The HORSE FLIES and DEER FLIES of IDAHO, OREGON and WASHINGTON STATE (Diptera: Tabanidae)

Anthony W. Thomas
Luc Leblanc
William J. Turner

Fly Times
Supplement 4
February 2022

Silvius gigantulus

FLY TIMES SUPPLEMENT

Issue 4, February 2022

PUBLISHER
North American Dipterists Society
P.O. Box 231113
Sacramento, California, 95823, USA

EMAIL ADDRESSES
sgaimari@dipterists.org
editor@dipterists.org

WEBSITES
https://dipterists.org/fly_times_supplement.html
http://www.nadsdiptera.org/News/FlyTimes/Flyhome.htm

HOSTING
Fly Times Supplement is a publication of the North American Dipterists Society. All issues are hosted on the webpages of the Society, at both the new website https://dipterists.org and the longstanding website http://www.nadsdiptera.org. The new website is fully hosted by the Society, with webmaster Steve Gaimari. The latter website, with Jim O'Hara as webmaster, is kindly hosted by the University of Guelph through arrangement with Steve Marshall.

DISTRIBUTION
Fly Times Supplement is simultaneously distributed in PDF and printed format, published on an intermittent basis.

SCOPE
Fly Times Supplement is meant for large manuscripts, while the *Fly Times* publishes more standard-length papers. We accept submissions on all aspects of dipterology, providing a forum to report on original research, ongoing projects, Diptera survey activities and collecting trips, interesting observations about flies, new and improved methods, to discuss the Diptera holdings in various institutions, to examine the historical aspects of dipterology and Diptera literature, and anything else fly-related that you can think of. And of course with all the images you wish to provide.

INSTRUCTIONS TO AUTHORS
Although not a peer-reviewed journal, all submissions are carefully considered by the editor before acceptance, often with consultation with other dipterists. We encourage submissions from dipterists worldwide on a wide variety of topics that will be of general interest to other dipterists, and hope that this will be an attractive medium for students through retirees to showcase their activities.

The requirements for submission are simple. Please send me a single-spaced text file (.rtf or .doc preferred) along with separate image files (.jpg or .png preferred). On a case-by-case basis, the editor may consider special formatting if it is of benefit to the presentation of the issue.

Following are some specific *do's* and *don't's*, bearing in mind that consistency among manuscripts is important:

1) *Do not* embed images into the text file (but *do* indicate in the text file approximately where each image should be placed).
2) *Do* submit image files of a reasonable size (no more than about 1MB per image file).
3) *Do not* use embedded styles (e.g., the various heading styles, small caps, paragraph spacing, etc.). *Do* limit styles to italics, bold, and (if you must) underline, and single-spaced.
4) *Do not* use different fonts, different font-sizes, or different colored fonts as headings. *Do* use Times New Roman, 11.5 point, black.
5) *Do* take a look at past issues of *Fly Times* and *Fly Times Supplement* for general formatting ideas.

There are no deadlines for submission, as issues are published intermittently.

Please submit manuscripts to the editor-in-chief, Stephen Gaimari, at:
sgaimari@gmail.com
and cc sgaimari@dipterists.com

ISSN 2769-6111 (Print)
ISSN 2769-612X (Online).

Available online 3 February 2022

The North American Dipterists Society is a 501(c)(3) nonprofit organization, incorporated in the state of California on 27 November 2019. We are an international society of dipterists and Diptera-enthusiasts, serving the needs of the worldwide dipterist community.

Our Mission is to advance the scientific study, understanding and appreciation of the insect order Diptera, or true flies. To accomplish this, we aim to foster communication, cooperation, and collaboration among dipterists, and to promote the dissemination and exchange of scientific and popular knowledge concerning dipterology.

As an **international society**, there are no boundaries, and our core activities are geared towards all dipterists, not a subset. We aim to provide a common stage for all people interested in flies, a place where our community can closely interact. Among our core activities, we produce Society publications such as this one (as well as the *Fly Times* and *Myia*), facilitate or organize Society and other Diptera-related meetings and events, provide grants and awards in support of dipterological activities and achievements, perform outreach activities and provide educational resources to those who need them, and maintain an organizational website, an online Directory of World Dipterists, a dipterists mailing list server, and social media presence. In these efforts, we as a group can make our society as successful as we want!

A note about Society membership – To thrive as an organization and to provide all the resources we can for the dipterological community, we need your support through becoming a member (https://dipterists.org/membership.html) or making donations (https://dipterists.org/support.html). Please see our website to understand our vision for our society!

From the Editor – Welcome to the latest *Fly Times Supplement*! This issue holds a special place for me, as it is co-authored by my M.S. degree mentor and friend, Dr. William J. Turner, from Washington State University. Although I was at WSU 30 years ago, I have always kept in mind my appreciation for Bill's having given me my first post-undergraduate opportunity as a researcher in dipterology! In so doing, he stoked my love for acalyptrate flies in general (a group feared by many students) and introduced me to the family Chamaemyiidae (and further the superfamily Lauxanioidea), which has been a focal group of mine since that time, with much thanks to Bill's influence and enthusiasm in teaching and guiding me! He also helped solidify my love for fieldwork in entomology, making me the enthusiastic collector I have been! And so, as editor, I am particularly pleased to be handling this manuscript!

****

CONTENTS

****

The HORSE FLIES and DEER FLIES of IDAHO, OREGON and WASHINGTON STATE (Diptera: Tabanidae)

Anthony W. Thomas[1], Luc Leblanc[2] and William J. Turner[3]

[1] New Brunswick, Canada; at5535587@gmail.com
[2] University of Idaho, Moscow, Idaho, USA; leblancl@uidaho.edu
[3] Washington State University, Pullman, Washington, USA; wjturner100@gmail.com

Abstract. Profusely illustrated keys are provided to identify females for the known (68 spp.) and expected (5 spp.) tabanids of the Pacific Northwest (PNW), *i.e.*, *Apatolestes* 2 spp.; *Stonemyia* 2 spp.; *Silvius* 4 spp.; *Chrysops* 15 spp.; *Haematopota* 1 sp.; *Tabanus* 12 spp. (11+1); *Atylotus* 4 spp.; and *Hybomitra* 33 spp. (29+4). A species-page that includes a dot-distribution map showing collection localities (for known PNW species) is provided for each of the species. A total of 2,766 specimens were examined and additional data were extracted from unpublished datasets. In total, we have records for 1,383 localities in the PNW. Also included is a brief history of tabanid studies in the PNW, comments on recent changes in scientific names and a discussion regarding intraspecific variation in selected species.

Introduction
The genesis for this project was two articles in the Canadian Journal of Arthropod Identification (CJAI) by AWT (2009, 2011) on the "Tabanids of Canada East of the Rockies" which are heavily-illustrated identification guides, with keys to the species. Keys to tabanid species were nothing new but these two articles were the first to use a plethora of colored digital photographs of actual specimens.

An offer by AWT posted on the dipterists listserv (hosted by the North American Dipterist Society, at https://lists.dipterists.org/mailman/listinfo/dipterists) for cooperation for a similar study for the United States received a response from LL suggesting Idaho be considered. Dr. Leblanc contacted WJT and Washington State was included. Oregon was added to expand the project to become what was initially titled, "Tabanidae of the Pacific Northwest (PNW)". Finally, five species from adjacent states and provinces, not yet found in the PNW, were included due to the possibility of their eventually being found in the PNW.

The senior author, AWT, is responsible for the format and keys (with input from the co-authors), based on a checklist supplied by LL and WJT, and most of the imagery. Dr. Turner summarized the history of tabanid studies in the PNW, discussed nomenclature and variation within species, and identified the specimens in museums. Drs. Leblanc and Turner are the sole contributors for the species and specimen records. Dr. Leblanc digitized and transcribed label data for museum specimens and produced the maps.

Tabanids of the Pacific Northwest, Introductory Remarks (WJT)
Washington, Idaho and Oregon comprise the Pacific Northwest, of the conterminous United States, in the northwestern portion of the country. They share certain topographic and like-habitat features that occur in nearby adjacent areas including British Columbia and Alberta Provinces in Canada, western Montana and Wyoming to the east, and northern California and Utah to the south. As a result, the insect fauna of the PNW region extends into (or from) these states and areas. In this paper we have limited the coverage to the three-state area but include information about species occurring in the adjacent areas that likely extend into the Pacific Northwest states.

The horseflies and deerflies of the Pacific Northwest have received varying taxonomic treatments over the years. In earlier publications the PNW species were treated as portions of the larger Nearctic or North American faunas. As examples are two important catalogs by Philip (1965: Nearctic species) and more recently Burger (1995: North America North of Mexico). A major contribution by Pechuman and Teskey (1981: Manual of Nearctic Diptera) was the chapter reviewing the Nearctic tabanid fauna at the generic level, including coverage of larvae. Several other publications are taxonomic treatments of particular subgroups of horseflies and deerflies (Brennan, 1935: Pangoniinae; Stone 1938: Tabaninae; Philip, 1954b, 1955: Pangoniinae and *Chrysops*). More recently tabanologists from the included states and regions considered the faunas of their respective states and Canada with varying degrees of coverage (Mahmoud, 1980: Oregon; Middlekauf and Lane, 1980: California; Nowierski and Gittins, 1976: Idaho; Teskey, 1990: Canada and Alaska; Thomas, 1973: Alberta *Chrysops*; Turner, 1985: PNW). Turner (1985) is noteworthy as the only coverage to date treating specifically the PNW fauna by providing a checklist of species and an illustrated key to the common species occurring there. It was based on a multiyear systematic sampling survey throughout the region, using CO_2-baited Malaise traps (Blume *et al*., 1972) for capturing females and swarm sampling of males. There was also some limited rearing of immatures (Washington State University, College of Agriculture Research Center, Project # 0209, "Biting Flies of Washington").

This present publication reports detailed distribution records and maps for Idaho, Washington and Oregon, and provides an illustrated key and species pages (for females) for the 68 species occurring in the PNW. We have opted for a photographic key to assist users with little familiarity of important taxonomic features to place specimens to species. In addition to the species documented for the region, we include five additional species from adjacent states (Montana, Wyoming) and Canadian provinces (British Columbia and Alberta) that might eventually be collected in the PNW, based on geographic proximity and similarities of shared habitats and topographic features. We also provide current names for those that have changed since their usage in earlier publications, and discuss significant nomenclatural changes and outstanding taxonomic challenges.

Nomenclature: Correct Scientific Names (WJT)
The names applied to North American tabanids have been relatively stable for the past 20 years. This stability was provided by earlier catalogs (Philip 1947; Philip, 1965) and more recently by Burger (1995). In his monograph of Canadian and Alaskan tabanids, Teskey (1990) added critical information and discussion about several species that were in question. Two other important catalogs were of European tabanids prepared by Chvála et al. (1972) and the World synoptic catalog by Moucha (1976). Historically, the largest change in generic assignment was made by Philip (1947) when he reassigned 27 species of *Tabanus* to *Hybomitr*a and 6 (plus subspecies) to *Atylotus*. At the time, *Tabanus* was characterized as "unwieldly." Nearly all *Hybomitra* species present in the PNW were reassigned by Philip during this move.

