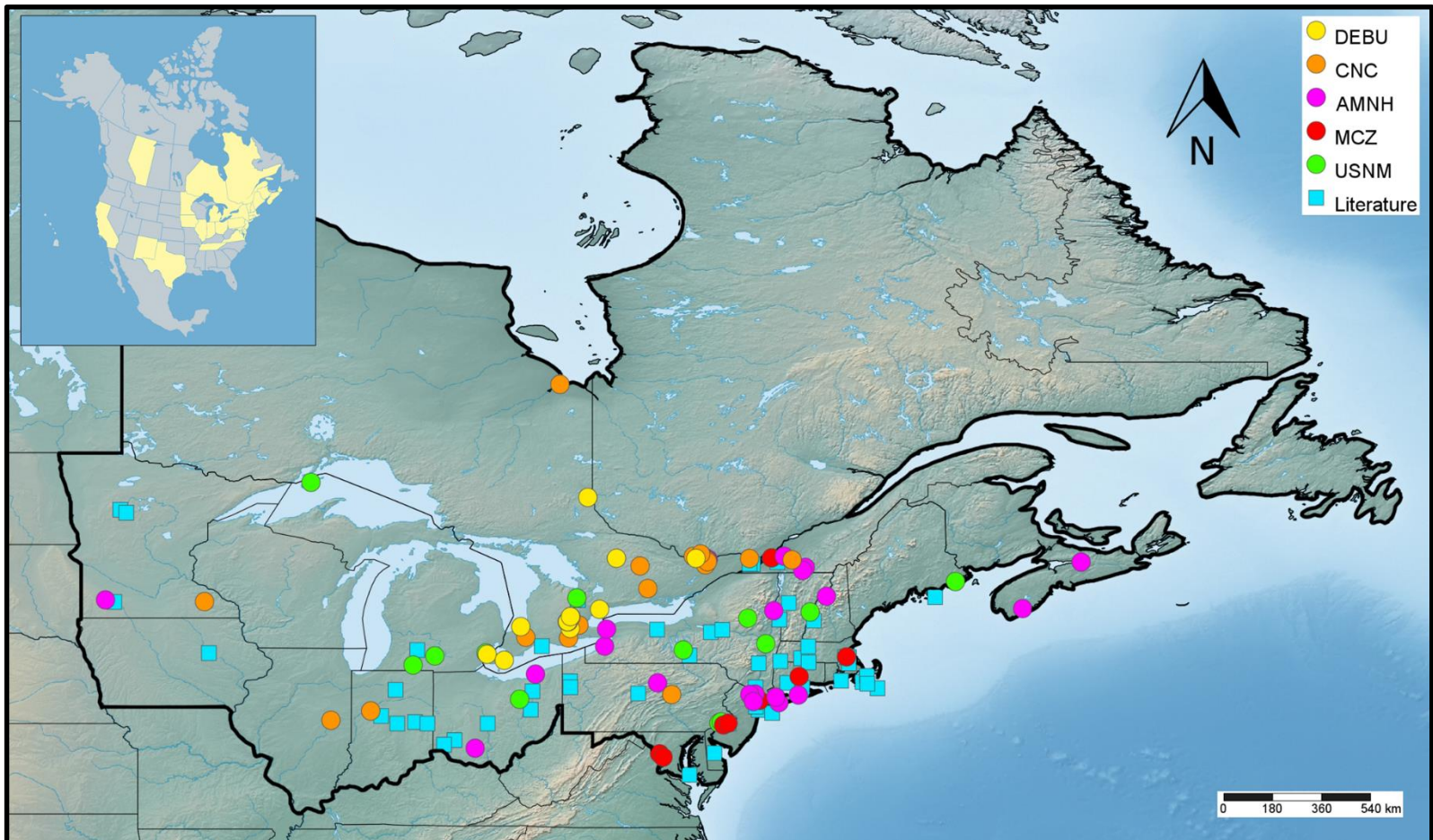
Reared  
in Lab ✓





# *Drosophila quinaria* Loew

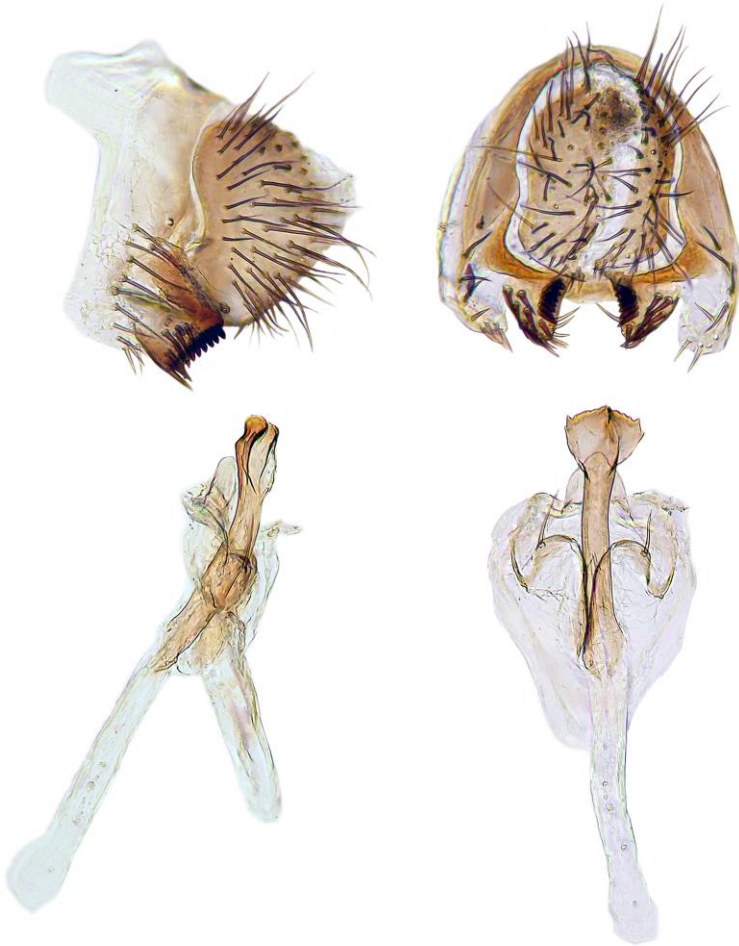
## North American and Northeastern North American Distribution



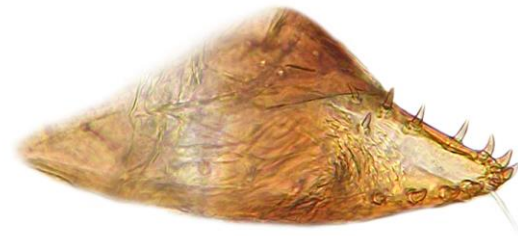


# *Drosophila quinaria* Loew

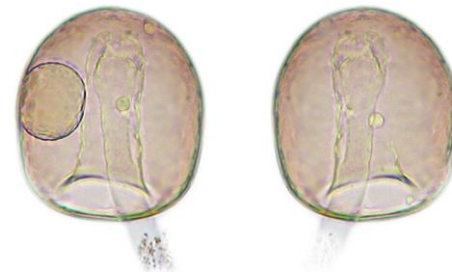
## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila recens* Wheeler

*Drosophila (Drosophila) recens* Wheeler 1960



***Drosophila quinaria* species group:** Yellowish flies with wing infusate/spotted at crossveins and/or wing tips, with up to 13 distinct dark spots. Tergites yellowish with 4 circular blackish-brown spots on each tergite; or light brown with a diffuse pale area down the midline; or pale with posterior bands, forming triangular patches towards the midline. Male terminalia with dorsal "hood" over distiphallus. Egg with three filaments.

**Species Diagnosis:** Very similar externally to *D. falleni*, distinguished by gena broader than in *D. falleni*, 0.16–0.25X diameter of the eye at greatest vertical height; subvibrissa as thick as vibrissa, dark in colour; cross vein dm-cu slightly sinuous and oblique to wing veins  $M_1$  and  $CuA_1$ . Like *falleni*, tergites pale yellow, each with 4 dark spots. Wing infusate at crossveins.



Biology



Key Characters



Distribution



Terminalia





# *Drosophila recens* Wheeler

## Key Characters



Gena broader than in *D. falleni*, 0.16-0.25X diameter of the eye at greatest vertical height; subvibrissa as thick as vibrissa, dark in colour.



Wing infusate at crossveins, cross vein dm-cu slightly oblique to wing veins  $M_1$  and  $cuA_1$ .



Apex of aedeagus rounded, with small scales on lateral margins.



Tergites pale yellow, each with 4 dark spots.



Spermathecae round and sclerotized.



# *Drosophila recens* Wheeler

## Biology

Like other members of the *quinaria* species group, *D. recens* is typically associated with fungi. Mushrooms are its primary breeding site. No standard medium for rearing this species is listed in Markow & O'Grady (2006) or the University of California (2015), however some authors have successfully maintained a population in the lab and Giglio & Dyer (2013) reared it on commercial Instant *Drosophila* food (Carolina Biological supply) supplemented with *Agaricus bisporus*.

Label data, with collection dates from May to November, include records from traps (Malaise, yellow pan, pitfall, mushroom bait and moose dung baited) in (deciduous, boreal and mixed) forests, from composter traps, from apple cider vinegar traps placed in a raspberry field, from mushrooms (*Polyporus betulinus*, *Armillaria mellea*, *Pleurotus ostreatus*, *Pleurotus* sp., *Amanita* spp.), and were reared from iris roots.



Fermenting  
baits



Rotting  
Organics



Fungi



Reared  
in Lab ✓

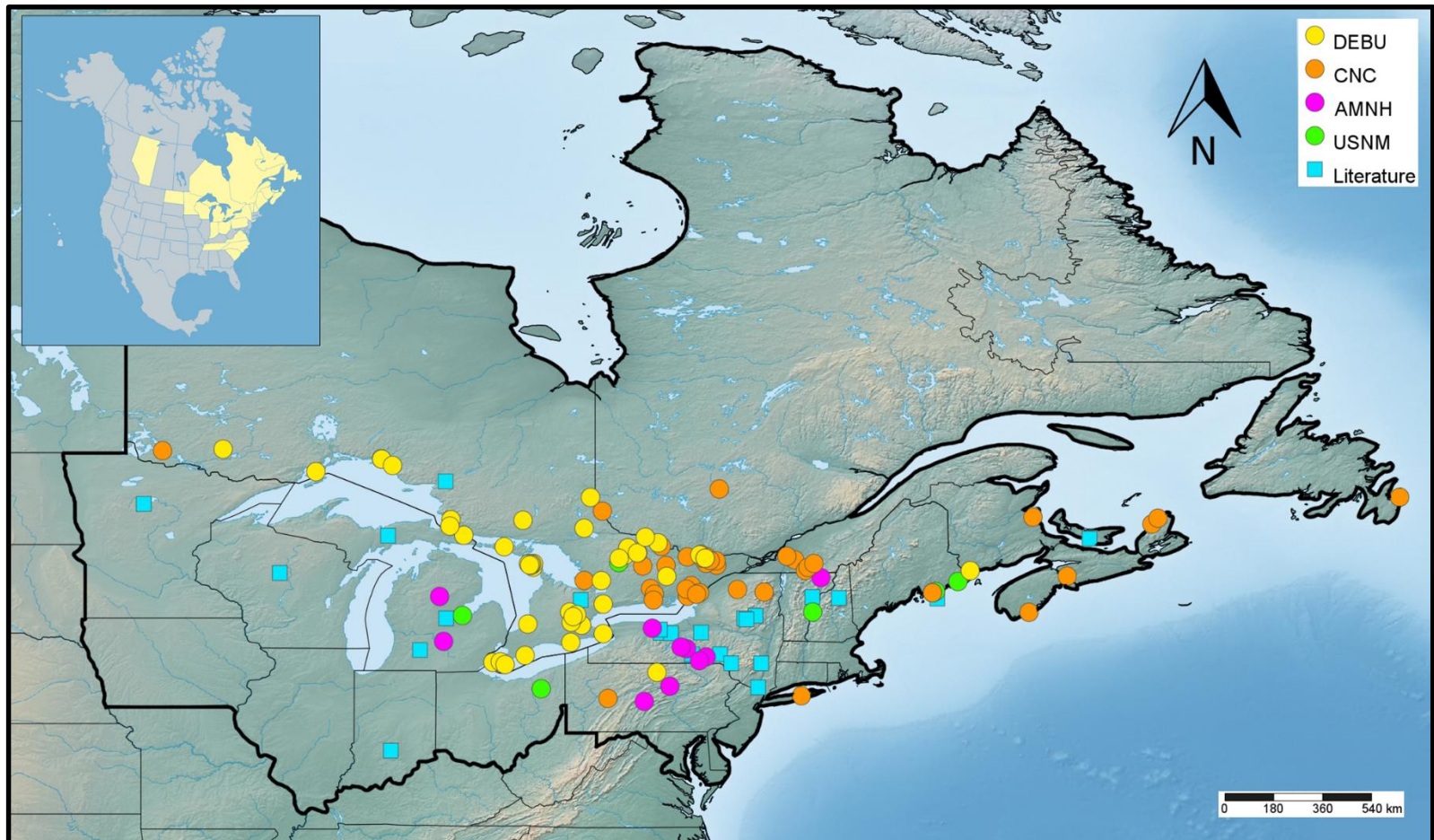


For additional information & photographs see Werner T. & Jaenike J. (2017).