Several recent changes in taxonomic assignments are worth noting. They involve several smaller groups of tabanids. *Pilimas* was primarily a western group with two or three species. Burger (1985) analyzed its relationships to a related genus, *Stonemyia,* and discovered that *Pilimas californicus* was closely related to species of *Stonemyia,* and moved *P. californicus* to that genus. Because of some nomenclatural difficulties *(i.e., Pilimas* was not clearly assigned a generotype species at its creation by Brennan), the two remaining species in *Pilimas* (*P. abaureus* and *P. ruficornis*) were reassigned by Burger (1985) to a new genus*: Pegasomyia*.

For more than 40 years, the common and widespread species *Atylotus incisuralis* was well recognized, with the species *A. insuetus* as a synonym. In fact, Pechuman (1981b) found the reverse was true, with *A. incisuralis* actually the junior synonym of *A. insuetus*, and the latter being the valid name. A biologically more interesting situation is when one species, on further study, proves to be two. Thus, individuals thought of as *A. insuetus* proved to be either *A. insuetus* or an undescribed species later named *A. calcar* (Teskey,1983). Similarly, *Hybomitra rupestris* consisted of *H. rupestris* and a new species *H. agora* (Teskey *et al*., 1987); and *H. sonomensis* consisted of *H. sonomensis*, restricted to coastal areas of Washington and Oregon, and a new species, *H. enigmatica*, found further inland, including Idaho (Teskey, 1982). These three pairs of sibling species are all present in the PNW and it highlights that the stability of some scientific names is not as solid as it might seem.

More recent major taxonomic revisions have been produced for several smaller genera, including *Stonemyia* (Burger, 1985) and *Haematopota* (Burger and Pechuman, 1986). The subfamily Pangoniinae was revised earlier by Philip (1954b) as was *Chrysops* (Philip, 1955). Stone (1938) revised the Tabaniinae.

Corrected assignments of three additional PNW species have been resolved. *Hybomitra nuda* was historically recognized at the specific rank. LeClercq and Olsufjev (1981), in their "new catalog" of Palearctic Tabanidae, placed *H. nuda* as a subspecies of the European *H. nitidifrons*. Pechuman

(1981a) agreed with this reduction to subspecific status and Teskey (1990) supported this new reassignment. Subsequently, the correction to restore it to full rank species was clarified by Philip and Lane (1984). However, Burger in his 1995 Catalog still placed *nuda* as a subspecies of *H. nitidifrons*. *Hybomitra lurida* was long known as *H. metabola* until Pechuman and Stone (1968) realized that it was the same as a European species. As it turns out, *H. lurida* was determined to be the valid name and, because of priority, placed *H. metabola* as a junior synonym.

In another case, *Tabanus sequax* was initially moved to *Hybomitra* by Philip (1947) but subsequently returned to *Tabanus* by Teskey (1990) who justified the move based on several sound morphological characters. Again, a more detailed study of significant taxonomic characters helped to correctly place *H. sequax* into the correct genus.

***Apatolestes comastes* complex**

For some time, the relationships among the western *Apatolestes* species have been confused. Teskey (1990) remarked that, "the genus *Apatolestes* is in need of a thorough revision." In the Catalog of Nearctic Diptera, Philip (1965) lists the variant *A. willistoni* under the species *A. comastes*. More recently, Middlekauff and Lane (1980) and Teskey (1990) considered *A. comastes* and *A. willistoni* as separate species. From the catalog, one would assume that *A. comastes* and its variant *A. willistoni* occur throughout the western U.S. and into the PNW. However, a study of several long series of *Apatolestes* in our museum collections revealed that of the two, only *A. willistoni* is present here. Apparently, *A. comastes s. str.* occurs farther south in California and Arizona and perhaps into Utah and Nevada, but does not extend into our region. Middlekauff and Lane (1980) also considered another variant of *A. comastes* (*A. c.* var. *fulvipes*) that is probably closer to *A. willistoni* and reassigned it there. This variant is restricted to California and does not occur in the northwest. In addition to *A. willistoni*, a second species, *A. albipilosus*, is also present in Oregon and California.

***Tabanus tetropsis* – recognized as valid species?**

The status of *Tabanus tetropsis* was uncertain for years and was thought to be a species of *Stenotabanus,* perhaps the unrecognized male of *S. floridensis* (Stone, 1938). The name was associated with the type specimen erroneously thought to be from "Am[erica] Boreal. Georgia." With all the uncertainty, Stone (1938) and Philip (1947) continued to consider the species "unrecognized." The type specimen, a male, was examined by Harold Oldroyd (BMNH) and found to key to *Tabanus lineola* using Stone's (1938) key but he (HO) noted significant differences (see Philip 1950a). It was still considered "unrecognized and not Nearctic" by Philip (1965) and not included as a valid species in the Nearctic Diptera Catalog. It was Stone (1972) who first considered the western *T. productus* to be a synonym of *T. tetropsis* after comparison with a Utah specimen of that species. But *Tabanus tetropsis* was the senior synonym and had priority as the species. Middlekauff and Lane (1985) included it in their treatment of California tabanids, also with *T. productus* as a junior synonym. This assignment was accepted by Burger (1995).

****

Table of Name Changes for PNW Tabanids

current name	Nowierski and Gittins, 1976: Idaho*	Middlekauf and Lane, 1980: California	Mahmoud, 1980: Oregon	Turner, 1985: PNW
Apatolestes willistoni	*A. comastes* var *willistoni*			
Stonemyia californica	*Pilimas californica*	*Pilimas californica*	*Pilimas californicus*	*Pilimas californica*
Stonemyia fera	*S. tranquilla fera*	*S. tranquilla fera*	*S. tranquilla fera*	*S. tranquilla fera*
Chrysops aestuans	*C. aestuans* var *abaestuans* *C. callidus* *C. callidus* var *confusus*			
Chrysops ater	*C. carbonarius*			
Chrysops frigidus	*C. frigidus* var *xanthus*			
Chrysops furcatus	*C. furcatus* var *chagnoni*			
Chrysops noctifer	*C. noctifer noctifer* *C. noctifer pertinax*		*C. noctifer noctifer* *C. noctifer pertinax*	
Chrysops proclivis	*C. proclivis* var *atricornis*			
Tabanus similis	*T. lineola*			
Tabanus stonei	*T. stonei* var *jellisoni*			
Atylous insuetus	*A. incisuralis* *A. insuralis* var *utahensis*	*A. incisuralis*	*A. incisuralis*	
Atylotus calcar	*A. thoracicus*			
Hybomitra osburni	*H. rhombica* var *osburni*			
Hybomitra enigmatica?	*H. sonomensis.* *H. sonomensis* var *phaenops*			
Hybomitra tetrica	*H. tetrica* var *hirtula*		*H. hirtula*	
Hybomitra pechumani	*H. typha*			
Tabanus sequax	*Hybomitra sequax*		*Hybomitra sequax*	*Hybomitra sequax*

*includes species not found in Idaho

Understanding Variation in PNW Tabanidae (WJT)
While most tabanid species are easily recognized because of fairly consistent diagnostic taxonomic characters, several species show considerable variation making identification difficult. Tabanologists in their efforts to assign all specimens have treated variability in several ways. Often the differences between variable forms are size, color and patterns of color, degree of pollinosity or limited, often poorly recognized, morphological features. Of most importance, does the observed variability impact recognized formal taxa (species or subspecies) or is the variability random, inconsistent and not meaningful? In these cases the odd specimens are considered to represent morphs, forms, variants or even assigned, in some cases, to subspecies. The taxonomic categories of species and subspecies are clearly defined by particular criteria in the International Code of Zoological Nomenclature. With other designations below the species rank, the criteria are not as clear. In those species and subspecies where formal recognition remains questionable, current molecular techniques along with more extensive collecting may be necessary to resolve the questions. Studies of immature stages and breeding sites have sometimes brought greater clarity to relationships between forms. Although *Hybomitra pediontis* is very similar to *H. frontalis*, the male aggregation swarm behavior is entirely different between them and specific differences are supported by morphological characters (McAlpine, 1961; Teskey, 1990).

Perhaps the most complex and puzzling case of variability has been the *Hybomitra frontalis* complex that involves *H. frontalis, H. pediontis* and *H. opaca*, along with 4 nominal "species" (*H. incisus*, *H. septentrionalis*, *H. labradorensis*, *H. canadensis*) that are now considered synonyms of *H. frontalis.* McAlpine (1961) analyzed in depth the nature and extent of variation for this group of species and characterized eight "morphs" in the populations he studied, based on 5,000 specimens from 300 localities. Of these, morph 1 is by far the most common in the PNW. McAlpine concluded that the complex "consists of a continuous transcontinental population made up of many local demes that differ from each other in varying degrees." Variation was shown to be mostly intraspecific and that there was no justification for considering any of the various morphs of the complex anything but different phenotypes of a single, large, panmictic population. McAlpine also determined the distinctness of two other species involved, *H. opaca* and *H. pediontis*. The long history of the names applied to species of this complex are detailed by McAlpine (1961).

In preparing the present paper we have considered perplexing variation in three other species pairs and one three-species complex after reexamining our material. The first is *Hybomitra osburni* and *H. rhombica*. The second problematic pair is *Hybomitra tetrica tetrica and H. t. hirtula*, while the third is *Chrysops aestuans aestuans* and *C. a. abaestuans. Hybomitra sonomensis/enigmatica/phaenops* form a three-species complex.

Relationships between *Hybomitra rhombica* and *H. osburni* have received varied treatment by different workers. *Hybomitra osburni* has been considered a subspecies, variety or synonym of *H. rhombica* or a full species. *Hybomitra rhombica* specimens occur within the distributional range of *H. osburni* but are never as common. Teskey (1990) considered the two as separate species and clearly argued the case but indicated that further study of larger series of specimens from the ranges of both species is necessary to finally resolve their relationships. This case illustrates some of the problems with analyzing variation to establish species' limits.

Hybomitra tetrica belongs to a taxonomic group involving the typical form *H. t. tetrica* and its well-known subspecies, *H. t. hirtula*. The two have been variously treated as forms, subspecies or as full species depending on the worker. Their similar morphologies have traditionally been separated by the presence/absence of pruinosity on the subcallus and some other minor characters. Typically, there

are specimens identified as *H. tetrica* with partly or completely denuded and glossy subcallus, and *H. hirtula* with a gray pruinose subcallus. Unfortunately, there are also specimens with all sorts of intermediate conditions that are impossible to assign to one or the other form. Teskey (1990) concluded that there was no reason for continuing to recognize the "*hirtula*" variant and all forms should be considered to belong to the typical form, *H. tetrica*. Because a pruinose or denuded subcallus is a very useful key character this species occurs in two key couplets. Interestingly, this species appears most closely related to the *H. opaca/H. frontalis* complex but differs from both by its strong R_{4+5} spur vein. Teskey (1990) notes that there are no very useful secondary features for separating *H.tetrica* from *H. opaca* and this species group needs additional taxonomic review. However, *Hybomitra opaca* also differs from *H. tetrica* by having a small denuded projection of the (denuded) basal callus into the upper margin of the otherwise pruinose subcallus.

Relationships of *Chrysops aestuans* to *C. aestuans abaestuans* are not as complex as with the previous complex and pairs, and rate only as passing interest with regard to status. Apparently, the darker *C. aestuans* occurs commonly east of the Great Lakes while the paler *C. a. abaestuans* specimens are typical in the western portion of its range. South of the Great Lakes and in western areas there are populations with individuals intermediate in color characters but never as dark as their eastern counterparts. They resemble *C. aestuans* but are darker above on the abdomen and legs that are dark only in part. Other markings on the wing and abdomen seem to vary considerably within sympatric populations. Philip (1941a) described *C. abaestuans* at the subspecific rank and not as a full species. Teskey (1990) decided the variation within the populations was within the limits of *C. aestuans* and agreed it did not deserve specific recognition. The current status of *C. abaestuans* is still questionable and needs further study. At this point, it does not merit further consideration.

In many cases, new tabanid species have been discovered among specimens of more well-known species. Often there was some degree of confusing variation that masked their exact relationships. These associations often went unrealized until new methods of analysis or the discovery of previously unrecognized taxonomic features were used to parse out the new species. Earlier tabanid taxonomy was based primarily on morphological characters that in many cases were quite variable and unreliable. There often was necessary reliance on color and color patterns, degree of hairiness, and surface pruinosity (or its absence), in cases where no "hard" features could be measured and differentiated (such as absolute sizes, measurements of morphology features and ratios). Resolution of relationships often came when other, more recent, non-morphological methods were used. For example, the relationships of *Hybomitra sonomensis* and its related species *H. phaenops* have been confusing for some time. *Hybomitra phaenops* was initially treated as a subspecies of *H. sonomensis* but there was no understanding of the relationships between the two. Teskey (1982) examined large series of specimens identified as both species. He discovered and described a third species, *H. enigmatica*, from the combined material. He was able to distinguish three species by their unique eye color, banding patterns and pilosity, and by distribution patterns associated with larval habitats. Teskey's study was continued by Burger (2001) who described 5 color forms of *H. phaenops*, four of which are present in the PNW. Color form I reaches the PNW in SE Oregon; form II is widespread on the PNW but is not found in Montana; forms III and IV are widespread in the PNW. With this new insight, *H. sonomensis* was determined to be restricted to coastal areas from Alaska to San Francisco Bay, as their larvae develop in marshes, whereas *H. phaenops* and *H. enigmatica* are inland species, with *H. phaenops* being more widespread extending further south and further east.

A few additional examples of unresolved traditional morphological variation being settled by additional detailed morphological and newer non-morphological characters are as follows. *Chrysops pertinax* appears to be a black form of *C. noctifer* with gradations in abdominal patterns between

them. Teskey (1990) and Middlekauff and Lane (1985) determined that the intermediate forms were only variants of *C. noctifer* and considered *C. pertinax* a subspecies based on adult and larval features. *Chrysops ater* and *C. carbonarius* are very similar morphologically. However, there is a distinctive distribution for each: *C. ater* (transcontinental) and *C. carbonarius* (eastern NA) with hybridization in the areas of overlap. This relationship strongly suggests both represent distinct species. *Hybomitra agora* and *H. rupestris* are similar but males and females are readily separated by facial features. Also, male aggregation swarming behavior differs between the two species (Teskey *et al*., 1987).

Before 1979 most references to *Hybomitra typhus* probably referred to a species later described as *H. pechumani* by Teskey and Thomas (1979). Before the formal description of *H. pechumani* two types of *H. typhus* (A and B) were recognized (Pechuman 1960; Pechuman *et al*., 1961). Later, in two studies, molecular isozyme characters confirmed the distinctiveness of these types (Hudson and Teskey, 1976; Hudson,1979). *Hybomitra pechumani* is a common widespread transcontinental species; *H. typhus* is a much rarer eastern species.

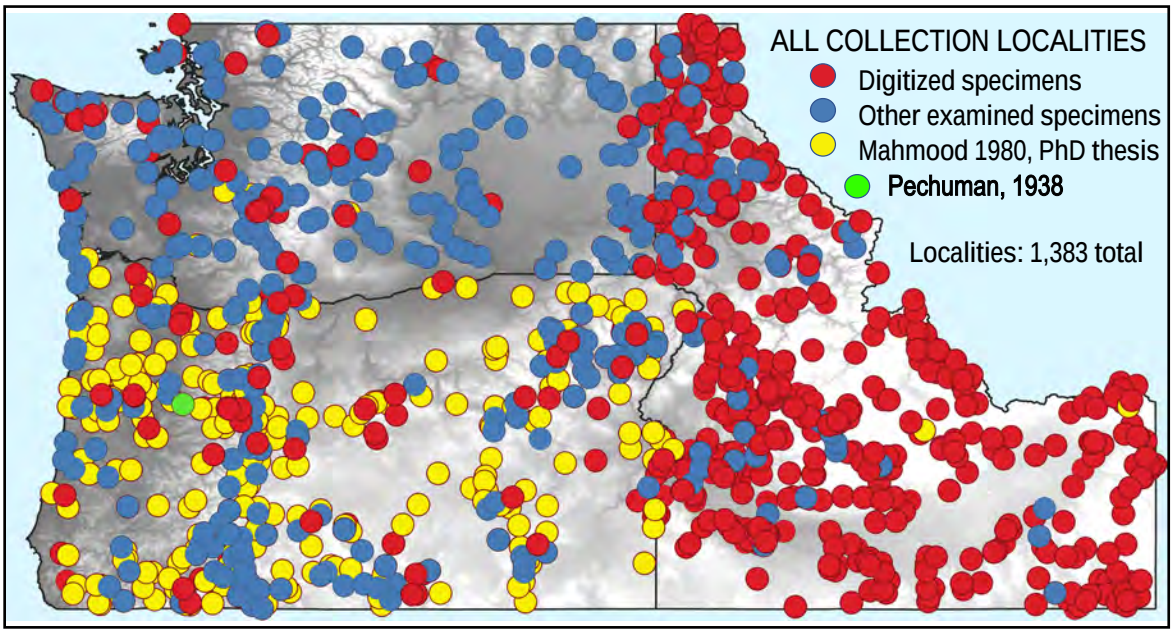
Specimens & Maps (LL)
I used data from three sources to compile the dot-distribution maps. Digitized specimens, represented by red dots on maps, were examined in 2021 in two museums, and their species identifications were validated. Each specimen was labelled with a unique museum identifier code, and its complete label information was uploaded on the Symbiota Collections of Arthropods Network (SCAN) [https://scan-bugs.org]. The two museums are the William F. Barr Entomological Museum (WFBM; University of Idaho, Moscow, ID) (2,477 databased specimens) and the Orma Smith Museum of Natural History (CIDA; College of Idaho, Caldwell, ID) (289 databased specimens). These two datasets can be viewed and downloaded through the following links:

WFBM dataset: https://doi.org/10.15468/dl.haxuac
CIDA dataset: https://doi.org/10.15468/dl.w2ak36

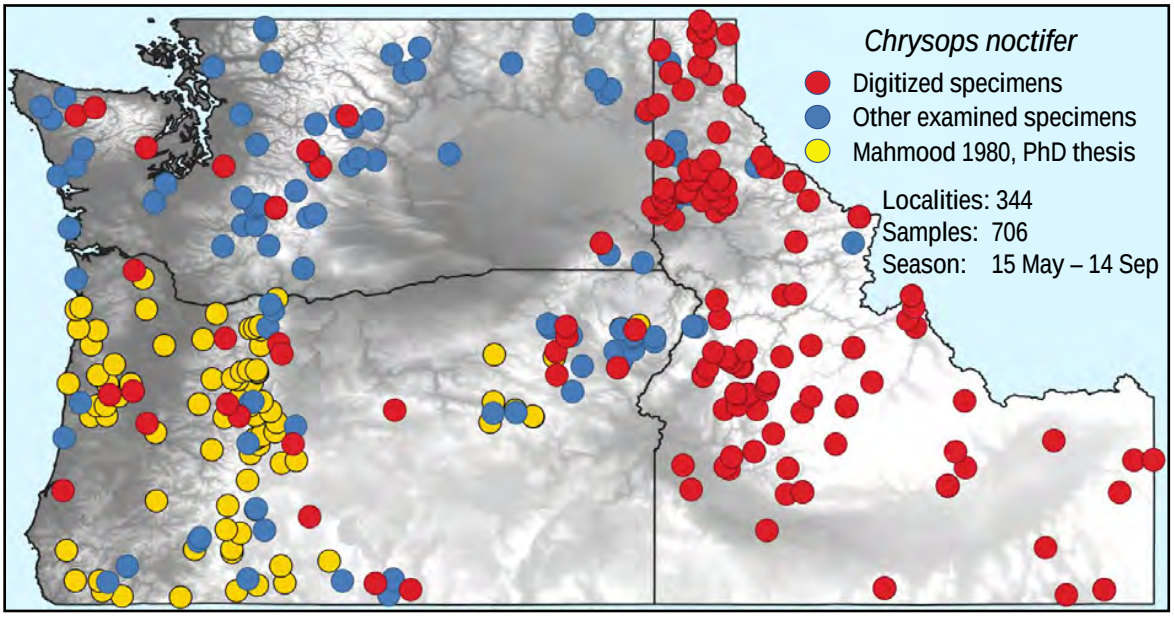
Additionally, I include other records of digitized specimens downloaded from the SCAN database. Because we were unable to examine actual specimens to validate determinations, we included the 98 records judged credible, *i.e*., within the geographical range of our distribution data. Other examined specimens, represented by blue dots on maps, were examined and identified in the 1980's by co-author WJT while compiling his published checklist and key to the Tabanidae of the Pacific Northwest (Turner, 1985). In this process, WJT examined and noted label data on index cards for all tabanid specimens in the Maurice James Entomological Museum (WSU; Washington State University, Pullman, WA), the California Academy of Sciences (CAS; San Francisco, CA) and the Essig Museum of Entomology (EMEC; Berkeley, CA). Records labelled as Mahmoud 1980, PhD thesis, represented by yellow dots (753 records), were taken from a PhD dissertation on the Tabanidae of Oregon (Mahmoud, 1980). Most of the specimens from these records, located at the Oregon State University collection (OSAC; Corvallis, OR), were not examined by the authors. In addition to the three sources of data cited above, one additional record taken from published literature is also included, represented by a green dot. Together, all these records resulted in georeferencing 1,383 collecting localities (Map A) and the production of individual distribution maps by LL.

I georeferenced all the localities from records, using Google Maps, to visualize distributions on maps (Map A). These localities are not to be treated as exact collecting location coordinates. The maps were produced using QGIS 3.16 software (https://qgis.org). Additionally, I include on each map the number of localities, the number of samples (1 sample = single specimen or series of specimens collected at one location during one day), and the season (the earliest and latest date of collection among all specimen and literature records compiled for each species).

Of the 20 most common species in the PNW *Chrysops noctifer* was found in significantly more localities than any other species (Fig. A). However, it was absent from the central area of the PNW (Map B).



Map A. The 1,383 localities from which we have records of tabanids.



Map B. Localities for *Chrysops noctifer*.