# *Drosophila recens* Wheeler

## North American and Northeastern North American Distribution

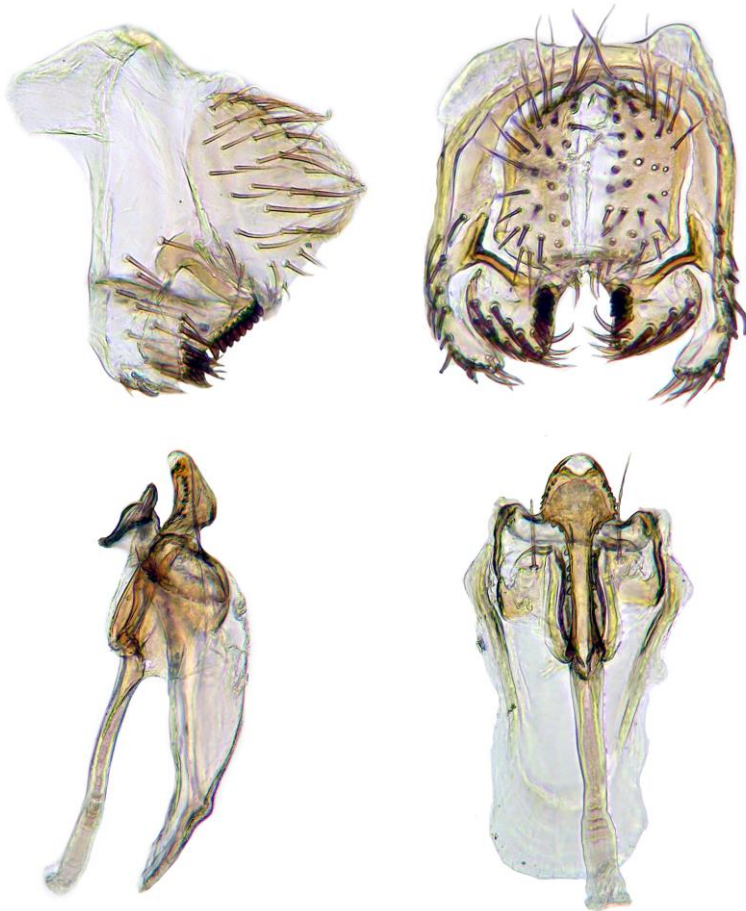






# *Drosophila recens* Wheeler

## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila rellima* Wheeler

*Drosophila (Drosophila) rellima* Wheeler 1960



***Drosophila quinaria* species group:** Yellowish flies with wing infusate/spotted at crossveins and/or wing tips, with up to 13 distinct dark spots. Tergites yellowish with 4 circular blackish-brown spots on each tergite; or light brown with a diffuse pale area down the midline; or pale with posterior bands, forming triangular patches towards the midline. Male terminalia with dorsal "hood" over distiphallus. Eggs with three filaments.

**Species Diagnosis:** Wing crossveins slightly infusate. Tergites with posterior bands forming triangular patches towards the midline, tergites 5 and 6 sometimes completely darkened. Aedeagus with pointed lateral flanges.



Biology



Key Characters



Distribution



Terminalia



# *Drosophila rellima* Wheeler

## Key Characters



Tergites with posterior bands forming triangular patches towards the midline, tergites 5 and 6 sometimes completely darkened.



Wing crossveins slightly infusate.





# *Drosophila rellima* Wheeler

## Biology

Like other members of the *quinaria* species group, *D. rellima* is associated with fungi. This species cannot be reared in the laboratory environment.

Label data, with collection dates from May to September, include records from a Malaise trap in savannah habitat, from a bracket fungus pan near a fallen hemlock, and from an inky mushroom cap on the edge of a grass lawn. The species has been found in Ontario, the Yukon Territory, Nebraska, California, Alaska and into eastern Russia (Toda et al., 1996).



Fungi



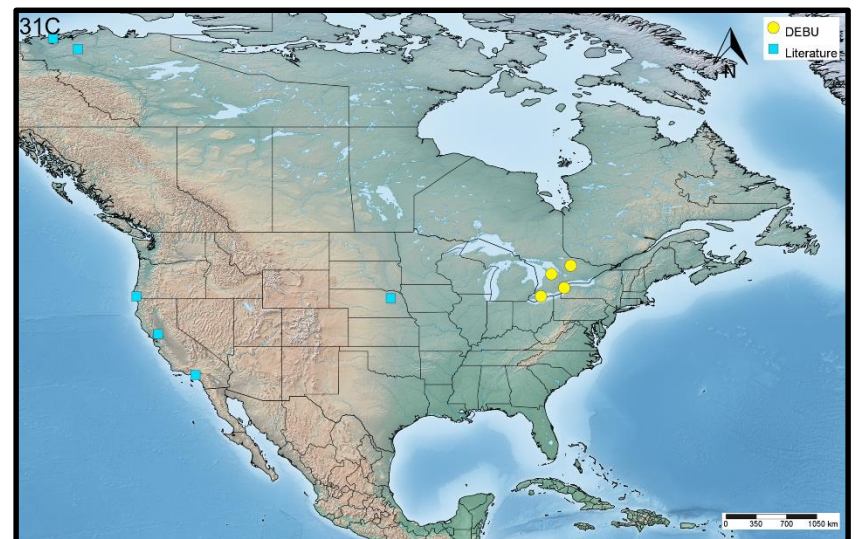
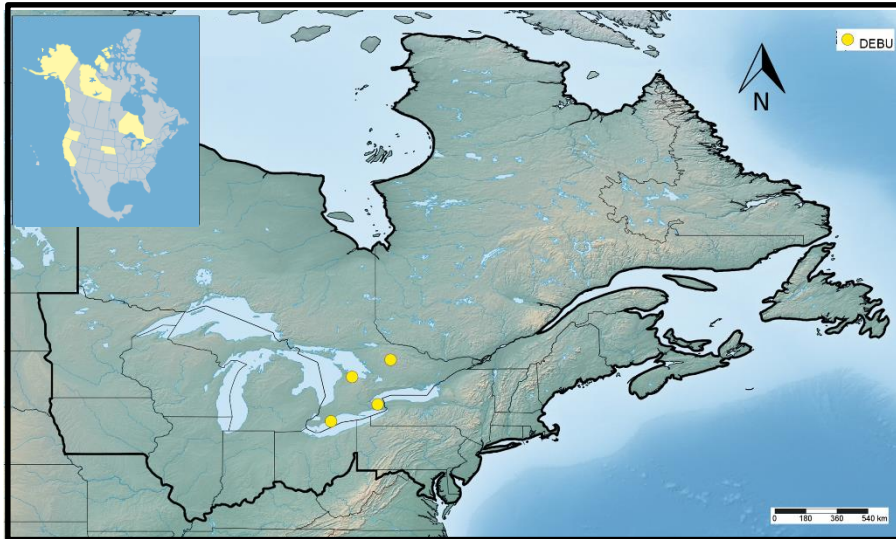
Not reared in  
Lab





# *Drosophila rellima* Wheeler

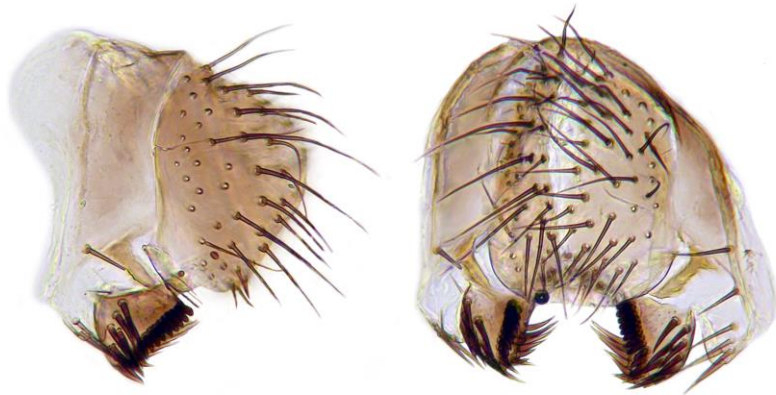
## North American and Northeastern North American Distribution





# *Drosophila rellima* Wheeler

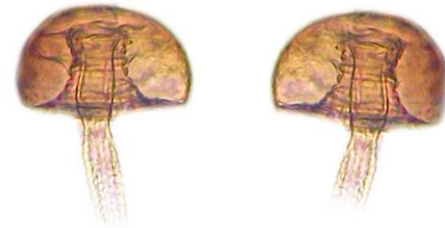
## Male Terminalia



## Oviscapt



## Spermathecae







# *Drosophila neotestacea*

Grimaldi, James  
& Jaenike

*Drosophila (Drosophila) neotestacea* Grimaldi, James & Jaenike 1992



***Drosophila testacea* species group:** Yellowish to brownish flies, body colour highly variable (Grimaldi et al. 1992) with a pair of presutural acrostichal setae between acrostichal rows 2 to 5, either fine, long and erect, or stout, short and decumbent. Wing hyaline. Tergites 2 to 4 with dark marginal bands that are triangular in shape towards midline and tergites 5 and 6 dark, or tergites pale with pairs of dark spots. Their common breeding sites are mushrooms, especially very decayed ones.

**Species Diagnosis:** Presutural acrostichal setae long, fine, slightly sinuate, usually erect. Epandrium typically with only 1 seta on ventral lobe; surstylus with 12-14 prensisetae in sinuate row. Adeagus blunt with rounded apical corners at apex.



Biology



Key Characters



Distribution



Terminalia



# *Drosophila neotestacea*

Grimaldi, James  
& Jaenike

## Key Characters



Presutural acrostichal setae long, fine, slightly sinuate, usually erect.



Adeagus blunt with rounded apical corners.



# *Drosophila neotestacea*

Grimaldi, James  
& Jaenike

## Biology

Typically associated with fungi (Grimaldi, James & Jaenike, 1992; Starmer, 1981). Markow & O'Grady (2006) and the University of California (2015) list a standard medium for rearing *D. neotestacea* in the lab. However, Pinzone & Dyer (2013) maintained *D. neotestacea* colonies in the laboratory environment on Instant *Drosophila* Food (Carolina Biological supply) supplemented with *Agaricus bisporus*.

Label data in this study, with collection dates from April to November, include records from traps (pan, Malaise, pitfalls and mushroom baited) in (deciduous and mixed) forests, from composter traps, from apple cider vinegar bait traps (in blueberry, peach, raspberry and cherry fields, and among sea buckthorn), from rotting fungi (*Agaricus*, *Pleurotus ostreatus* etc.), from bleeding maple stumps, from moose antlers and moose dung, from rotting squash and from lights.



Fermenting  
baits



Rotting  
Organics



Fungi



Sap fluxes



Reared  
in Lab ✓

For additional information & photographs see Werner T. & Jaenike J. (2017).

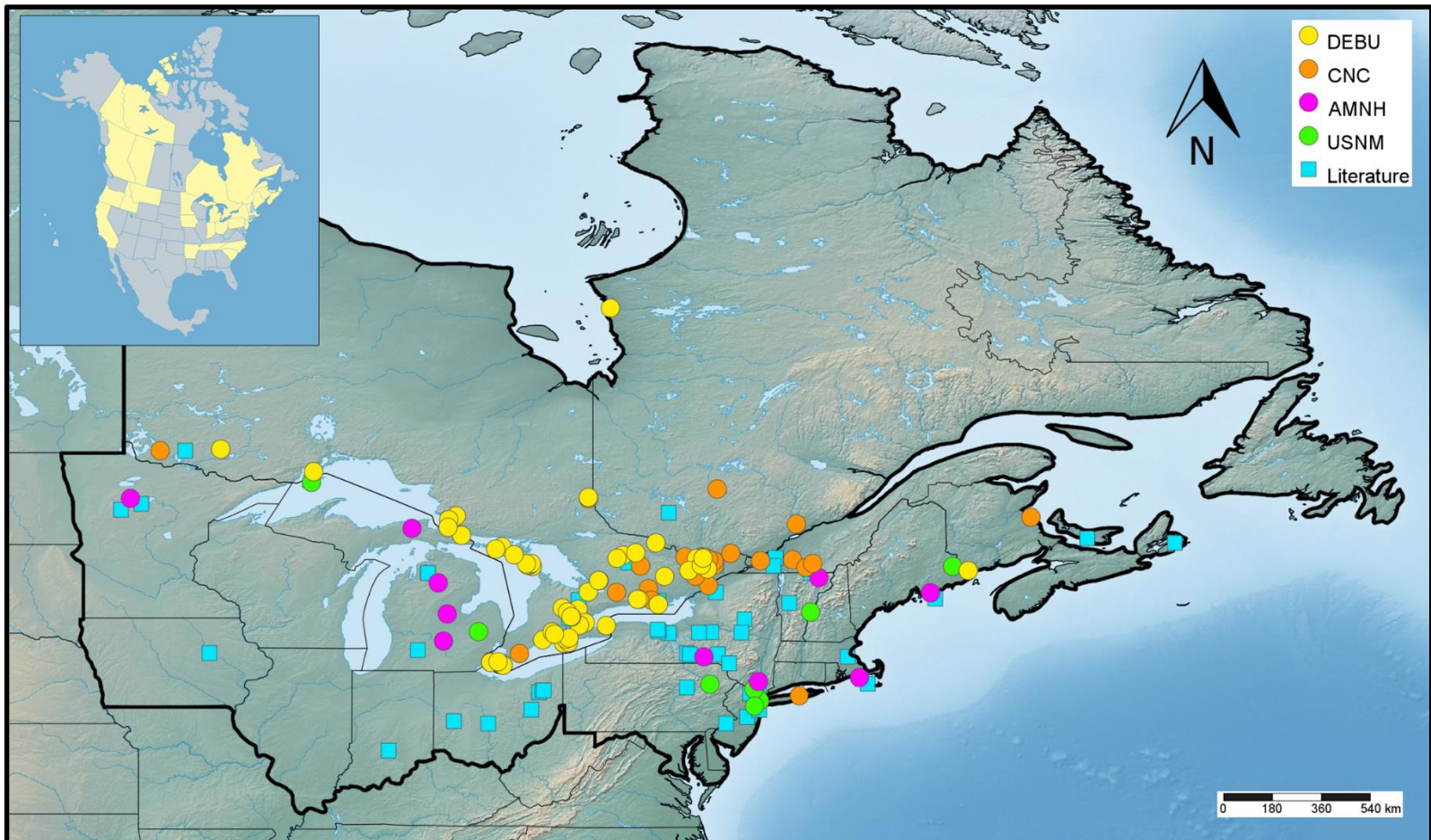




# *Drosophila neotestacea*

Grimaldi, James  
& Jaenike

## North American and Northeastern North American Distribution

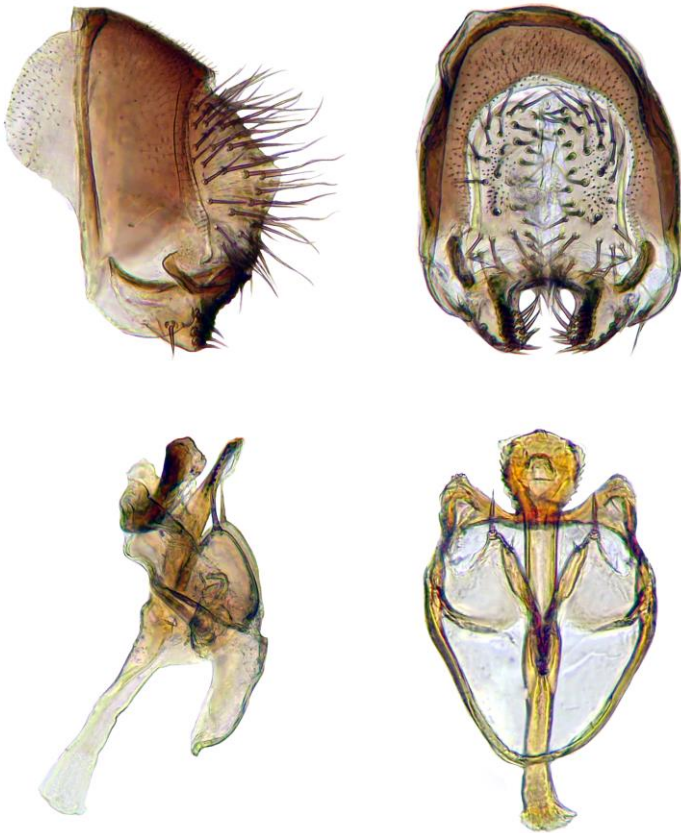




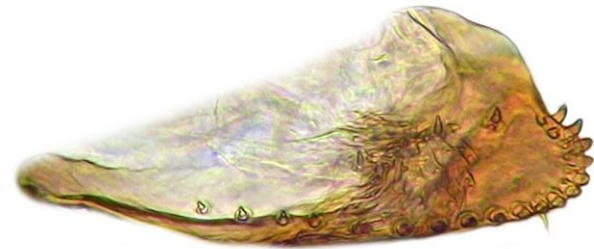
# *Drosophila neotestacea*

Grimaldi, James  
& Jaenike

## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila putrida* Sturtevant

*Drosophila (Drosophila) putrida* Sturtevant 1916



***Drosophila testacea* species group:** Yellowish to brownish flies, body colour highly variable (Grimaldi et al. 1992) with a pair of presutural acrostichal setae between acrostichal rows 2 to 5, either fine, long and erect, or stout, short and decumbent. Wing hyaline. Tergites 2 to 4 with dark marginal bands that are triangular in shape towards midline and tergites 5 and 6 dark, or tergites pale with pairs of dark spots. Their common breeding sites are mushrooms, especially very decayed ones.

**Species Diagnosis:** Presutural acrostichal setae short, thick, and always decumbent. Epandrium with 2-3 setae on ventral lobe; surstylus as in *D. neotestacea*. Aedeagus with 2 large, flat apically pointed serrated lobes at apex with deep medium cleft.



Biology



Key Characters



Distribution



Terminalia





# *Drosophila putrida* Sturtevant

## Key Characters



Presutural acrostichal setae short, thick, and always decumbent.



Aedeagus with 2 large, flat apically pointed serrated lobes at apex with deep medium cleft.



# *Drosophila putrida* Sturtevant

## Biology

Typically associated with fungi (Grimaldi, James & Jaenike, 1992; Starmer, 1981). This species can be reared in the laboratory on the standard banana-*Opuntia* and standard mushroom mediums (Markow & O'Grady, 2006).

Label data in this study, with collection dates from April to November, include records from Malaise traps in forest and savannah habitats, from mushroom baited pit falls and pans, from dung traps, from pan traps located among mossy cedar, from composter traps, from apple cider vinegar bait traps (in blueberry, peach, cherry and peach fields, and among wild vegetation), from a grass field, from a cedar forest, from mushrooms (i.e. *Pleurotus* and *Polyporus versicolor*) from moose dung, from lights and from Araceae.



Fermenting  
baits



Rotting  
Organics



Fungi



Reared  
in Lab ✓

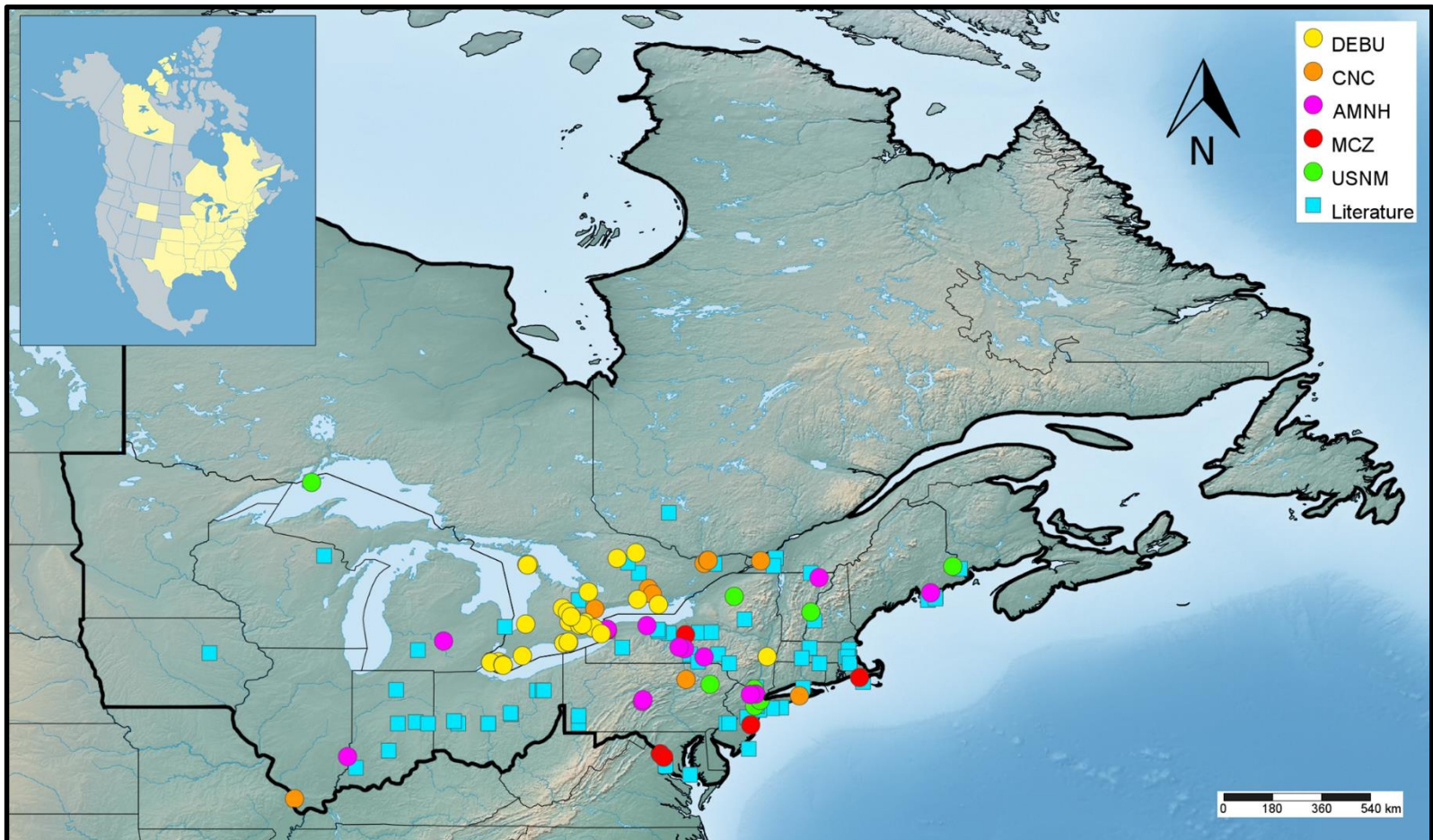


For additional information & photographs see Werner T. & Jaenike J. (2017).



# *Drosophila putrida* Sturtevant

## North American and Northeastern North American Distribution

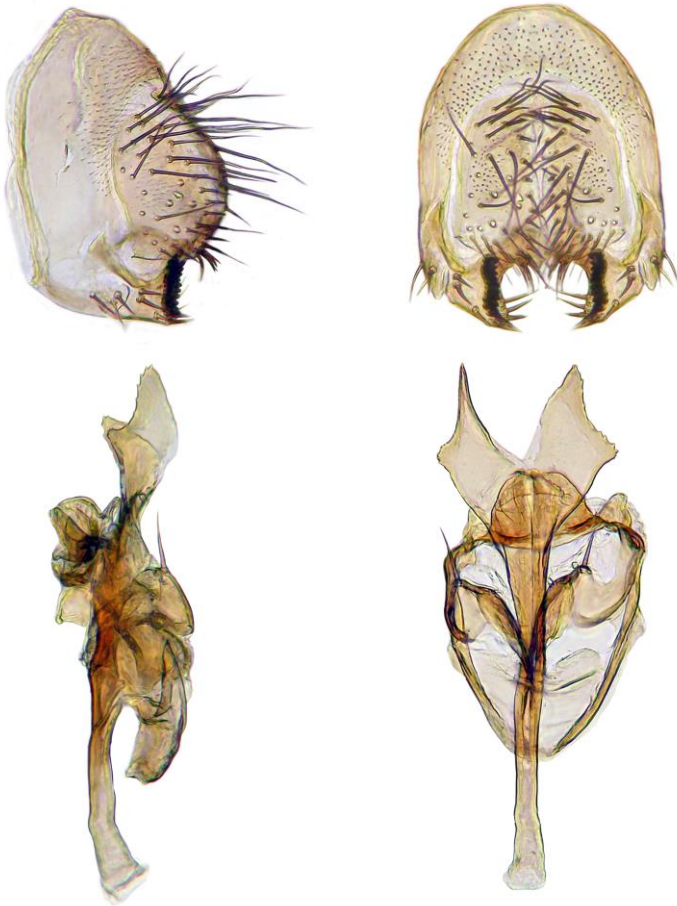






# *Drosophila putrida* Sturtevant

## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila tripunctata* Loew

*Drosophila (Drosophila) tripunctata* Loew 1862



## ***Drosophila tripunctata* species group:**

The *tripunctata* species group is one of the largest species groups of *Drosophila* endemic to the New World. Almost all of the species are found in the neotropical region. *Drosophila tripunctata* is the only species of the group that is abundant in North America. Species in this group specialize in breeding in forest fungi, flowers, sometimes fruits.



**Species Diagnosis:** Yellowish flies. Body length 2.0 to 3.5 mm. Wing 1.9 to 2.7 mm. Wing infusate at crossveins and at apices of wing veins  $R_{2+3}$ ,  $R_{4+5}$  and M. Tergites with unbroken dark posterior bands on tergites 2 and 3, and a dark fuscous spot on the midline of tergites 4 to 6.



Redescription



Biology



Key Characters



Distribution



Terminalia



# *Drosophila tripunctata* Loew

## Key Characters



Wing infusate at crossveins and at apices of wing veins  $R_{2+3'}$   $R_{4+5}$  and M.



Tergites with unbroken dark posterior bands on tergites 2 and 3, and a dark fuscous spot on the midline of tergites 4 to 6.





# *Drosophila tripunctata* Loew

## Biology

The principal hosts of *Drosophila tripunctata* are mushrooms, however it appears to be quite polyphagous. It has been associated with rotting produce such as squash, bananas, grapes, cabbage and watermelon (Malloch & McAtee, 1924; Sturtevant, 1916). Sturtevant (1916) noted that it could be reared from tree sap, and Malloch & McAtee (1924) noted that it was attracted to light. This species can be reared in the laboratory environment on the standard banana-*Opuntia* medium, the Wheeler-Clayton medium and the standard mushroom medium (Markow & O'Grady, 2006).

Label data, with collection dates from May to October, include records from mushroom traps (baited pitfalls and pans), from Malaise traps in wooded areas, from apple cider vinegar baited traps (in raspberry, cherry, peach fields, among sea buckthorn and among wild vegetation), from dung, from sweeps over compost, from *Sarracenia* pitchers, from cabbage and from skunk cabbage spadices.



Fermenting  
baits



Rotting  
Organics



Fungi



Reared  
in Lab ✓

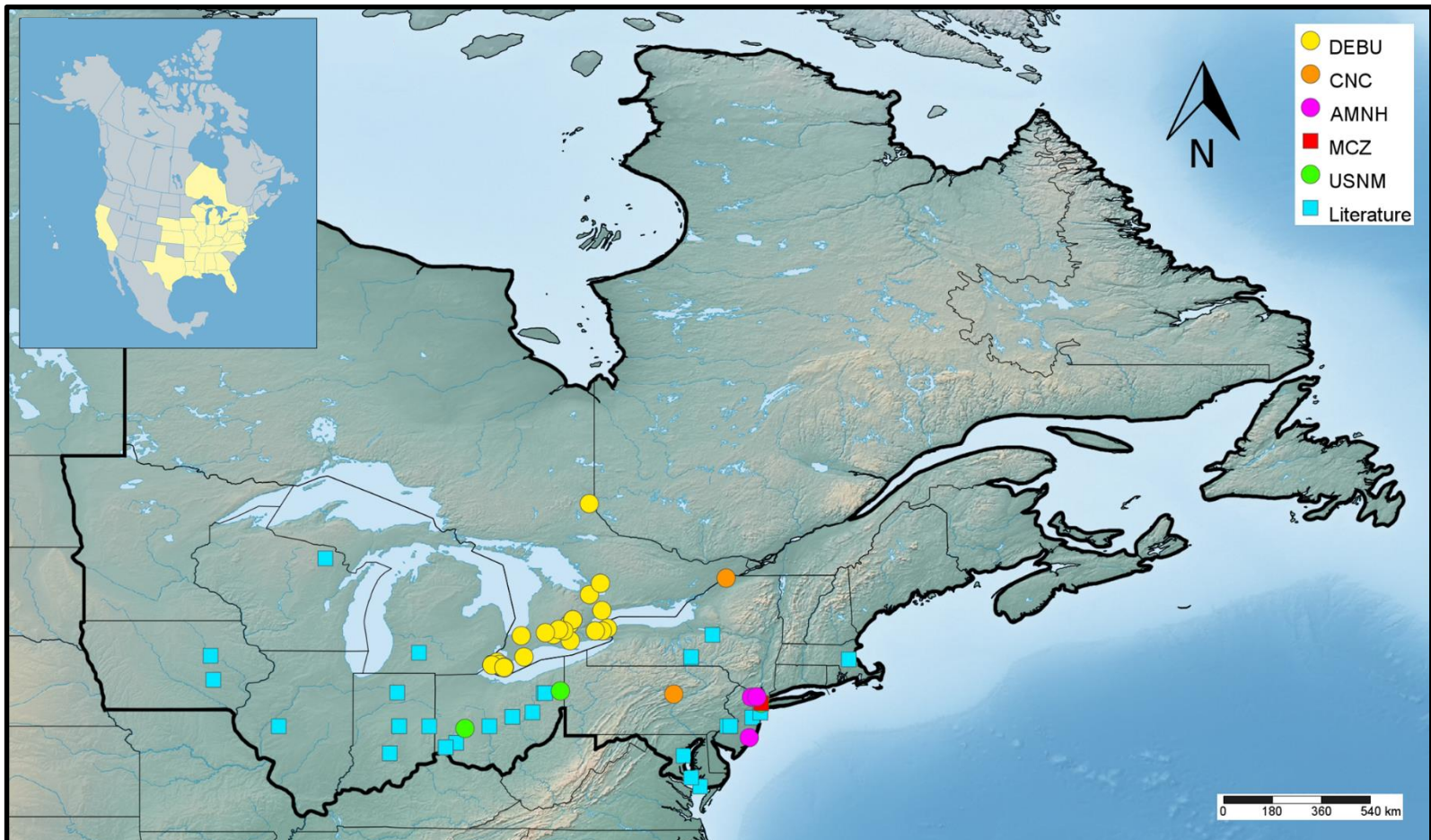


For additional information & photographs see Werner T. & Jaenike J. (2017).