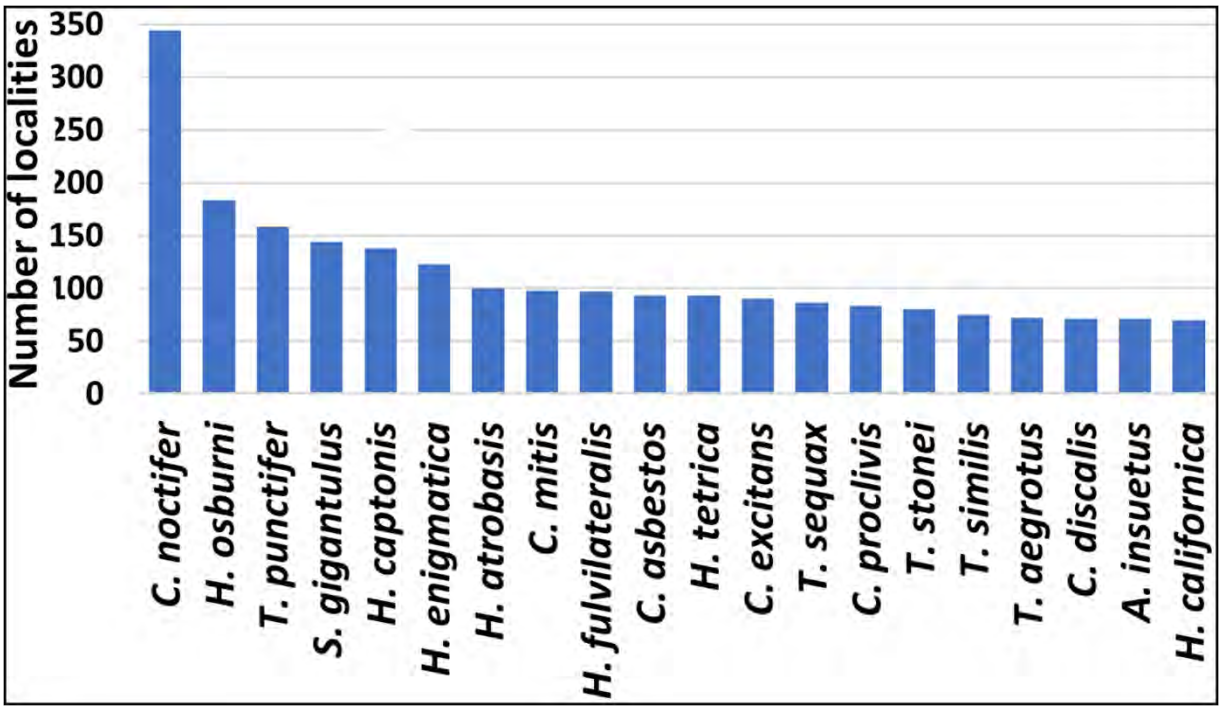


Figure A. The 20 most common species, based on number of localities.

Photography

Most of the specimens photographed are in the collection of AWT. Other specimens are in the collections of WJT and the University of Idaho; these specimens were photographed by LL. Two species, *Apatolestes albipilosus* and *Atylotus utahensis*, were loaned to LL. We thank Christopher C. Grinter and the California Academy of Sciences for the loan.

The senior author used Nikon DSLR cameras, most recently a D810, with a bellows mounted on a vertical stand. Mounted, in reverse, on the bellows was an enlarger lens; either a Schneider APO-Componon or an El-Nikkor. Five enlarger lenses were available: 40mm, 45mm, 50mm, 63mm, 80mm, with each providing a different magnification (the 40mm giving the greatest and the 80mm the least magnification). For the largest *Tabanus* species a 105mm Micro-NIKKOR was needed. Several images (frames) of each specimen were taken, each at a different focus level, and combined into one image using Zerene Stacker. Lighting was provided by two Nikon flash units diffused through a styrofoam cup. Adobe Photoshop was used for final image preparation.

Dr. Leblanc used an Olympus TG-4 camera with an inbuilt focus-stacking function. Lighting was provided by two 14x20 cm Albinar 5600K 16W flat panel LED lights set at a 45 degree angle on each side of the specimen. The following 13 species photos are © Luc Leblanc: *Apatolestes albipilosus, A. willistoni, Stonemyia fera, Silvius notatus, S. philipi, Chrysops aestuans, C. bishoppi, C. wileyae, Atylotus tingaureus, A. utahensis, Hybomitra phaenops, Tabanus monoensis,* and *T. punctifer.* The remaining 60 species photos are © Anthony Thomas.

The cover photograph, in a limited-edition printed book, featuring a golden deer fly (*Silvius gigantulus*) was taken by Cole Gaerber and used with permission.

Checklist and Distribution of PNW Tabanids

Arranged by subfamily, genus, subgenus, species; ordered as in Burger's 1995 Catalog. The codes in the right-hand column for each taxon (#.# = Subfamily number + genus number within subfamily; species codes by the first two letters of each genus) indicate the sequence as presented in the keys, based on species similarity. For **genus codes**, the link goes to the key to species for that genus. For species codes, the link goes to its respective species page. The taxa in red type are included in the key but not yet known or verified from the PNW.

Subfamily: Pangoniinae (SF 1)				
Genus ***Apatolestes*** Williston, 1885				**1.1**
Subgenus ***Apatolestes***				
albipilosus Brennan, 1935			OR	Ap 1
willistoni Brennan, 1935	ID	WA	OR	Ap 2
Genus ***Stonemyia*** Brennan, 1935				**1.2**
californica (Bigot, 1892)	ID	WA	OR	St 1
fera (Williston, 1887)	ID	WA	OR	St 2
Subfamily: Chrysopsinae (SF2)				
Genus ***Silvius*** Meigen, 1820				**2.1**
Subgenus ***Silvius***				
gigantulus (Loew, 1872)	ID	WA	OR	Si 1
Subgenus ***Griseosilvius*** Philip, 1861				
notatus (Bigot, 1892)	ID	WA	OR	Si 4
quadrivittatus (Say, 1823)		WA		Si 3
Subgenus ***Zeuximyia*** Philip, 1941c				
philipi Pechuman, 1938			OR	Si 2
Genus ***Chrysops*** Meigen, 1803				**2.2**
aestuans Wulp, 1867	ID	WA	OR	Ch 9
asbestos Philip, 1950b	ID	WA	OR	Ch 11
ater Macquart, 1850	ID			Ch 2
bishoppi Brennan, 1935	ID	WA	OR	Ch 10
coloradensis Bigot, 1892		WA	OR	Ch 14
discalis Williston, 1880	ID	WA	OR	Ch 5
excitans Walker, 1850	ID	WA	OR	Ch 4
frigidus Osten Sacken, 1875	ID	WA		Ch 12
fulvaster Osten Sacken, 1877	ID			Ch 13
furcatus Walker, 1848	ID		OR	Ch 8
mitis Osten Sacken, 1875	ID	WA	OR	Ch 3
noctifer Osten Sacken, 1877	ID	WA	OR	Ch 1
proclivis Osten Sacken, 1877	ID	WA	OR	Ch 6
surdus Osten Sacken, 1877		WA	OR	Ch 7
wileyae Philip, 1955	ID		OR	Ch 15

Subfamily: Tabaninae (SF3)

Genus ***Haematopota*** Meigen, 1803				**3.1**
americana Osten Sacken, 1875	ID	WA		Ha 1
Genus ***Tabanus*** Linnaeus, 1758				**3.2**
aegrotus Osten Sacken, 1877	ID	WA	OR	Ta 2
fratellus Williston, 1887 [1]	ID	WA	OR	Ta 8
kesseli Philip, 1950c	ID	WA	OR	Ta 3
laticeps Hine, 1904	ID	WA	OR	Ta 11
marginalis Fabricius, 1805	ID	WA		Ta 10
monoensis Hine, in Webb & Wells, 1924	ID	WA	OR	Ta 6
punctifer Osten Sacken, 1876	ID	WA	OR	Ta 1
reinwardtii Wiedemann, 1828 [2]				Ta 7
sequax Williston, 1887	ID	WA	OR	Ta 4
similis Macquart, 1850	ID	WA	OR	Ta 9
stonei Philip, 1941b	ID	WA	OR	Ta 12
tetropsis Bigot, 1892	ID	WA	OR	Ta 5
Genus ***Atylotus*** Osten Sacken, 1876				**3.3**
calcar Teskey, 1983	ID	WA	OR	At 3
insuetus (Osten Sacken, 1877)	ID	WA	OR	At 4
tingaureus (Philip, 1936b)	ID	WA	OR	At 2
utahensis (Rowe & Knowlton, 1935)	ID		OR	At 1
Genus ***Hybomitra*** Enderlein, 1922				**3.4**
aasa Philip,1954a		WA	OR	Hy 10
affinis (Kirby, 1837)	ID	WA		Hy 26
agora Teskey, 1987	ID	WA		Hy 5
arpadi (Szilády, 1923) [3]				Hy 24
atrobasis (McDunough, 1921)	ID	WA	OR	Hy 18
californica (Marten, 1882)	ID	WA	OR	Hy 16
captonis (Marten, 1882)	ID	WA	OR	Hy 13
enigmatica Teskey, 1982	ID	WA	OR	Hy 21
epistates (Osten Sacken, 1878)	ID	WA	OR	Hy 17
frontalis (Walker, 1848)	ID	WA	OR	Hy 33
fulvilateralis (Macquart, 1838)	ID	WA	OR	Hy 25
hearlei (Philip, 1936a)	ID			Hy 27
illota (Osten Sacken, 1876)	ID	WA		Hy 30
itasca (Philip, 1936a) [3]				Hy 28

[1] Burger (1995) places this species in subgenus *Glaucops* Szilády, 1923

[2] included in key, known from southern BC, southern Alberta, Wyoming; possibly PNW

[3] included in key, known from southern BC, southern Alberta, Montana, Wyoming; possibly PNW

Subfamily: Tabaninae (SF3) (continued)

Genus ***Hybomitra*** (continued)				**3.4**
lanifera (McDunnough, 1922)	ID	WA	OR	Hy 3
lasiophthalma (Macquart, 1838)	ID	WA		Hy 4
liorhina (Philip, 1936a) [3]				Hy 9
lurida (Fallén, 1817)	ID	WA		Hy 11
melanorhina (Bigot, 1892)	ID	WA	OR	Hy 14
nuda (McDunnough, 1921) [4]	ID	WA		Hy 12
opaca (Coquillett, in Baker, 1904)	ID		OR	Hy 32
osburni (Hine, 1904)	ID	WA	OR	Hy 7
pechumani Teskey & Thomas, 1979	ID	WA		Hy 29
pediontis (McAlpine, 1961)	ID			Hy 31
phaenops (Osten Sacken, 1877)	ID	WA	OR	Hy 19
procyon (Osten Sacken, 1877)	ID	WA	OR	Hy 2
rhombica (Osten Sacken, 1876)	ID	WA	OR	Hy 8
rupestris (McDunnough, 1921)	ID	WA	OR	Hy 6
sonomensis (Osten Sacken, 1877)		WA	OR	Hy 20
tetrica (Marten, 1883)	ID	WA	OR	Hy 15 [6]
trepida (McDunnough, 1921)	ID	WA		Hy 22
zonalis (Kirby, 1837) [3] [5]				Hy 1
zygota (Philip, 1937)		WA	OR	Hy 23

[4] as *H. nitidifrons* ssp. *nuda* in Burger (1995)

[5] cited as present in PNW in Turner (1985), but no specimen seen and no further records from the PNW

[6] *H. tetrica* comes out in the key in several places, also in position between Hy 30 and 31 and Hy 32 and 33

Literature cited + useful references

Baker, C.F. 1904. Diptera. Reports on Californian and Nevadan Diptera, I. Invertebrata Pacifica 1: 17-40.

Bigot, J.M.F. 1892. Descriptions de Diptères nouveaux. Tabanidi. Mémoires de la Société Zoologique de France 5: 602-691.

Blume, R.R., J.A. Miller, J.L. Eschle, J.J. Matter, and M.O. Pickens. 1972. Trapping tabanids with modified Malaise traps baited with CO2. Mosquito News 32: 90–95.