# *Drosophila tripunctata* Loew

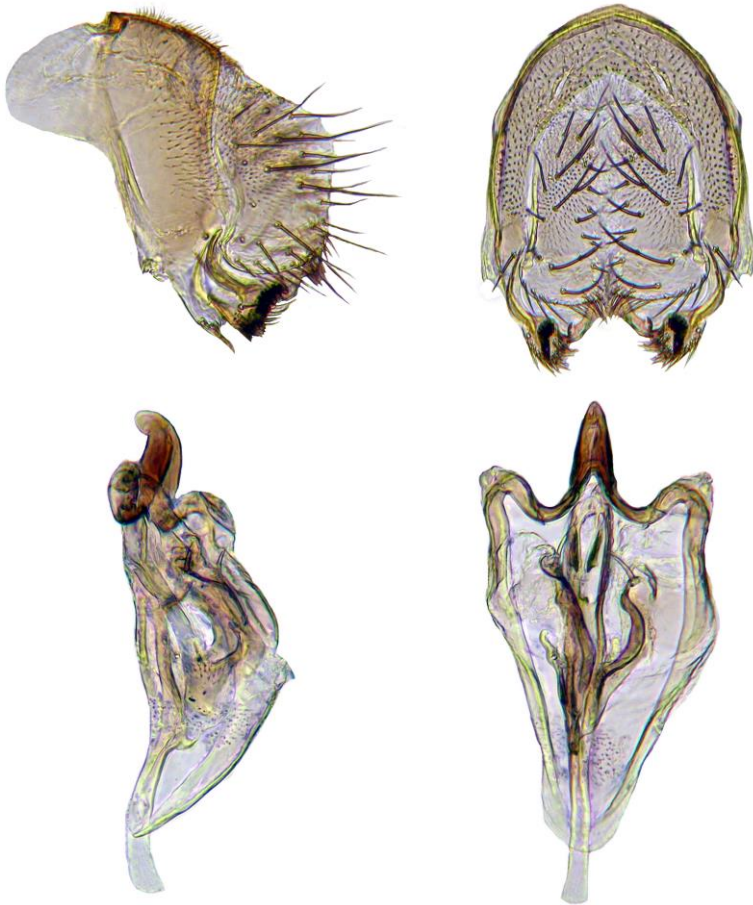
## North American and Northeastern North American Distribution





# *Drosophila tripunctata* Loew

## Male Terminalia



## Oviscapt



## Spermathecae







# *Drosophila tripunctata* Loew

## Redescription:

Patterson (1943) provides a description of the external characters of the adults, internal male and female reproductive anatomy, puparia and eggs. Hsu (1949) provides notes and an illustration of the external male terminalia. A description of the male and female terminalia is provided below.

♂ **Terminalia:** Epandrium microtrichose on posterior half; with 1 lower and no upper setae; ventral lobe not microtrichose. Cercus kidney-shaped, microtrichose, without ventral lobes, covered in long setae, multiple small setae on ventral margin. Surstylus not microtrichose, with a concave row of about 9-10 peg-like prenisetae in a concave row in the middle of the surstylus, numerous setae on margin. Gonopod with 1 long seta on pointed dorsal margin, linked to paraphysis with membranous tissue. Aedeagus fused to aedeagal apodeme, sclerotized, rounded and arrowhead shaped at apex in posterior view. Aedeagal apodeme approximately one third the length of the aedeagus, strongly flattened laterally, curving posteriorly, slightly widening at apex.

♀ **Terminalia:** Valve of oviscapt brownish, distally rounded, with a bulbous dorsal margin, slightly convex ventrally, with 4 discal and 19-20 marginal roundish tipped peg-like outer ovisensilla; 3 thin, distally positioned and 1 long, curved subterminal inner ovisensilla. Spermathecae sclerotized, round dorsally, flat on ventral margin.



# *Drosophila melanogaster* Meigen

*Drosophila (Sophophora) melanogaster* Meigen 1830



***Drosophila melanogaster* species group:** Male fore tarsus with 1 or 2 combs. For the species found in northeastern North America, male tergites 2-4 pale yellow with narrow dark unbroken posterior bands, tergites 5 and 6 completely darkened or with yellowish tergites; female tergites pale yellow with narrow dark unbroken posterior bands. The *melanogaster* group is native to the Old World, with greatest diversity in tropical forests of Asia and central Africa.

**Species Diagnosis:** Gena broader than in *D. simulans*, about 0.1X the diameter of eye at greatest vertical height. Male fore tarsus with comb on first fore tarsomere, composed of approximately 12 teeth. Wing hyaline. Male with small, nearly triangular dorsal branch of epandrial lobe. Female oviscapt small, pale without dorsodistal depression and with 12-13 peg-like outer ovisensilla.



Biology



Key Characters



Distribution



Terminalia



# *Drosophila melanogaster* Meigen

## Key Characters



Gena broader than in *D. simulans*, about 0.1X of diameter of eye at greatest vertical height.

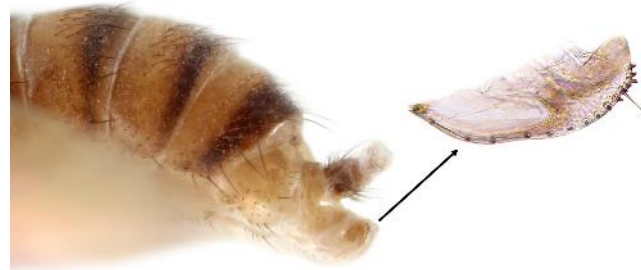


Male tergites 2-4 pale yellow with narrow dark unbroken posterior bands, tergites 5 and 6 completely darkened. Female tergites pale yellow with narrow dark unbroken posterior bands.

Male with small, nearly triangular, dorsal branch of epandrial lobe.



Male fore tarsus with comb on first fore tarsomere, composed of approximately 12 teeth.



Female oviscap small, pale, slightly concave ventrally, without dorsodistal depression.





# *Drosophila melanogaster* Meigen

## Biology

*D. melanogaster* is a cosmopolitan species, originating in central Africa. According to Bächli et al. (2004), this species is commonly found on rotting fruit, or indoors around fermented drinks; it is extremely abundant in tomato fields, orchards, vineyards, and wineries. Population sizes in northeastern North America reach their peak in late summer to early fall. This species can be reared in the laboratory environment on the standard cornmeal-yeast and/or banana-*Opuntia* medium (Markow & O'Grady, 2006; University of California, 2015).

Label data in this study, with collection dates from January to December, include records from rotting mushroom bait traps, from apple cider vinegar bait traps (in blackberry, blueberry, raspberry, sour cherry, grape and peach fields), from rotting organic materials (onions, grapes, bananas, grass piles and compost), from field sweeps, from a hog barn, from tree wounds, upon emergence from tulip bulbs (originating from Holland), upon emerging from damp birch & maple and indoors .



Fermenting  
baits



Rotting  
Organics



Fungi



Sap fluxes



Reared  
in Lab ✓

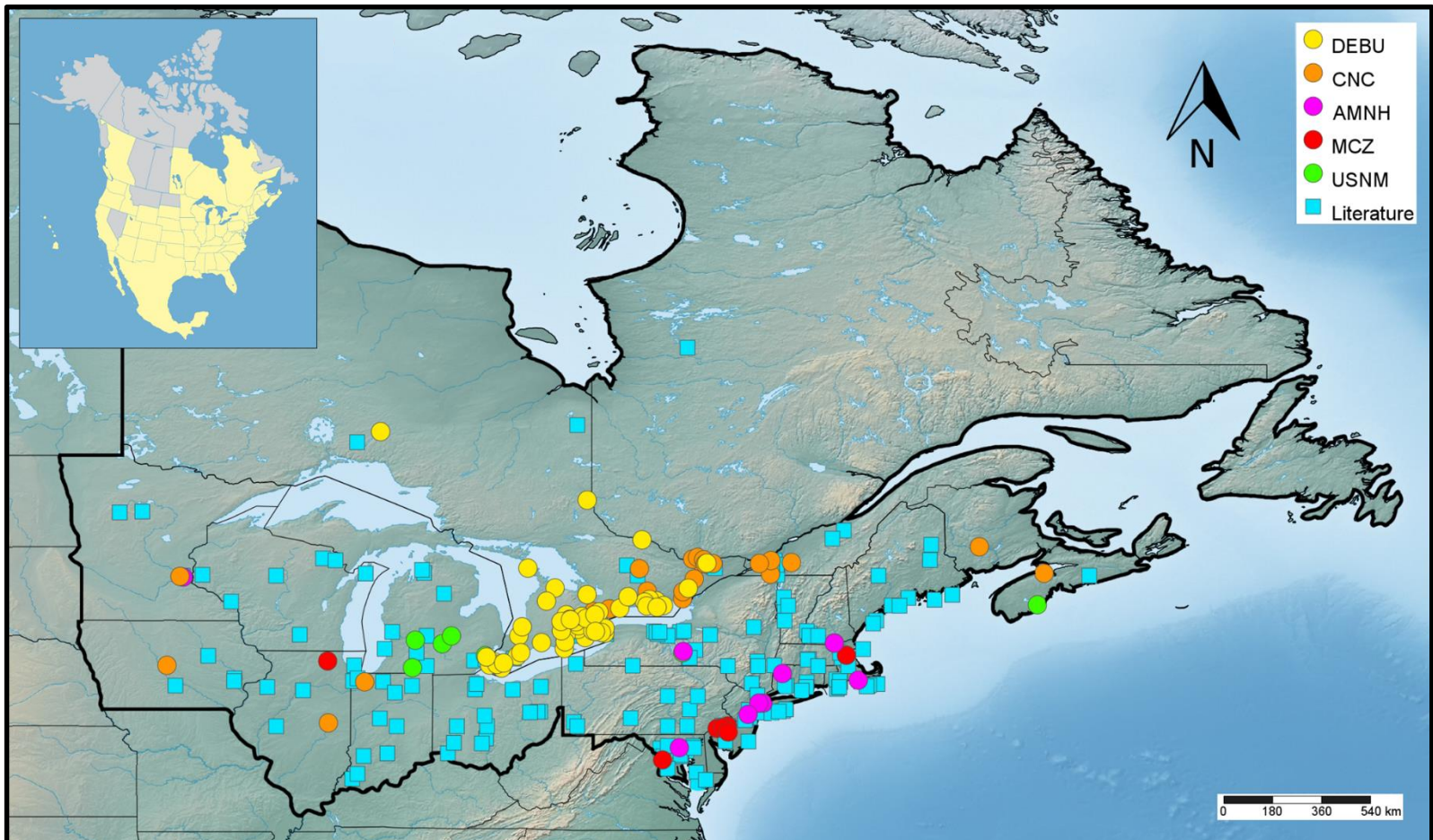


For additional information & photographs see Werner T. & Jaenike J. (2017).



# *Drosophila melanogaster* Meigen

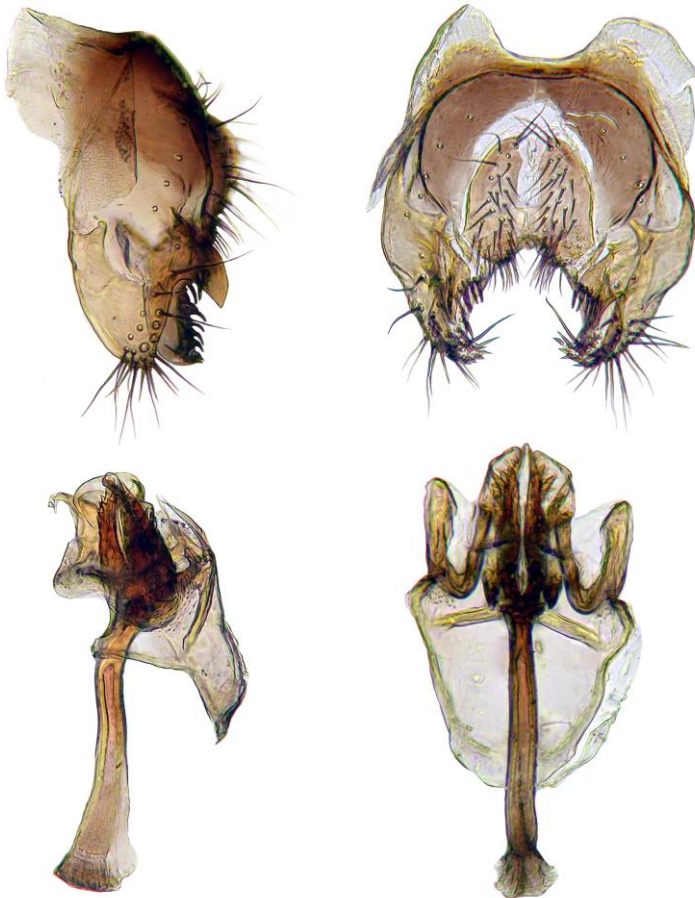
## North American and Northeastern North American Distribution



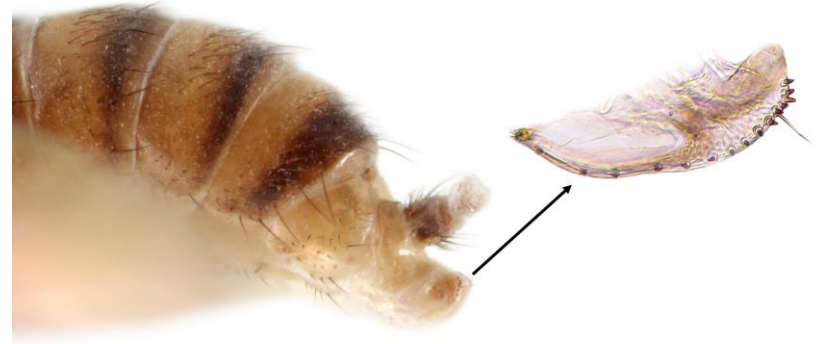


# *Drosophila melanogaster* Meigen

## Male Terminalia



## Oviscapt



## Spermathecae







# *Drosophila simulans* Sturtevant

*Drosophila (Sophophora) simulans* Sturtevant 1919



***Drosophila melanogaster* species group:** Male fore tarsus with 1 or 2 combs. For the species found in northeastern North America, male tergites 2-4 pale yellow with narrow dark unbroken posterior bands, tergites 5 and 6 completely darkened or with yellowish tergites; female tergites pale yellow with narrow dark unbroken posterior bands. The *melanogaster* group is native to the Old World, with greatest diversity in tropical forests of Asia and central Africa.