Brennan, J.M. 1935. The Pangoniinae of Nearctic America (Tabanidae, Diptera). Kansas University Science Bulletin 36 (8): 249–401.

Burger, J.F. 1985. A redefinition of *Stonemyia* (Diptera: Tabanidae) and description of a new genus, *Pegasomyia*, from western North America. Psyche 92: 119–123.

Burger, J.F. 1995. Catalog of Tabanidae (Diptera) of North America north of Mexico. Contributions on Entomology, International 1(1): 100 pp.

Burger, J.F. 2001. A review of the *Hybomitra sonomensi*s group (Diptera: Tabanidae) in western North America, with emphasis on geographic variation in *Hybomitra phaenops*. Entomological News 112(1): 22–30. [compares *H. enigmatica, H. phaenops,* and *H. sonomensis*].

Burger, J.F., and L.L. Pechuman. 1986. A review of the genus *Haematopota* (Diptera: Tabanidae) in North America. Journal of Medical Entomology 23: 345–352.

Chvála, M., L. Lyneborg, and J. Moucha. 1972. The horse flies of Europe (Diptera, Tabanidae). Entomological Society of Copenhagen. 499 pp. E.W. Classey.

Enderlein, G. 1922. Ein neues Tabanidensystem. Mitteilungen aus dem Zoologischen Museum in Berlin 10: 333-351.

Fabricius, J.C. 1805. Systema antliatorum: secundum ordines, genera, species, adiectis synonymis, locis, observationibus, descriptionibus. xiv + 15-372 + [1] + 30 pp. C. Reichard, Brunsvigae [=Brunswick].

Fallen, C.F. 1817. Tabani et Xylophagei Sveciae. 14 pp. Berlingianis, Lundae [=Lund].

Hine, J.S. 1904. The Tabanidae of western United States and Canada. The Ohio Naturalist 5: 217-249.

Hudson, A. 1979. Additional isozyme characters that differentiate two closely related species of *Hybomitra* (Diptera: Tabanidae). The Canadian Entomologist 111: 351–356.

Hudson, A., and H.J. Teskey. 1976. Morphological and biochemical characteristics of two forms of *Hybomitra typhus* (Diptera: Tabanidae). The Canadian Entomologist 108: 737–740.

Kirby, W. 1837. The insects. Pt 4, xxxix + 325 pp., 8 pls. In: Richardson, J. (ed.), Fauna Boreali-Americana, or the zoology of the northern parts of British America. Longman, London.

Leclercq, M., and N.G. Olsufjiev. 1981. Nouveau catalogue des Tabanidae Paléarctiques (Diptera). Notes fauniques de Gembloux. No. 6. Faculté des Sciences Agronomiques de l'État. Belgium. 51 pp.

Linnaeus, C. 1758. Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Ed. 10, Vol. 1. 824 pp. L. Salvii, Holmiae [= Stockholm].

Loew, H. 1872. Diptera Americae septentrionalis indigena. Centuria decima. Berliner Entomologische Zeitschrift 16: 49-124.

Macquart, P.J.M. 1838. Insectes diptères nouveaux ou peu connus. Tome premier.--1re partie. Roret, Paris. Pp. 5–221, 25 pls.

Macquart, P.J.M. 1850. Diptères exotiques nouveaux ou peu connus. 4e supplement. Mémoires de la Société royale des sciences, de l'agriculture et des arts de Lille 1849: 309-479, pls. 1-14.

Mahmoud, A.H. 1980. The Tabanidae of Oregon. Unpublished Ph.D. Dissertation. Oregon State University, Corvallis, Oregon. 269 pp.

Marten, J. 1882. New Tabanidae. The Canadian Entomologist 14: 210-212.
Marten, J. 1883. New Tabanidae. The Canadian Entomologist 15: 110-112.
McAlpine, J.F. 1961. Variation, distribution and evolution of the *Tabanus* (*Hybomitra*) *frontalis* complex of horse flies (Diptera: Tabanidae). The Canadian Entomologist 93(10): 893–924. [compares *H. frontalis, H. opaca* and *H. pediontis*].
McDunnough, J. 1921. A revision of the Canadian species of the *affinis* group of the genus *Tabanus* (Diptera). The Canadian Entomologist 53: 139-144.
McDunnough, J. 1922. Two new Canadian *Tabanus* (Diptera). The Canadian Entomologist 54: 238-240.
Meigen, J.W. 1803. Versuch einer neuen Gattungs-Eintheilung der europäischen zweiflügligen Insekten. Magazin für Insektenkunde 2: 259-281.
Meigen, J.W. 1820. Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten. Zweiter Theil. Forstmann, Aachen. xxxvi + 363 pp.
Middlekauf, W.M., and R.S. Lane. 1980. Adult and immature Tabanidae (Diptera) of California. Bulletin of California Insect Survey 22: 1–99.
Moucha, J. 1976. Horseflies (Diptera: Tabanidae) of the world synoptic catalogue. Acta Entomologica Musei Nationalis Pragae Supplementum 7: 319 pp.
Nowierski, R.M., and A.R. Gittins. 1976. The horse flies and deer flies of Idaho. Research Bulletin, University of Idaho Agricultural Experiment Station 96: 48 pp.
Osten Sacken, C.R. 1875. Prodrome of a monograph of the Tabanidae of the United States. Part I. The genera *Pangonia*, *Chrysops*, *Silvius*, *Haematopota*, *Diabasis*. Memoirs of the Boston Society of Natural History 2: 365-397.
Osten Sacken, C.R. 1876. Prodrome of a monograph of the Tabanidae of the United States. Part II. The genus *Tabanus*. Memoirs of the Boston Society of Natural History 2: 421-479.
Osten Sacken, C.R. 1877. Western Diptera: Descriptions of new genera and species of Diptera from the region west of the Mississippi and especially from California. Bulletin of the United States Geological and Geographical Survey of the Territories 3: 189-354.
Osten Sacken, C.R. 1878. Prodrome of a monograph of the Tabanidae of the United States. Supplement. Memoirs of the Boston Society of Natural History 2: 555-560.
Pechuman, L.L. 1938. Two new Nearctic *Silvius* (Diptera). The Canadian Entomologist 70: 165-171.
Pechuman, L.L. 1981a. The horse flies and deer flies of New York (Diptera, Tabanidae), Second Edition. Search: Agriculture, Cornell University Agricultural Experiment Station 18: 68 pp.
Pechuman, L.L. 1981b. Notes on *Atylotus* and description of a new species from eastern North America (Diptera: Tabanidae). Entomological News 92(1): 1–6.
Pechuman, L.L., and H.J. Teskey. 1981. Tabanidae (pp. 463–478). In: McAlpine, J.F. *et al*., eds. Manual of Nearctic Diptera. Vol. 1. Research Branch, Agriculture Canada, Ottawa, Canada. Monograph 27: 674 pp.
Pechuman, L.L., H.J. Teskey, and D.M. Davies. 1961. The Tabanidae (Diptera) of Ontario. Proceedings of the Entomological Society of Ontario 91: 77–121.
Pechuman. L.L. 1938. Two new Nearctic *Silvius* (Diptera). The Canadian Entomologist. 70: 165-171.
Pechuman. L.L. 1960. Some new and little–known North American Tabanidae (Diptera). The Canadian Entomologist 92: 793–799.
Pechuman. L.L., and A. Stone.1968. A new synonymy in *Hybomitra.* Proceedings of the Entomological Society of Washhington 70: 302.
Philip, C.B. 1936a. New Tabanidae (horseflies) with notes on certain species of the *longus* group of *Tabanus*. Ohio Journal of Science 36: 149-156.
Philip, C.B. 1936b. The *furcatus* group of western North American flies of the genus *Chrysops* (Diptera: Tabanidae). Proceedings of the Entomological Society of Washington (1935) 37: 153-161.

Philip, C.B. 1937. Notes on certain males of North American horseflies (Tabanidae). II. The *affinis* or 'red-sided' group of *Tabanus sens. lat.*, with a key to the females. The Canadian Entomologist 69: 35-40, 49-58.

Philip, C.B. 1941a. Notes on Nearctic Pangoniinae (Diptera, Tabanidae). Proceedings of the Entomological Society of Washington 43: 113–130.

Philip, C.B. 1941b. Notes on Nearctic Tabaninae (Diptera). Part I. *Stenotabanus*, *Atylotus*, and *Tabanus s. str.*; Part II. *Tabanus s. lat.* and *Hybomitra*. The Canadian Entomologist 73: 105-110; 142-153.

Philip, C.B. 1941c. Notes on three western genera of flies (Diptera, Tabanidae). Bulletin of the Brooklyn Entomological Society 36: 185-199.

Philip, C.B. 1947. A catalog of the blood-sucking family Tabanidae (horseflies and deerflies) of the Nearctic Region North of Mexico. American Midland Naturalist 37: 257–324.

Philip, C.B. 1950a. Corrections and addenda to a catalog of Nearctic Tabanidae. American Midland Naturalist 43:430–437.

Philip, C.B. 1950b. New North American Tabanidae (Diptera). Part I. Pangoniinae. Annals of the Entomological Society of America (1949) 42: 451-460.

Philip, C.B. 1950c. New North American Tabanidae (Diptera). Part II. Tabanidae [sic] [=Tabaninae]; III. Notes on *Tabanus molestus* and related horseflies with a prominent single row of triangles on the abdomen. Annals of the Entomological Society of America 43: 115-122; 240-248.

Philip, C.B. 1954a. New North American Tabanidae (Diptera). VI. Descriptions of Tabaninae and new distributional data. Annals of the Entomological Society of America 47: 25-33.

Philip, C.B. 1954b. New North American Tabanidae. VIII. Notes on and keys to genera and species of Pangoniinae exclusive of *Chrysops*. Revista Brasileira de Entomologia 2: 13–60.

Philip, C.B. 1955. New North American Tabanidae. IX. Notes on and keys to the genus *Chrysops* Meigen. Revista Brasileira de Entomologia 3: 47–128.

Philip, C.B. 1961. Notes on Palaearctic *Nemorius* (Diptera: Tabanidae) with description of one new species. Bulletin et Annales de la Société Entomologique de Belgique 97: 225-236.

Philip, C.B. 1965. Family Tabanidae. In: Stone, A. *et al*. (eds), A catalog of Diptera of North America. United States Department of Agriculture, Washington, D.C., pp. 319–342

Philip, C.B., and R.S. Lane. 1984. Comments on the presumed Holarctic occurrence of the horse fly *Hybomitra nitidifrons* (Diptera: Tabanidae). International Journal of Entomology 26(3): 286–288. [elevated *Hybomitra nuda* to species].

Rowe, J.A. and G.F. Knowlton. 1935. The genus *Tabanus* in Utah. The Canadian Entomologist 67: 238–244.

Say, T. 1823. Descriptions of dipterous insects of the United States. Journal of the Academy of Natural Sciences of Philadelphia 3: 9-32, 33-64, 73-104.

Stone, A. 1938. The horse flies of the subfamily Tabaninae of the Nearctic Region. U.S. Department of Agriculture, Miscellaneous Publication 305: 171 pp.

Stone, A. 1972. Synonymic and other notes on Tabanidae, with two new species (Diptera). Annals of the Entomological Society of America 65(3): 637–641.

Szilády, Z. 1923. New or little know horseflies (Tabanidae). Biologica Hungarica 1 (1): 1-39.