**Species Diagnosis:** Gena narrower than in *D. melanogaster*, about 0.05X of diameter of eye at greatest vertical height. Male fore tarsus as in *D. melanogaster*. Wing hyaline. Most reliably separated from *D. melanogaster* based on terminalia: Male with large, roundish amber-colored dorsal branch of epandrial ventral lobe; female with oviscapt small, pale, having a dorsodistal depression and with 15-18 peg-like outer ovisensilla.



Biology



Key Characters



Distribution



Terminalia



# *Drosophila simulans* Sturtevant

## Key Characters



Gena narrower than in *D. melanogaster*, about 0.05X of diameter of eye at greatest vertical height.



Male fore tarsus with comb on first fore tarsomere, composed of approximately 12 teeth.



Male tergites 2-4 pale yellow with narrow dark unbroken posterior bands, tergites 5 and 6 completely darkened. Female tergites pale yellow with narrow dark unbroken posterior bands.



Males with large, roundish amber dorsal branch of epandrial ventral lobe.



Female oviscap small, pale, strongly convex ventrally, with a dorsodistal depression.





# *Drosophila simulans* Sturtevant

## Biology

*D. simulans* is a cosmopolitan species, originating in central Africa. The habits of this species are very much like those of *D. melanogaster* (Bächli et al., 2004). This species can be reared in the laboratory environment on the standard cornmeal-yeast medium, and standard banana-*Opuntia* medium (Markow & O'Grady, 2006).

Label data in this study, with collection dates from March to October, include records from composter traps, from Malaise and pan traps in a wooded area, from apple cider vinegar bait traps (in blackberry, blueberry, peach, raspberry and cherry fields, in sea buckthorn and among wild vegetation), from tree wounds, from compost, and from rotting produce (onions, bananas and pickles).



Fermenting  
baits



Rotting  
Organics



Fungi



Sap fluxes



Reared  
in Lab ✓

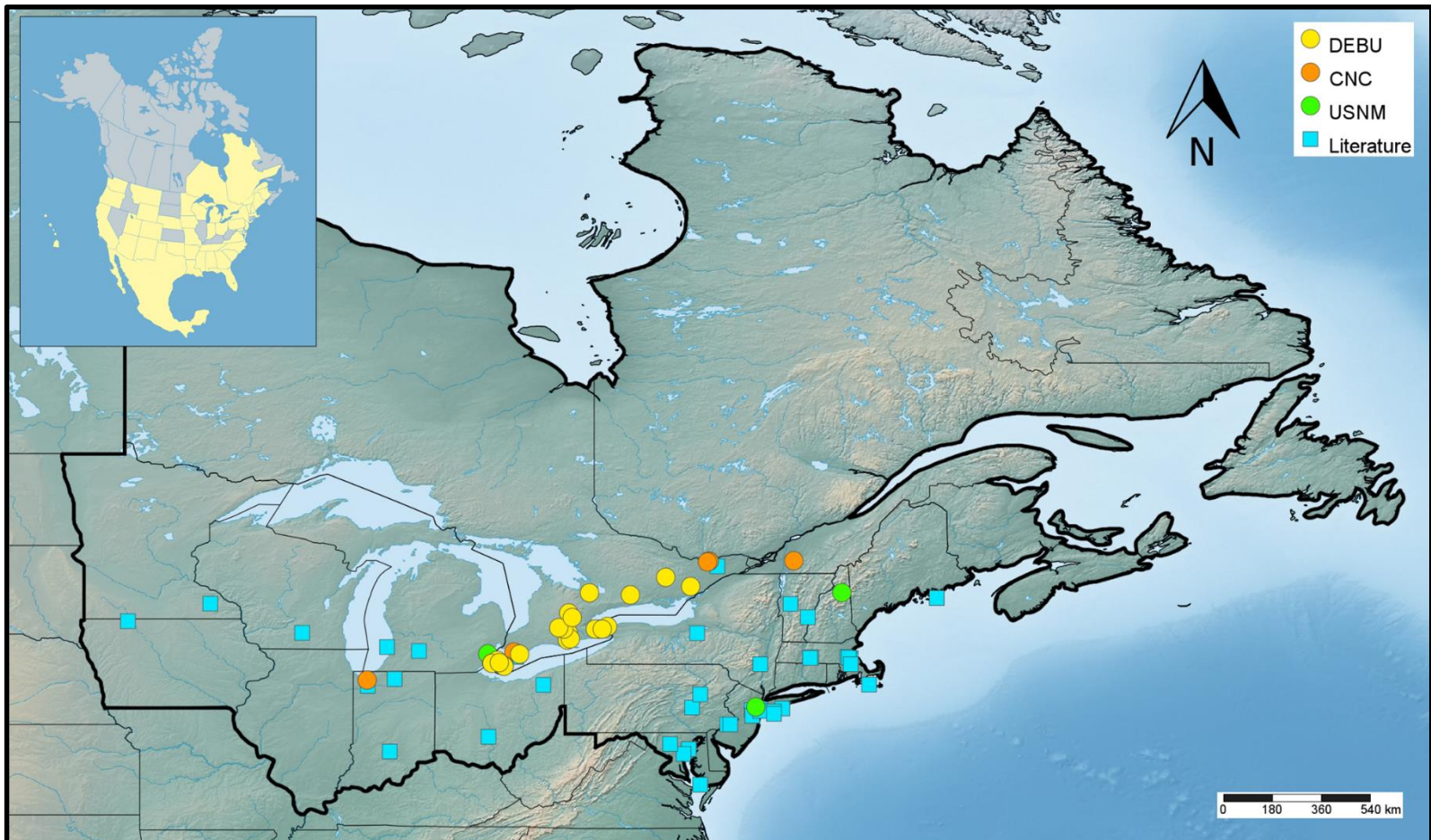






# *Drosophila simulans* Sturtevant

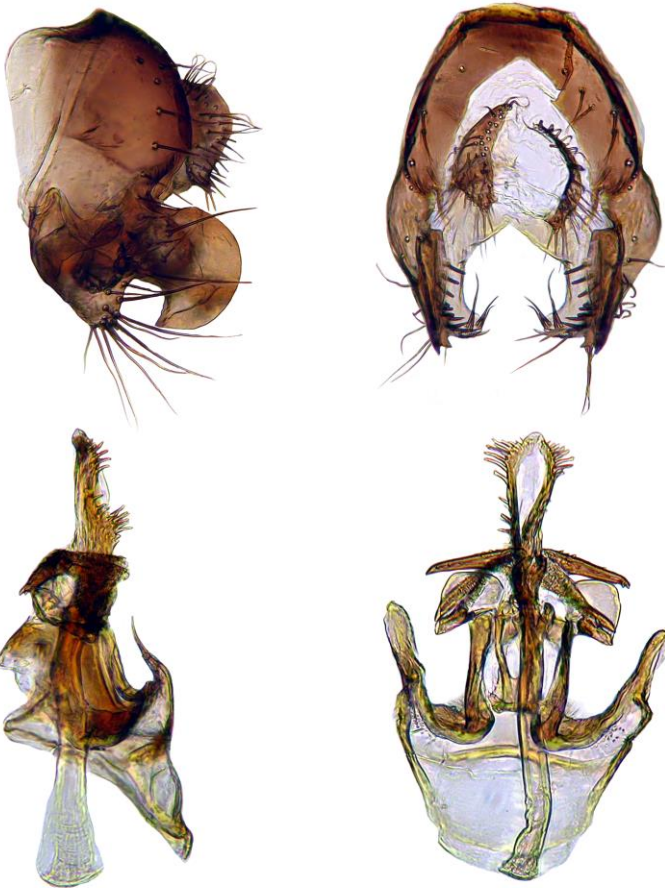
## North American and Northeastern North American Distribution



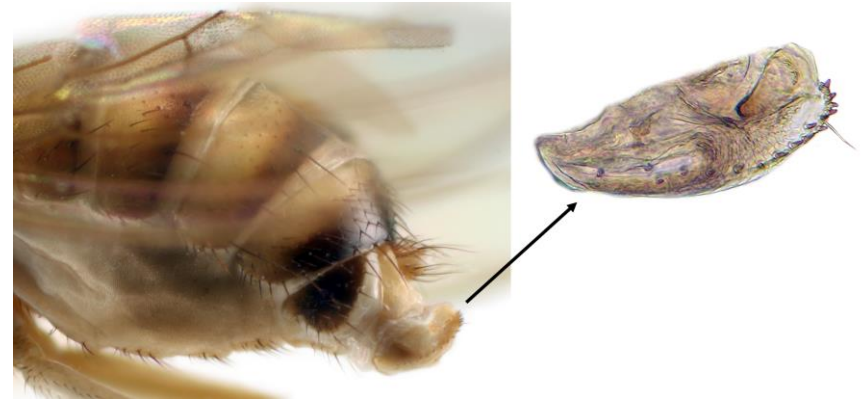


# *Drosophila simulans* Sturtevant

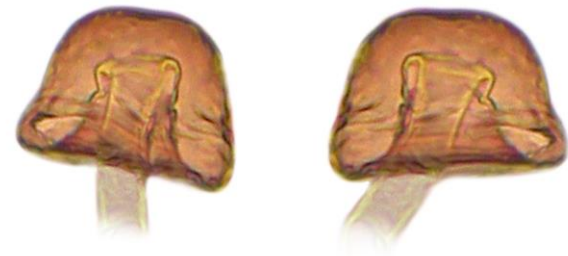
## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila suzukii* (Matsumura)

*Drosophila (Sophophora) suzukii* (Matsumura) 1931



***Drosophila melanogaster* species group:** Male fore tarsus with 1 or 2 combs. For the species found in northeastern North America, male tergites 2-4 pale yellow with narrow dark unbroken posterior bands, tergites 5 and 6 completely darkened or with yellowish tergites; female tergites pale yellow with narrow dark unbroken posterior bands. The *melanogaster* group is native to the Old World, with greatest diversity in tropical forests of Asia and central Africa.

**Species Diagnosis:** Male tarsus with comb on first and second fore tarsomeres, comb on first fore tarsomere composed of 4-6 teeth, comb on second fore tarsomere composed of 2-3 teeth. Male wing typically with, but sometimes without, infuscation at apices of wing veins  $R_{2+3}$  and  $R_{4+5}$ ; female wing hyaline. Males without dorsal branch of epandrial ventral lobe. Females with large, darkened, serrated ovipositor.



Biology



Key Characters



Distribution



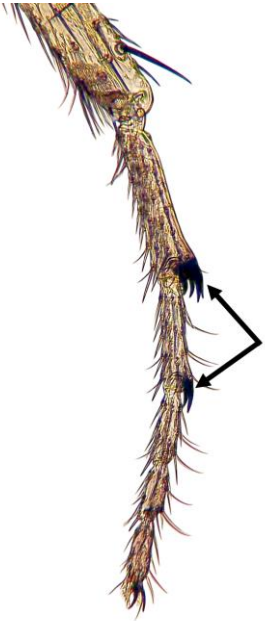
Terminalia





# *Drosophila suzukii* (Matsumura)

## Key Characters



Male fore tarsus with comb on first and second fore tarsomeres, comb on first fore tarsomere composed of 4-6 teeth, comb on second fore tarsomere composed of 2-3 teeth.

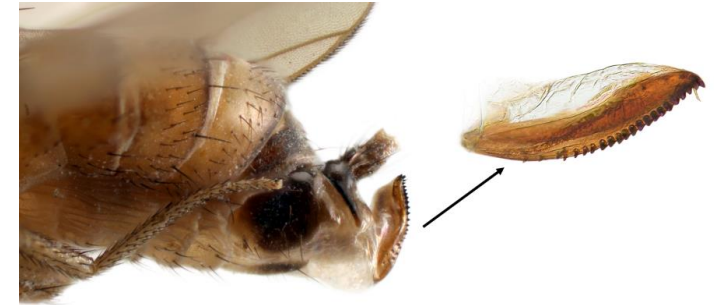


Male tergites 2-4 pale yellow with narrow dark unbroken posterior bands, tergites 5 and 6 completely darkened. Female tergites pale yellow with narrow dark unbroken posterior bands.



Male wing typically with, but sometimes without, infuscation at apices of wing veins  $R_{2+3}$  and  $R_{4+5}$ .

Females with large, darkened, serrated ovipositor.



Males without dorsal branch of epandrial ventral lobe.



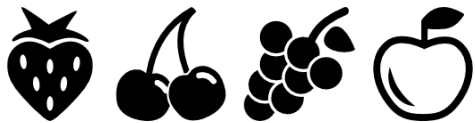


# *Drosophila suzukii* (Matsumura)

## Biology

*Drosophila suzukii* originates from Japan, and breeds in healthy whole fruit. It is the most serious agricultural pest in the family Drosophilidae. The primary host is cherries, but it is also known to oviposit in a wide range of other cultivated soft fruits in North America (strawberries, blueberries, raspberries, blackberries, peaches, grapes etc.) in addition to several wild hosts (Kanzawa, 1936; Kanzawa, 1939). This species can be reared in the laboratory environment on the standard cornmeal-yeast medium (University of California, 2015). A complete list of cultivated and wild hosts for *Drosophila suzukii* is provided in Loriatti et al. (2013).