Teskey, H.J. 1982. A new species of the *Hybomitra sonomensis* group (Diptera: Tabanidae) with descriptions of its immature stages. The Canadian Entomologist 114: 1077–1082.

Teskey, H.J. 1983. A review of the *Atylotus insuetus* group from Western North America including description of a new species and immature stages (Diptera: Tabanidae). The Canadian Entomologist 115: 693–702. [includes comparison of *A. insuetus, A. tingaureus*, and *A. utahensis*].

Teskey, H.J. 1987. *Hybomitra agora*, a new species of Tabanidae (Diptera) from western North America. The Canadian Entomologist 119: 1117-1122.

Teskey, H.J. 1990. The horse flies and deerflies of Canada and Alaska. Diptera: Tabanidae. The Insects and Arachnids of Canada, Part 16: 381 pp.

Teskey, H.J., and A.W. Thomas. 1979. Identity of *Hybomitra typhus* and description of a new species previously confused with it (Diptera: Tabanidae). The Canadian Entomologist 111: 343–350.

Teskey, H.J., J.A. Shemanchuk and J. Weintraub. 1987. *Hybomitra agora*, a new species of Tabanidae (Diptera) from western North America. The Canadian Entomologist 119: 1117–1122. [comparison of *H. agora, H. atrobasis, H. rupestris, H. osburni,* and *H. tetrica*].

Thomas, A.W. 1973. The deer flies (Diptera: Tabanidae, *Chrysops*) of Alberta. Quaestiones Entomologicae 9: 161–171.

Thomas, A.W. 2011. Tabanidae of Canada, east of the Rocky Mountains 2: a photographic key to the species of Tabaniinae (Diptera: Tabanidae). Canadian Journal of Arthropod Identification 13. 16 February 2011. online at doi:10.3752/cjai.2011.13

Thomas, A.W., and S.A. Marshal. 2009. Tabanidae of Canada, east of the Rocky Mountains 1: a photographic key to the species of Chrysopsinae and Pangoniinae (Diptera: Tabanidae). Canadian Journal of Arthropod Identification 8. 25 June 2009. online at doi:10.3752/cjai.2009.08

Turner, W.J. 1985. Checklist of Pacific Northwest Tabanidae with new state records and a pictorial key to common species (Diptera,: Tabanidae). Pan-Pacific Entomologist 61(1): 79–90.

Walker, F. 1848. List of the specimens of dipterous insects in the collection of the British Museum. Part 1. British Museum, London. 229 pp.

Walker, F. 1850. Diptera. Part I, pp. 1-76, pls. 1-2. In: Saunders, W.W. (ed.), Insecta Saundersiana: or characters of undescribed insects in the collection of William Wilson Saunders, Esq., F.R.S., F.L.S., &c. Vol. 1. Van Voorst, London. 474 pp.

Webb, J.L., and R.W. Wells. 1924. Horse-flies: biologies and relation to western agriculture. United States Department of Agriculture, Department Bulletin 1218: 1-36.

Wiedemann, C.R.W. 1828. Aussereuropäische zweiflügelige Insekten. Als Fortsetzung des Meigenschen Werks. Erster Theil. Schulz, Hamm. xxxii + 608 pp., 7 pls.

Williston, S.W. 1880. Some interesting new Diptera. Transactions of the Connecticut Academy of Arts and Sciences 4: 243-246.

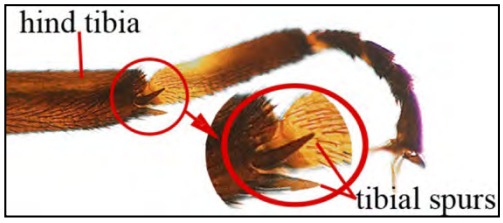
Williston, S.W. 1885. On the classification of North American Diptera. (Second paper). Entomologica Americana 1: 10-13.

Williston, S.W. 1887. Notes and descriptions of North American Tabanidae. Transactions of the Kansas Academy of Science 10: 129-142.

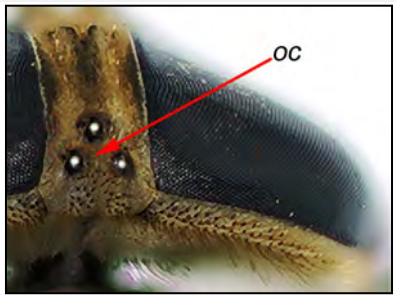
Key to subfamilies and genera

1 Hind tibia with 2 apical spurs. Three ocelli (oc) on vertex..... **2**

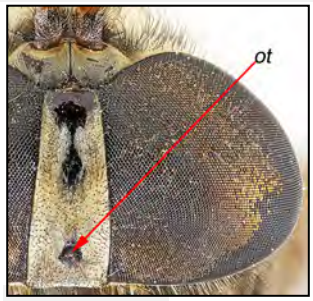
-- Hind tibia lacking spurs. Ocelli lacking ..... **SF: Tabaninae 5**
(A **single** ocellar tubercle (ot) in *Hybomitra*)



couplet 1



couplet 1



couplet 1--

2(1) Antenna with 7 terminal annuli……..... **SF: Pangoniinae 3**

-- Antenna with 4 terminal annuli……..……..…..……... **SF: Chrysopsinae 4**

couplet 2

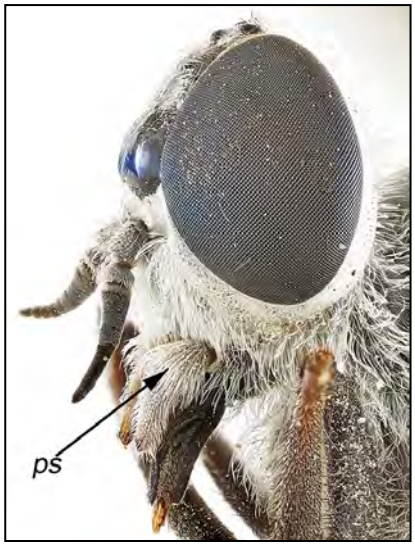
couplet 2

couplet 2--

couplet 2--

3(2) Apical segment of palpus swollen (ps) basally. Gray flies ..... ***Apatolestes***

-- Apical segment of palpus long (pl) and slender. Golden-brown flies ..... ***Stonemyia***



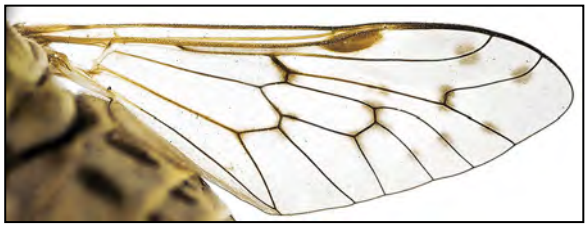
couplet 3 *Apatolestes*

couplet 3-- *Stonemyia*

Key to subfamilies and genera continuing

4(2) Wings hyaline or with scattered small dark spots…….... ***Silvius***

-- Wings with definite pattern, either dark (black) or pale makings……..... ***Chrysops***

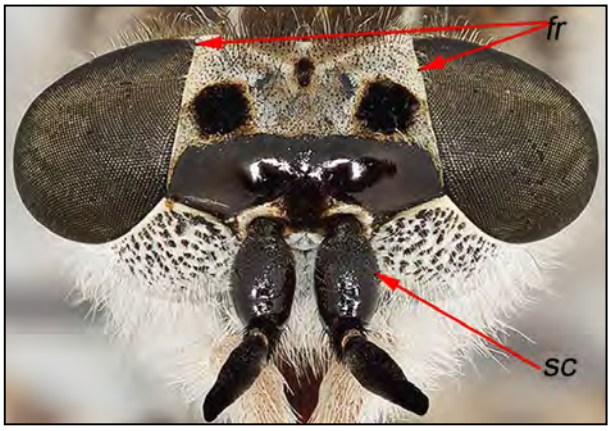


couplet 4

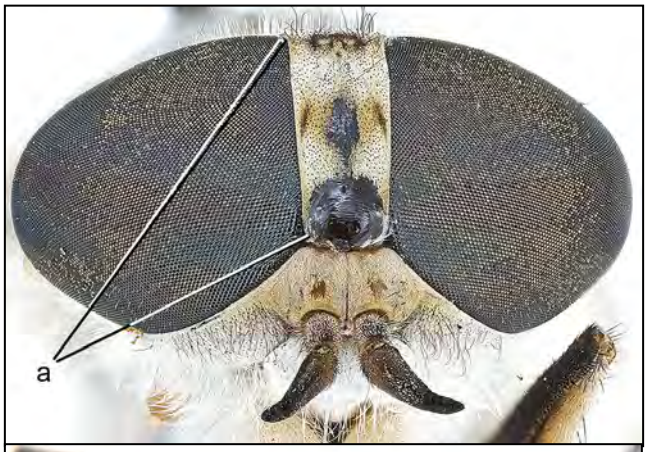
couplet 4--

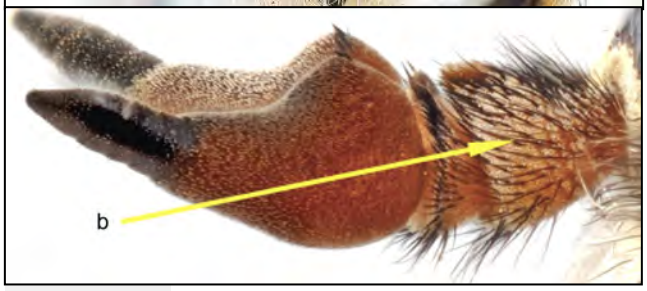
5(1) Frons (fr) much wider than high. Scape (sc) swollen, much longer than wide. Wings hyaline with distinct (and unique) gray pattern of spots and rosettes..... ***Haematopota***

-- Frons (a) longer than wide. Scape (b) rarely longer than wide, never so swollen. Wing pattern never as above……..... **6**



couplet 5 *Haematopota* face





couplet 5--

couplet 5 *Haematopota* wing

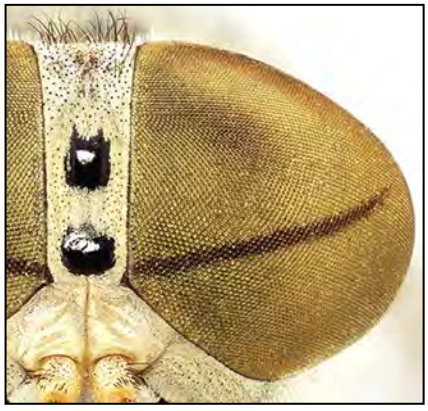
couplet 5-- wing

Key to subfamilies and genera continuing

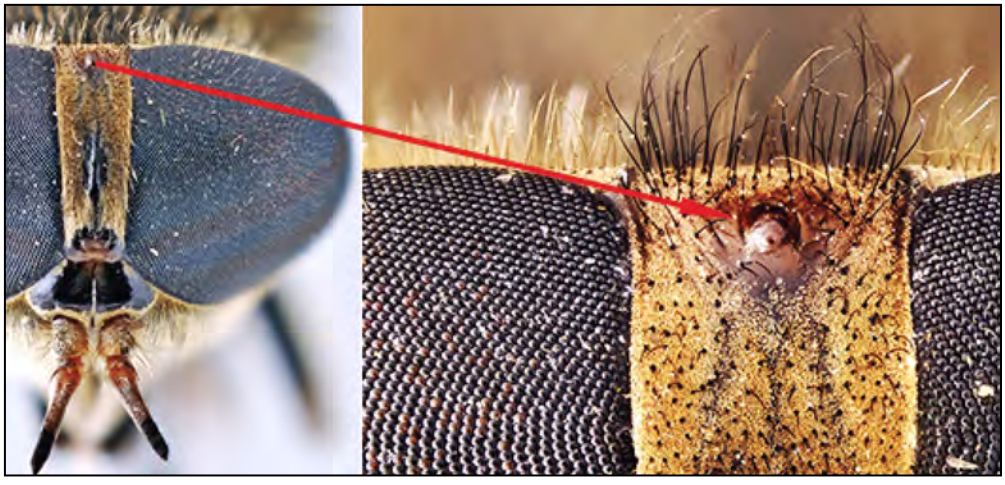
6(5) Vertex lacking ocellar tubercle. Eyes usually lacking dense hairs **7**