Label data, with collection dates from July to October, include records from apple cider vinegar traps (in cherry, raspberry, blackberry, peach, strawberry, grape and blueberry fields, in sea buckthorn, and among wild hosts) and from compost. It has also been taken in undisturbed beech-oak forest by sweeping understory vegetation and leaf litter in September.



Ripe Fruit



Forest sweeps  
& leaf litter



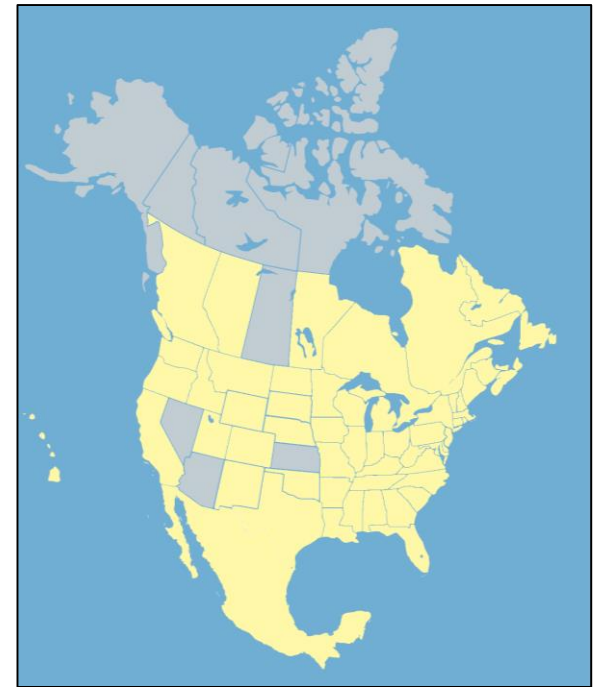
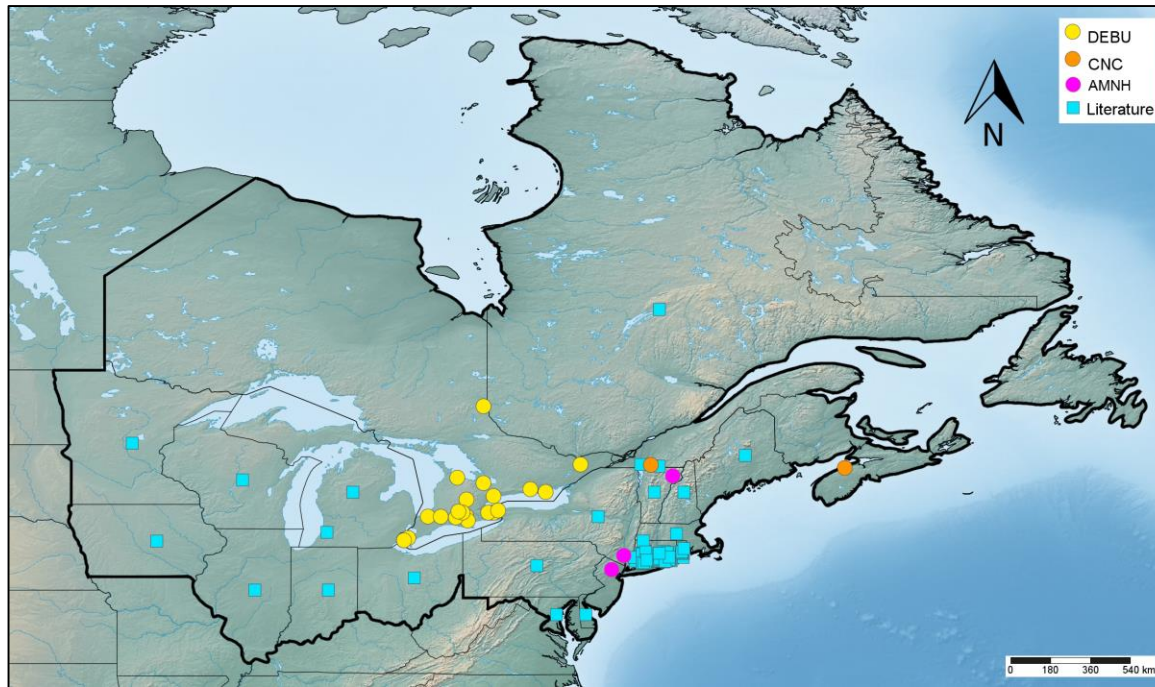
Reared  
in Lab ✓





# *Drosophila suzukii* (Matsumura)

## Specimens Examined in Northeastern North America North American Distribution

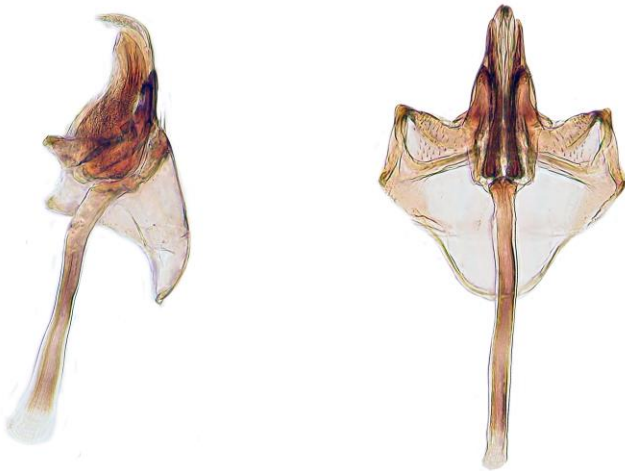
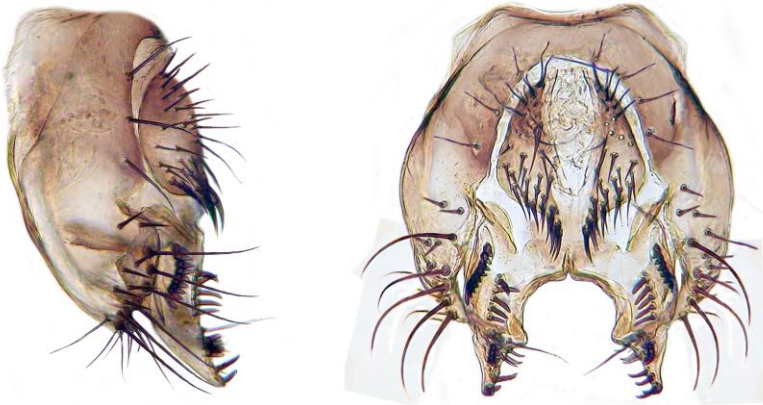




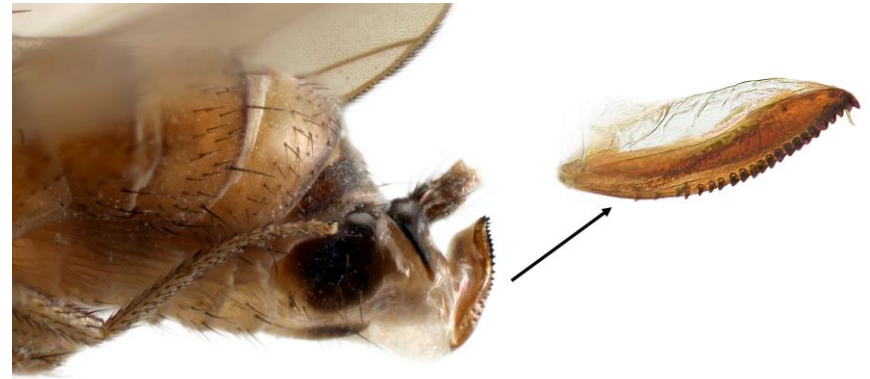


# *Drosophila suzukii* (Matsumura)

## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila affinis* Sturtevant

*Drosophila (Sophophora) affinis* Sturtevant 1916



***Drosophila obscura* species group:** Holarctic group of dark-bodied, cold-adapted species that are among the most abundant wild *Drosophila* in boreal forests, and among the first to emerge in spring. Males have small to large sex combs, and in fresh or alcohol-preserved specimens the bright red or yellow testes are visible through the abdominal membrane. The natural breeding sites of species in this group are largely unknown.

***Drosophila affinis* species subgroup:** Dark brown flies. Body length 1.8 to 2.2 mm. Wing 1.5 to 2.5 mm. Male fore tarsus with small to large sex comb on first fore tarsomere. Tergites completely dark. Females are indistinguishable.

**Species Diagnosis:** Second male fore tarsomere shorter than or equal to first; male fore tarsus with comb composed of 4-6 teeth.



Biology



Key Characters



Distribution



Terminalia

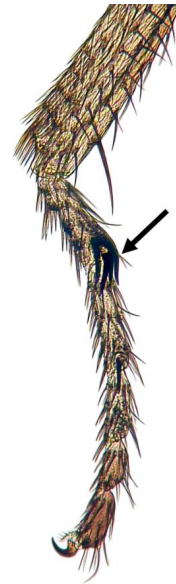


# *Drosophila affinis* Sturtevant

## Key Characters



Tergites completely dark.



Second male fore tarsomere shorter than or equal to first; male fore tarsus with comb composed of 4-6 teeth.





# *Drosophila affinis* Sturtevant

## Biology

*Drosophila affinis* has been associated with fungi and sap fluxes (Malloch & McAtee, 1924; Miller, 1950). Malloch & McAtee (1924) also noted that it is attracted to lights. This species can be reared in the laboratory environment on the standard banana-*Opuntia* medium (Markow & O'Grady, 2006).

Label data in this study, with collection dates from April to November, include records from Malaise and pan traps (in oak savannah, open pine and cedar forests, and Carolinian forests), from yellow pans on dunes, from apple cider vinegar bait traps (in cultivated peach, blueberry, raspberry, plum, straw, blackberry fields, among sea buckthorn and among wild vegetation), from oak wounds and from compost.



Fermenting  
baits



Rotting  
Organics



Fungi



Sap fluxes



Reared  
in Lab ✓

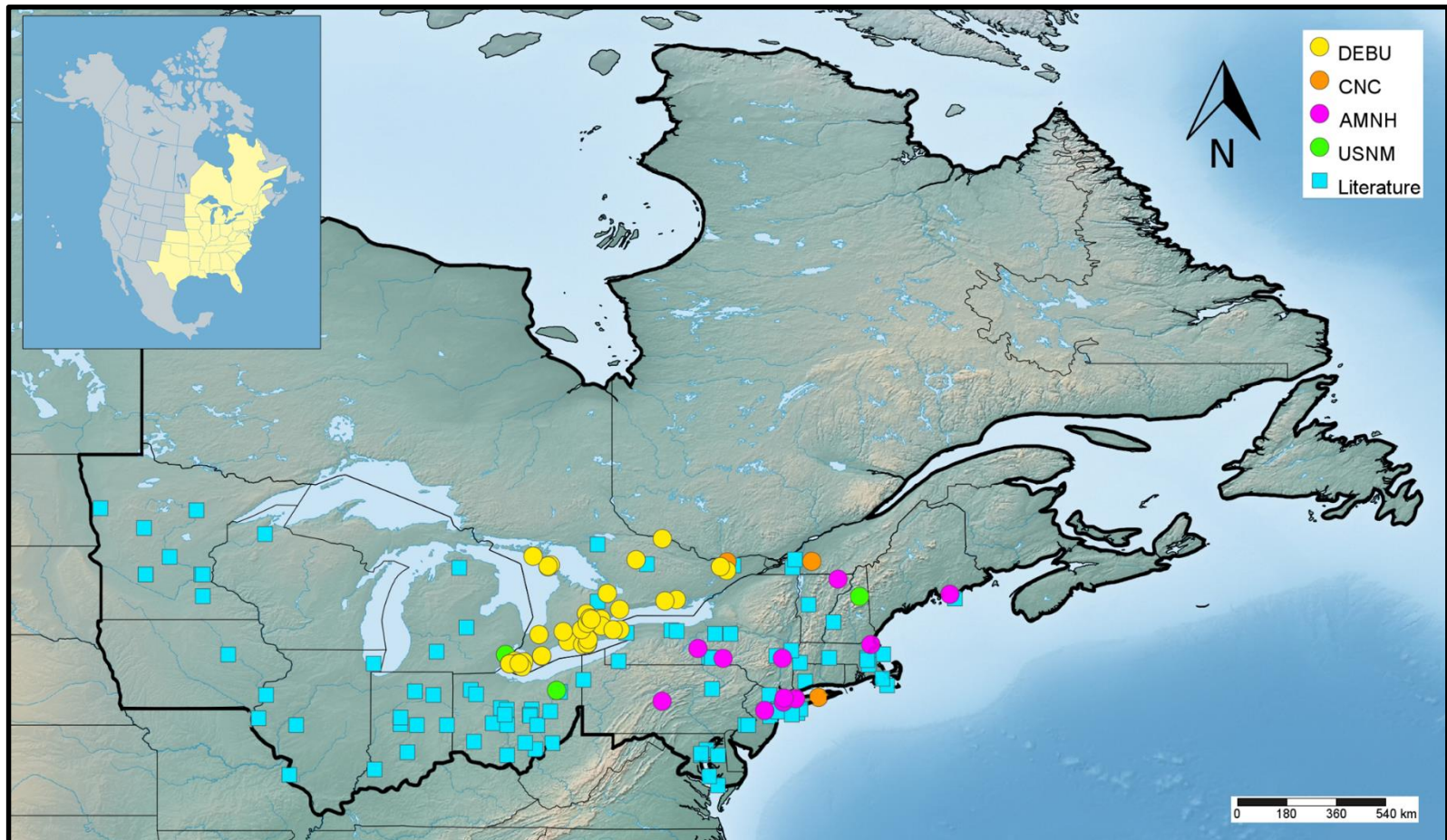


For additional information & photographs see Werner T. & Jaenike J. (2017).