-- Vertex with a distinct, shiny ocellar tubercle. Eyes with dense hairs ..... ***Hybomitra***

couplet 6



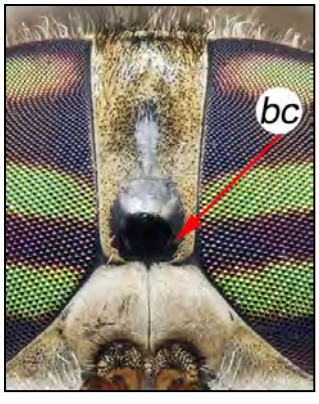
couplet 6



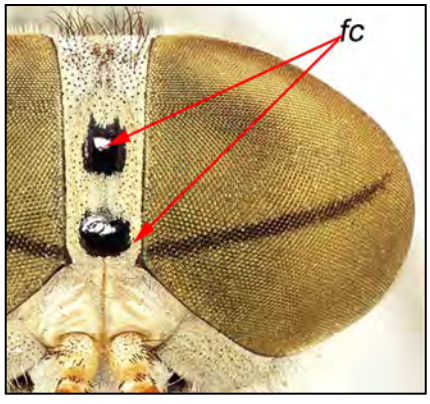
couplet 6– *Hybomitra;* right, ocellar tubercle

7(6) Eyes dark brown to black or brightly colored (in life), eye stripe, if any, not usually obvious in dried specimens. Basal callus (bc) close to or touching eyes..... ***Tabanus***

-- Eyes yellow to light brown, often with a complete eye stripe that is often obvious in dried specimens. Frontal calli (fc) well separated from eyes..... ***Atylotus***



couplet 7 *Tabanus*



couplet 7-- *Atylotus*

Subfamilies & Genera Identification Plate

left-click image for species key

Apatolestes

Stonemyia

Silvius

Subfamily: PANGONIINAE

SF: CHRYSOPSINAE

Chrysops

Haematopota

Tabanus

Subfamily: TABANINAE

Atylotus

Hybomitra

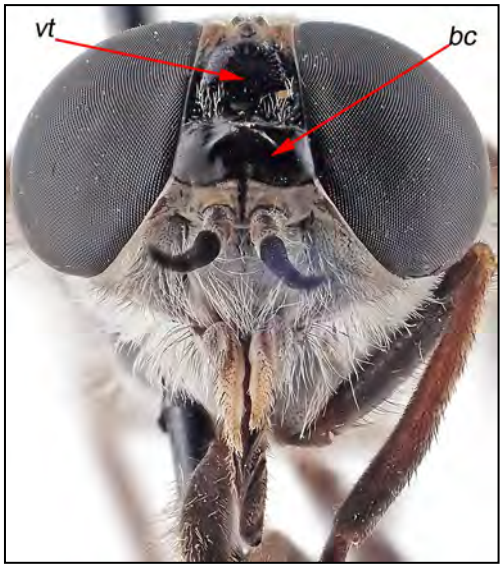
SF 1 Pangoninae 1.1 *Apatolestes*
Key to species; followed by species pages, sequence as separated in key

Key to *Apatolestes* females

1 Vertex and basal callus grayish-yellow pruinose ..... **Ap 1 *albipilosus***

-- Vertex (vt) and basal callus (bc) denuded, black and shiny ..... **Ap 2 *willistoni***

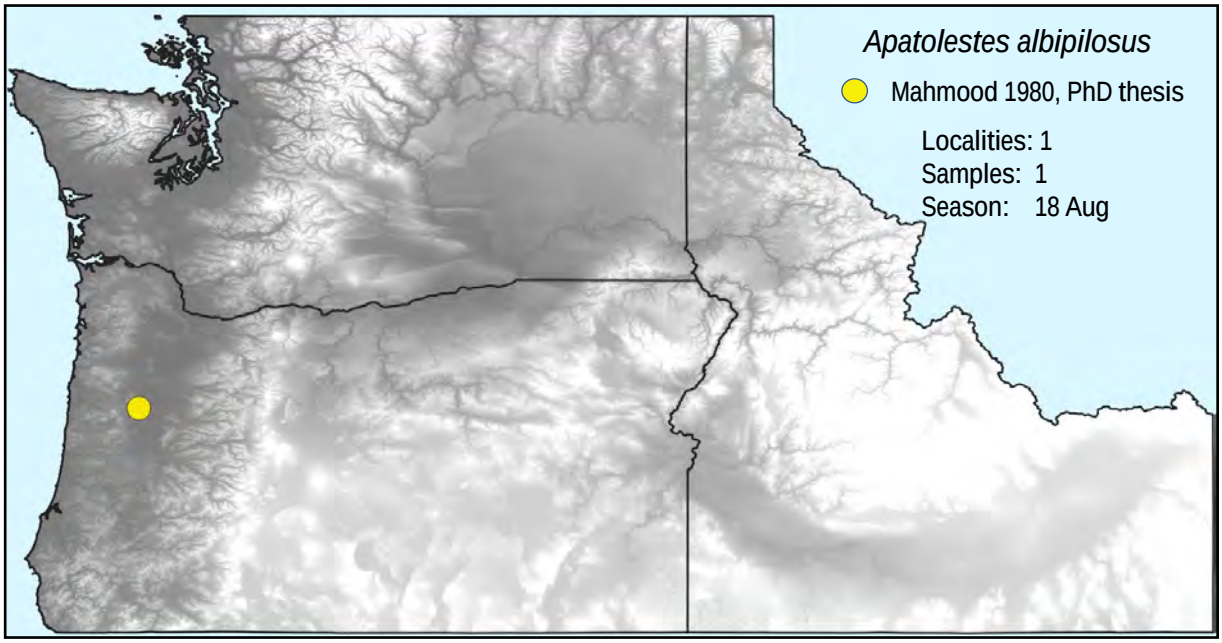
Ap 1 *Apatolestes albipilosus*



Ap 2 *Apatolestes willistoni*

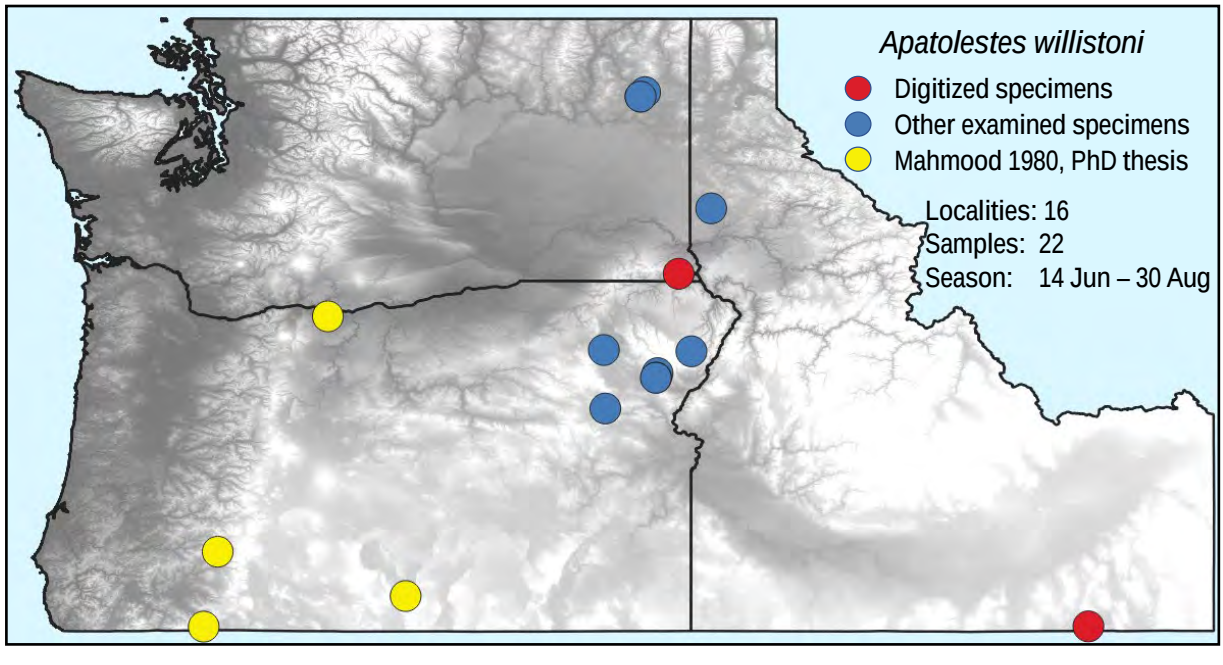
Apatolestes albipilosus Brennan

Ap 1



Diagnosis: Length 14 -15 mm. The pruinose frons with two bare patches separate this species from *Apatolestes willistoni* in the PNW. **Distribution:** Central California and Oregon.

Apatolestes willistoni Brennan Ap 2



Diagnosis: Length 10-12 mm. Very similar to *Apatoletes comastes* but differs by having many black hairs on palpus; (white hairs only on *A. comastes*). Costal wing cell infuscated. **Distribution:** Washington to Montana, south to California and Arizona; Mexico.