# *Drosophila affinis* Sturtevant

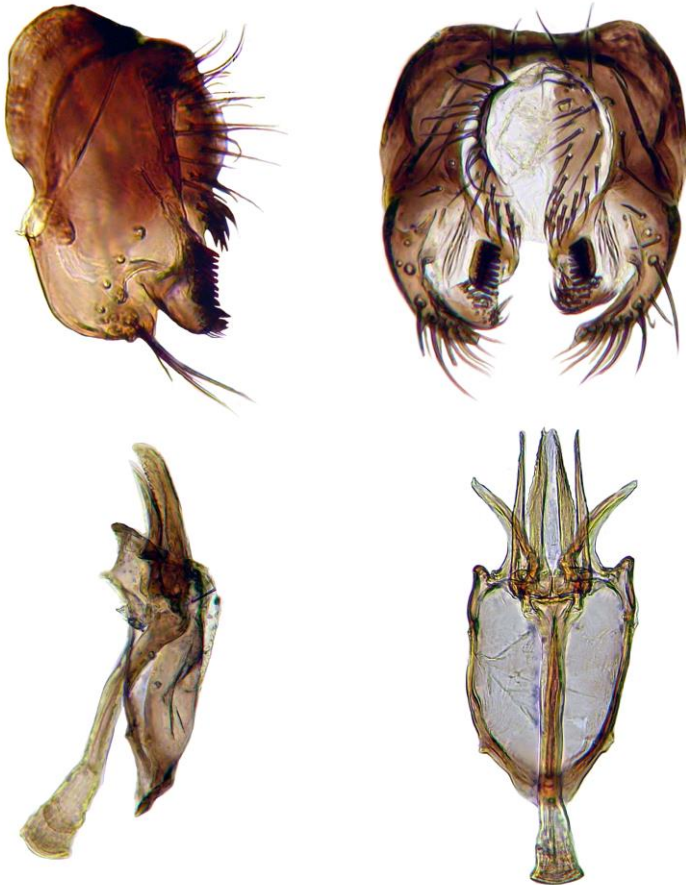
## North American and Northeastern North American Distribution



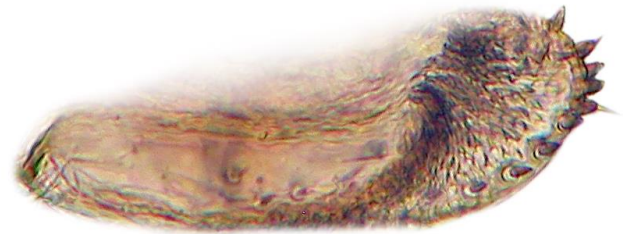


# *Drosophila affinis* Sturtevant

## Male Terminalia



## Oviscapt



## Spermathecae







# *Drosophila algonquin* Sturtevant & Dobhansky

*Drosophila (Sophophora) algonquin* Sturtevant & Dobzhansky 1936



***Drosophila obscura* species group:** Holarctic group of dark-bodied, cold-adapted species that are among the most abundant wild *Drosophila* in boreal forests, and among the first to emerge in spring. Males have small to large sex combs, and in fresh or alcohol-preserved specimens the bright red or yellow testes are visible through the abdominal membrane. The natural breeding sites of species in this group are largely unknown.

***Drosophila affinis* species subgroup:** Dark brown flies. Body length 1.8 to 2.2 mm. Wing 1.5 to 2.5 mm. Male fore tarsus with small to large sex comb on first fore tarsomere. Tergites completely dark. Females are indistinguishable.

**Species Diagnosis:** Second male fore tarsomere longer than first; male fore tarsus with comb composed of 8-10 teeth. Male and female terminalia as in *D. affinis*.



Biology



Key Characters



Distribution



Terminalia



# *Drosophila algonquin*

Sturtevant &  
Dobhansky

## Key Characters



Tergites completely dark.



Second male fore tarsomere longer than first; male fore tarsus with comb composed of 8-10 teeth.



# *Drosophila algonquin*

Sturtevant &  
Dobhansky

## Biology

Miller (1950) noted that the biology of *D. algonquin* is likely similar to that of *D. affinis* (associated with fungi and sap fluxes), and that it can be easily collected in fermenting banana traps. This species can be reared in the laboratory environment on the standard cornmeal-yeast medium (Markow & O'Grady 2006).

Label data, with collection dates from March to November, include records from Malaise traps in forested areas (larch, oak etc.), from carrion traps, from pans in grass clippings, from apple cider vinegar bait traps (in cultivated cherry, raspberry, blackberry, peach and wine grape fields, and among wild vegetation), from composter traps, in vegetative sweeps in maple forest, from bleeding maple stumps, from open pine plant sand & heath, from rotting apples and squash, and from lights.



Fermenting  
baits



Rotting  
Organics



Fungi



Sap fluxes



Reared  
in Lab ✓



For additional information & photographs see Werner T. & Jaenike J. (2017).

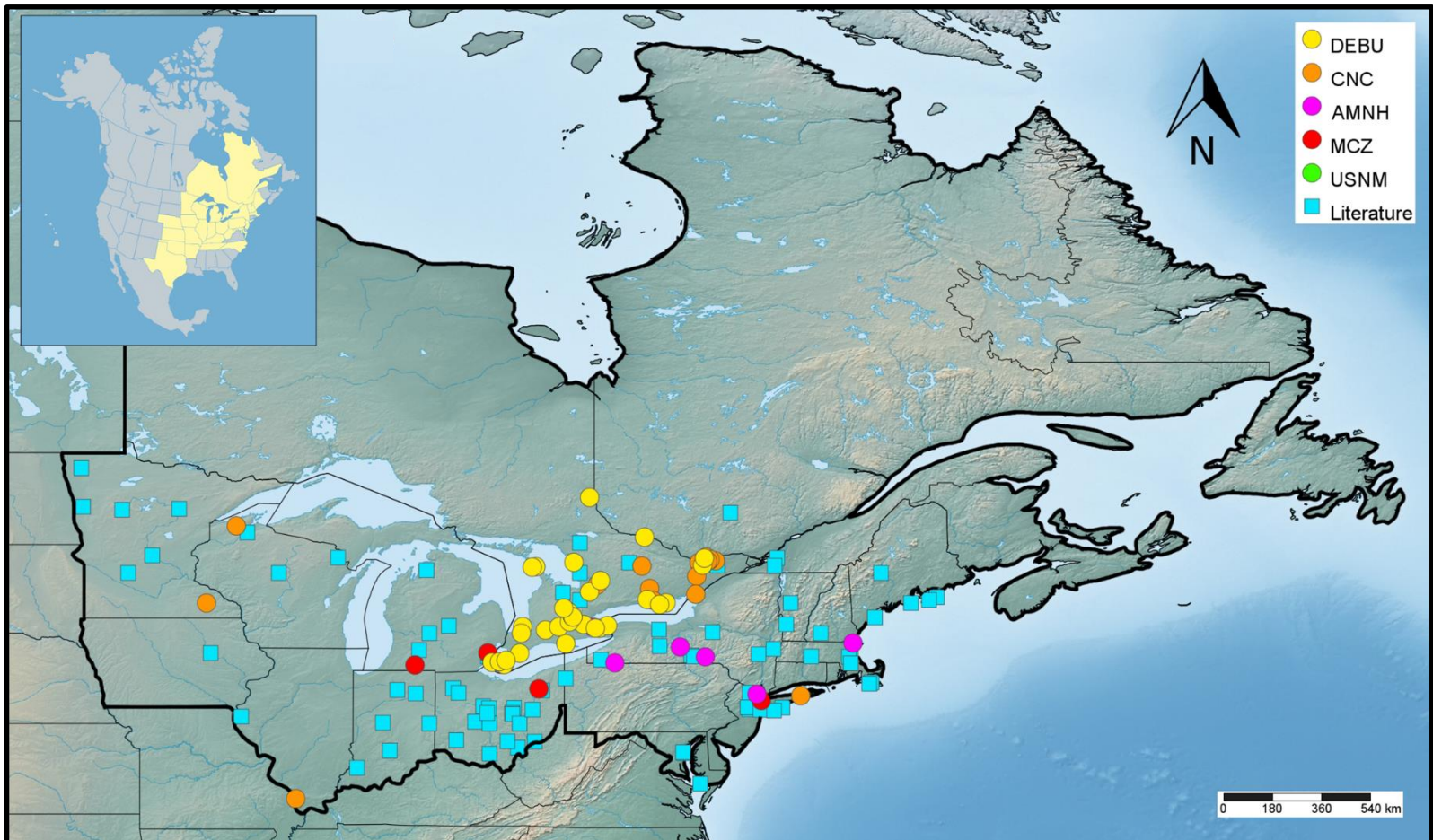




# *Drosophila algonquin*

Sturtevant &  
Dobhanszky

## North American and Northeastern North American Distribution





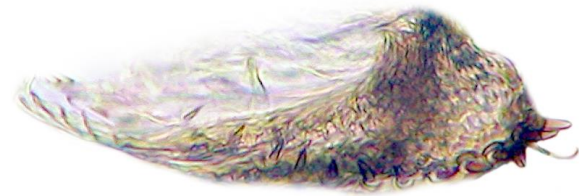
# *Drosophila algonquin*

Sturtevant &  
Dobhanszky

## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila athabasca* Sturtevant & Dobzhansky

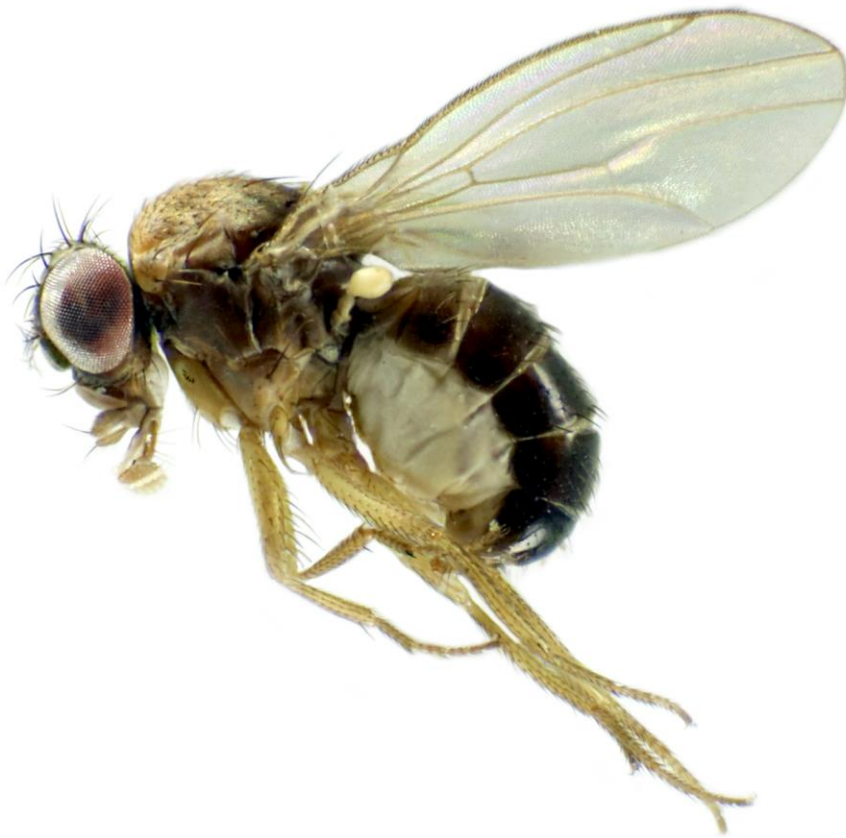
*Drosophila (Sophophora) athabasca* Sturtevant & Dobzhansky 1936



***Drosophila obscura* species group:** Holarctic group of dark-bodied, cold-adapted species that are among the most abundant wild *Drosophila* in boreal forests, and among the first to emerge in spring. Males have small to large sex combs, and in fresh or alcohol-preserved specimens the bright red or yellow testes are visible through the abdominal membrane. The natural breeding sites of species in this group are largely unknown.

***Drosophila affinis* species subgroup:** Dark brown flies. Body length 1.8 to 2.2 mm. Wing 1.5 to 2.5 mm. Male fore tarsus with small to large sex comb on first fore tarsomere. Tergites completely dark. Females are indistinguishable.

**Species Diagnosis:** Second male fore tarsomeme shorter than first; tarsal comb composed of 4-6 teeth. Male and female terminalia as in *D. affinis*. Virtually indistinguishable from *D. narragansett*.



Biology



Key Characters



Distribution



Terminalia





# *Drosophila athabasca*

Sturtevant &  
Dobhansky

## Key Characters



Tergites completely dark.



Second male fore tarsomere shorter than first; tarsal comb composed of 4-6 teeth.



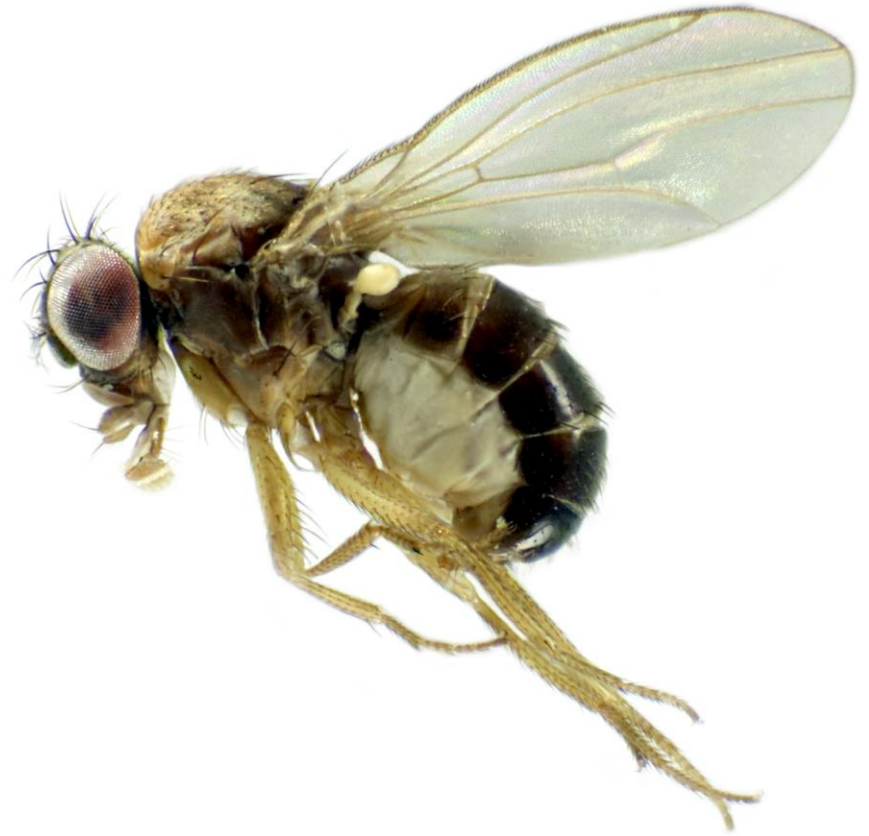
# *Drosophila athabasca*

Sturtevant &  
Dobhansky

## Biology

Hey & Houle (1987) noted that this species is attracted to fermenting banana traps. It can be reared in the laboratory on the standard banana-*Opuntia* medium (University of California, 2015).

Label data in this study, including collection records from April to October, reflect collections from traps (dung pan, decaying shrimp pans, Malaise and mushroom baited) in mixed forest and spring fens, from apple cider vinegar traps (in blueberry, raspberry, sour cherry, peach, straw fields, and among wild hosts), from a composter trap, Malaise traps in a *Typha* stand, on tree wounds, from a bare log, from vegetation sweeps and from grass clippings.



Fermenting  
baits



Rotting  
Organics



Sap fluxes

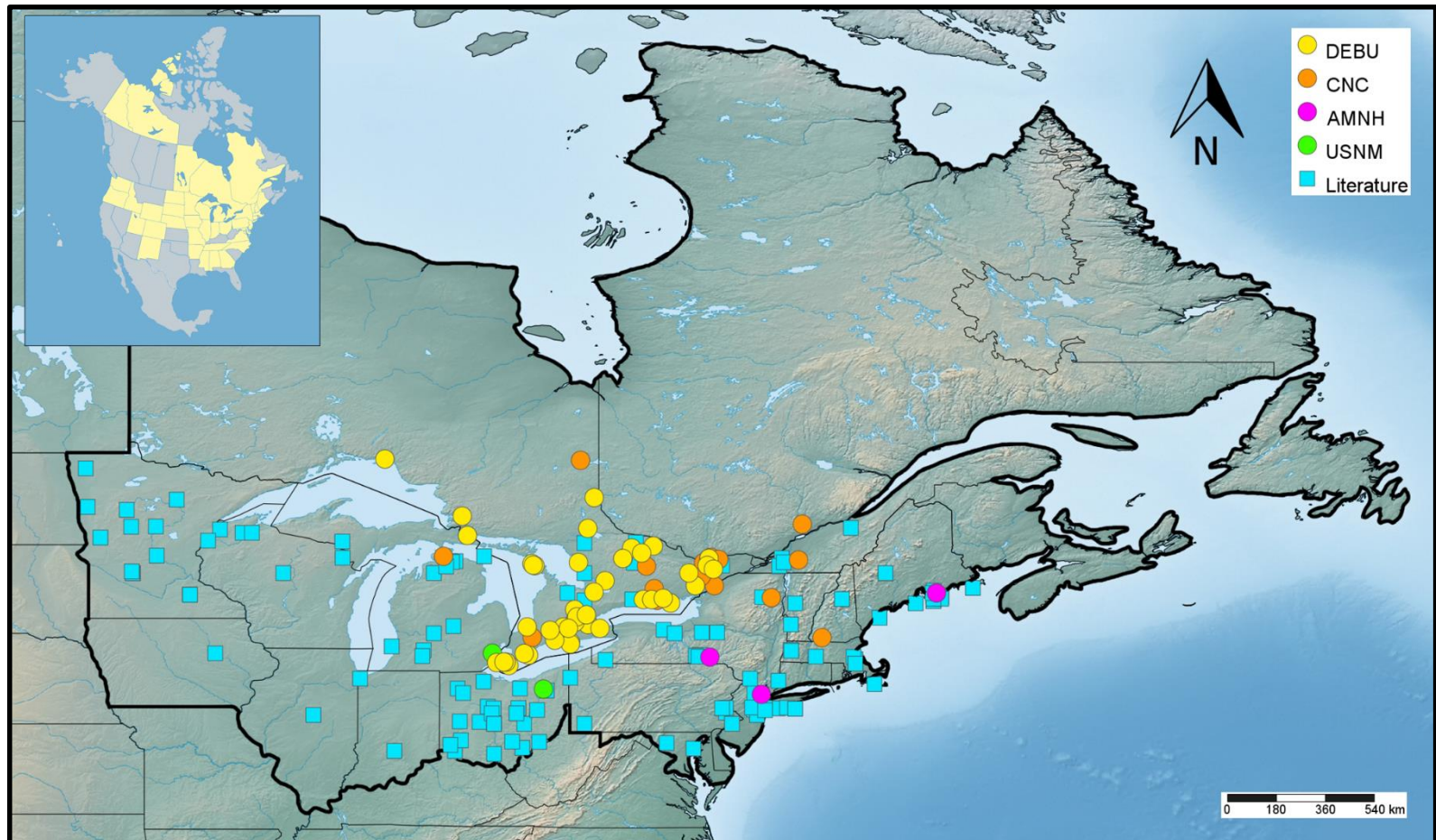


Reared  
in Lab ✓



# *Drosophila athabasca* Sturtevant & Dobhanszky

## North American and Northeastern North American Distribution



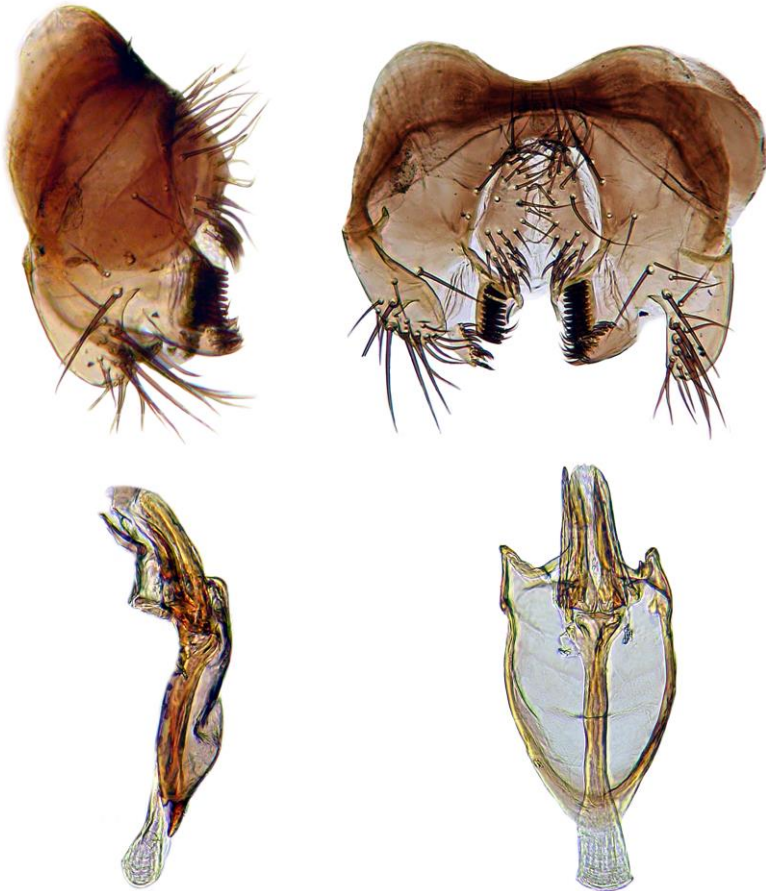




# *Drosophila athabasca*

Sturtevant &  
Dobhansky

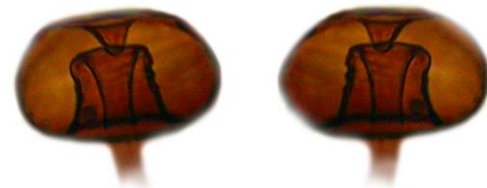
## Male Terminalia



## Oviscapt



## Spermathecae





# *Drosophila narragansett* Sturtevant & Dobzhansky

*Drosophila (Sophophora) narragansett* Sturtevant & Dobzhansky 1936



***Drosophila obscura* species group:** Holarctic group of dark-bodied, cold-adapted species that are among the most abundant wild *Drosophila* in boreal forests, and among the first to emerge in spring. Males have small to large sex combs, and in fresh or alcohol-preserved specimens the bright red or yellow testes are visible through the abdominal membrane. The natural breeding sites of species in this group are largely unknown.

***Drosophila affinis* species subgroup:** Dark brown flies. Body length 1.8 to 2.2 mm. Wing 1.5 to 2.5 mm. Male fore tarsus with small to large sex comb on first fore tarsomere. Tergites completely dark. Females are indistinguishable.

**Species Diagnosis:** Second male fore tarsomere shorter than first; tarsal comb composed of 4-6 teeth. Male and female terminalia as in *D. affinis*. Virtually indistinguishable from *D. athabasca*.



Biology



Key Characters



Distribution



Terminalia

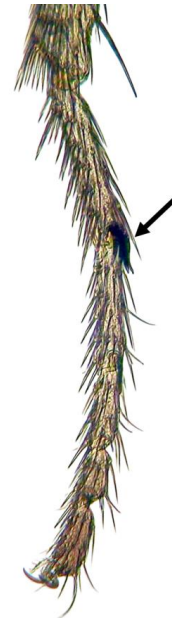


# *Drosophila narragansett* Sturtevant & Dobhanszky

## Key Characters



Tergites completely dark.



Second male fore tarsomere shorter than first; tarsal comb composed of 4-6 teeth.





# *Drosophila narragansett* Sturtevant & Dobhanszky

## Biology

Poorly known. This species can be reared in the laboratory environment on the standard banana-*Opuntia* medium (Markow & O'Grady, 2006).



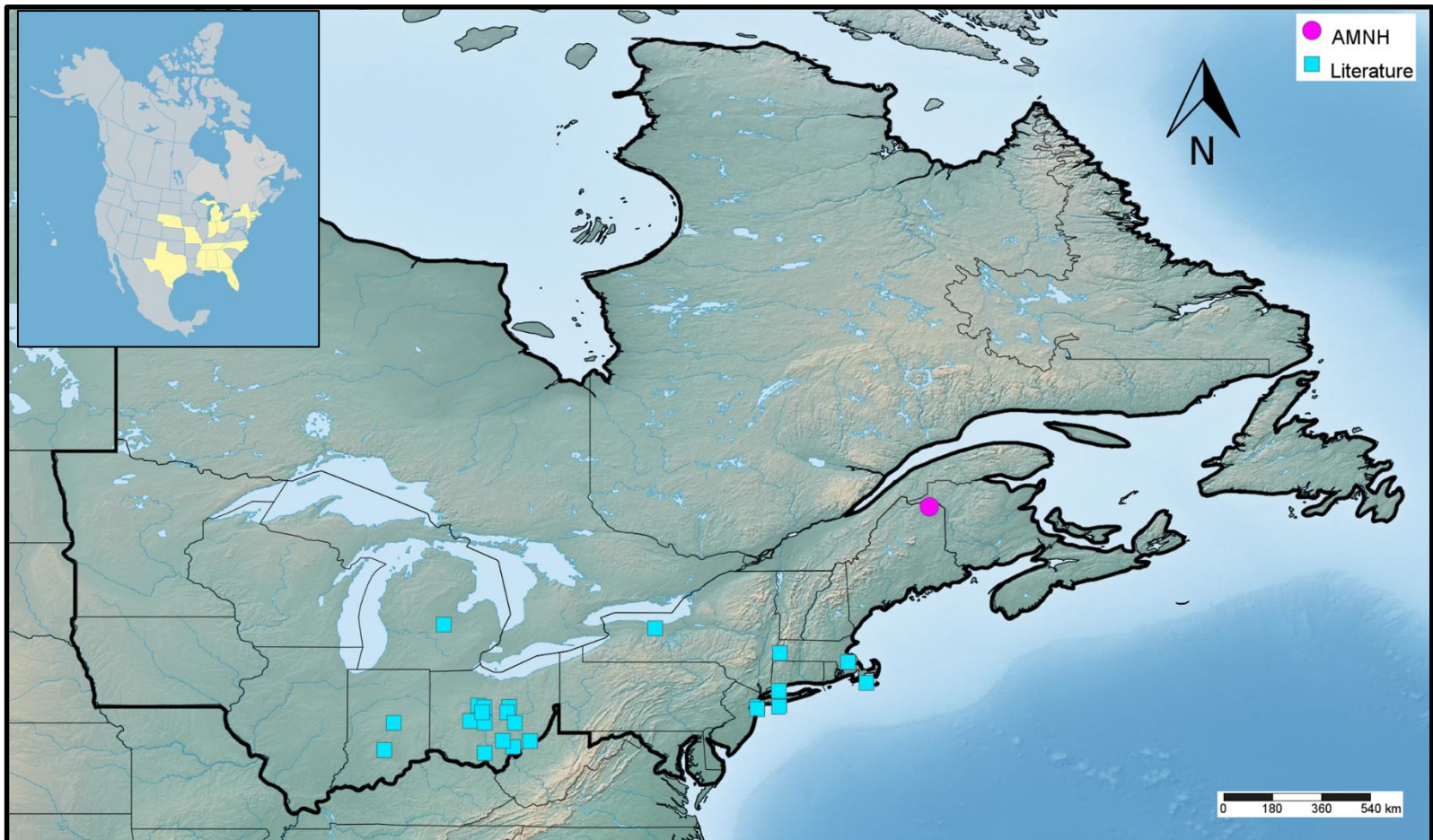
Reared  
in Lab ✓





# *Drosophila narragansett* Sturtevant & Dobhanszky

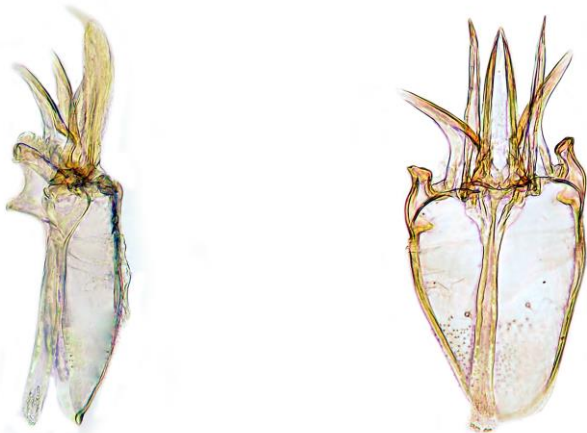
## North American and Northeastern North American Distribution





# *Drosophila narragansett* Sturtevant & Dobhansky

## Male Terminalia



## Oviscapt



## Spermathecae





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