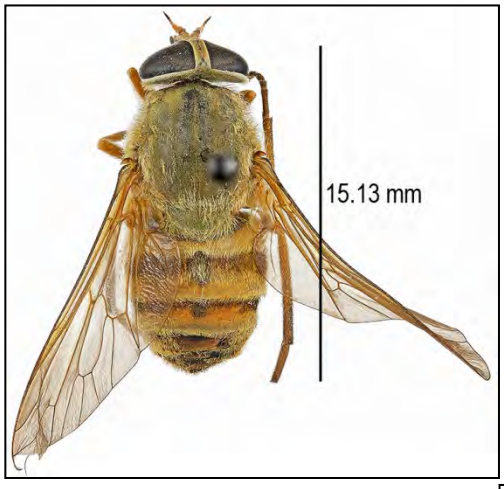
SF 1 Pangoninae 1.2 *Stonemyia*

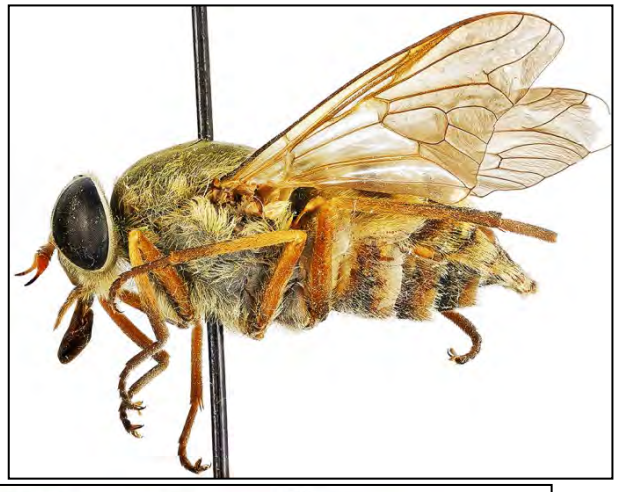
Key to species; followed by species pages, sequence as separated in key

Key to *Stonemyia* females

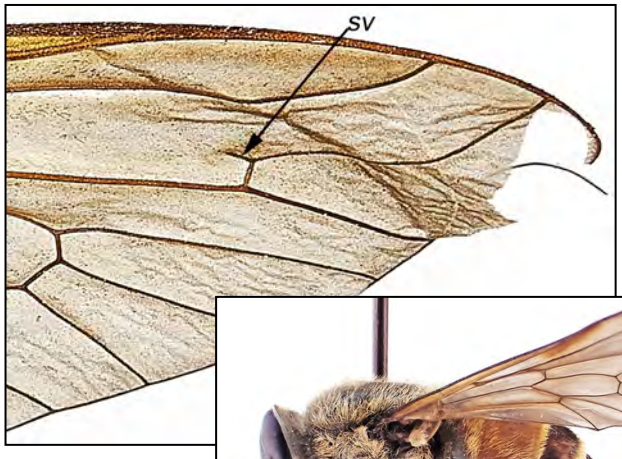
1 Larger flies, body length (head+thorax+abdomen) about 15 mm.
Legs orange. Stump vein (sv) present ..... **St 1 *californica***

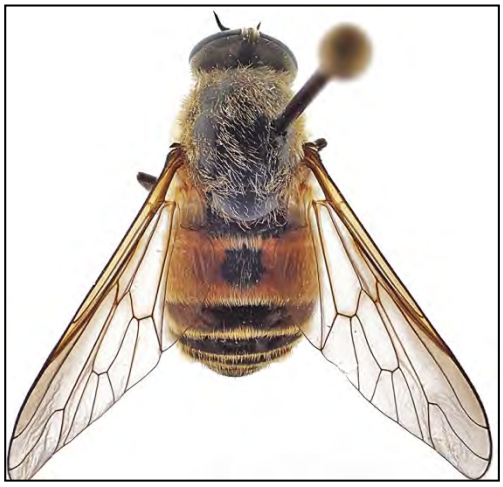
-- Smaller flies, 13 mm or less. Legs black. No stump vein on wing ..... **St 2 *fera***





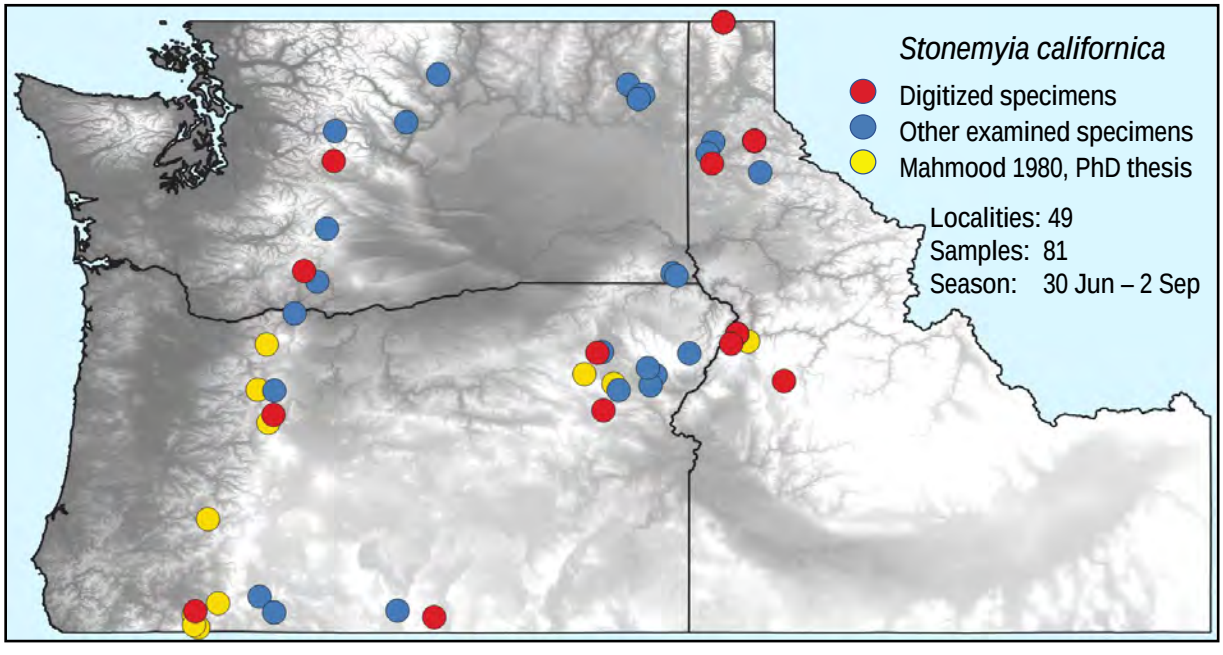
St 1 *Stonemyiia californica*





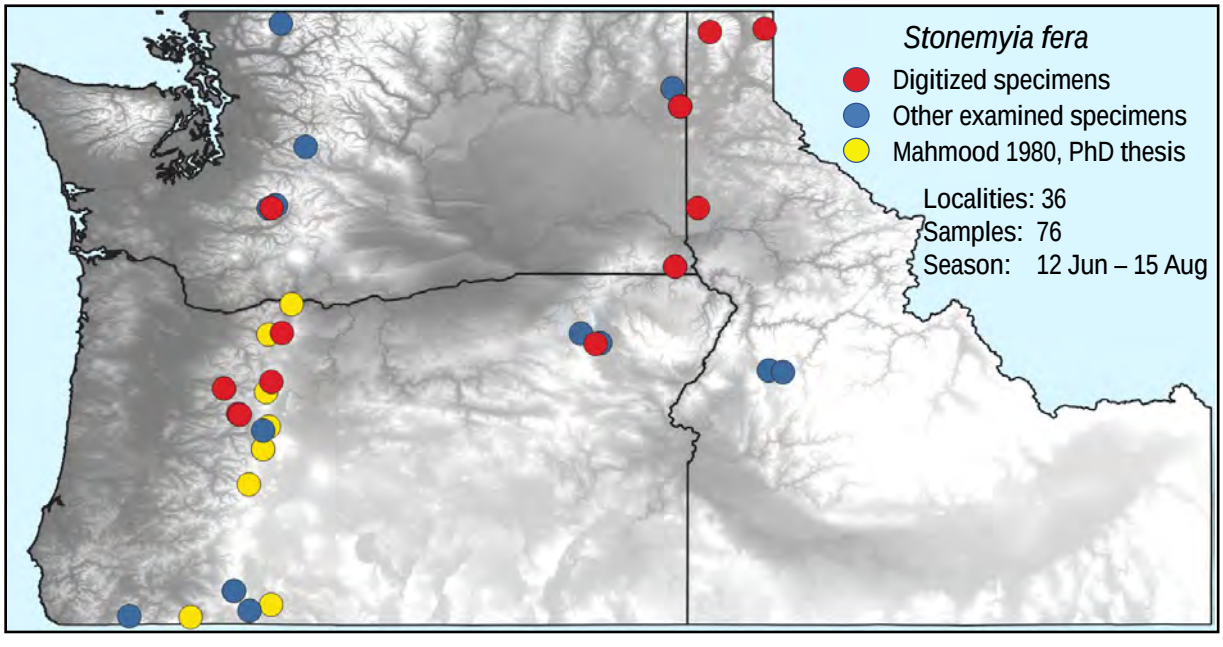
St 2 *Stonemyia fera*

Stonemyia californica (Bigot) St 1



Diagnosis: Length 13-17 mm. Body thickly clothed with hair. Tergites with basal half dark, distal half pale. Eyes hairy (at least in males) and wing with a stump at fork. Under genus *Pilimas* in earlier studies. **Distribution:** BC to Montana, south to California and northwestern Arizona.

Stonemyia fera (Williston) St 2



Diagnosis: Length 10-13 mm. Differs from *Stonemyia californica* in size, abdominal pattern, black legs, and absence of a stump at wing fork. **Distribution:** BC to extreme SW Alberta, south to California.

SF 2 Chrysopsinae 2.1 *Silvius*

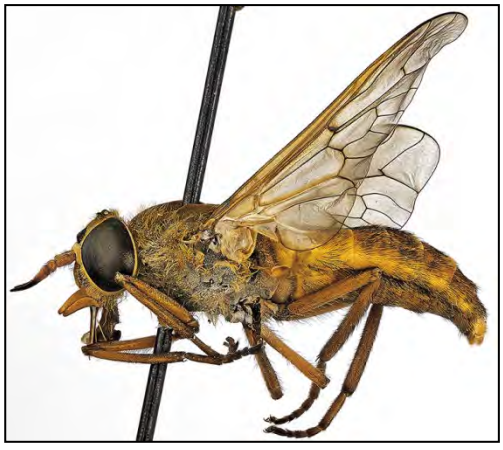
Key to species; followed by species pages, sequence as separated in key

Key to *Silvius* females

1 Orange species. Wing lacking spots except for light infuscation at fork (f) [Subgenus: *Silvius*] ..... **Si 1 *gigantulus***

-- Grayish species. Wing spotted **2**

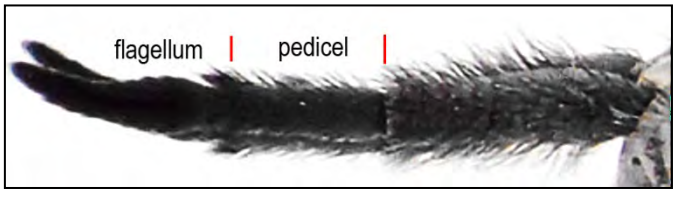
Si 1 *Silvius gigantulus*



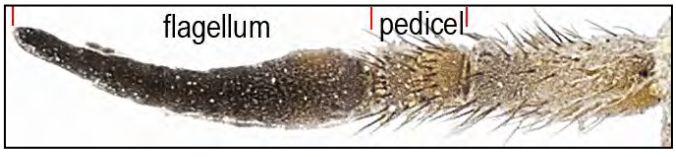
2(1) Antenna flagellum equal in length to the pedicel [Subgenus: *Zeuximyia*] ..... **Si 2 *philipi***

-- Flagellum significantly longer than pedicel [Subgenus: *Griseosilvius*] **3**

Si 2 *Sivius philipi*



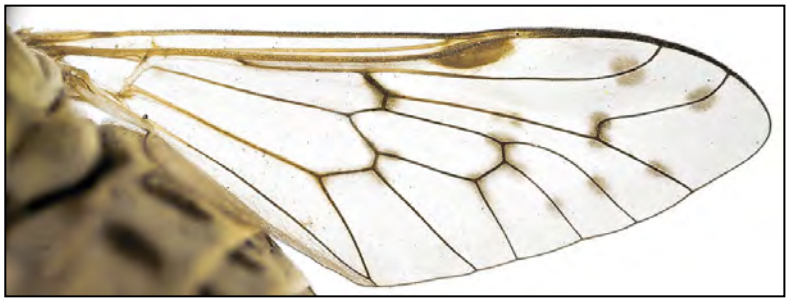
Griseosilvius



3(2) Up to 5 spots on wing veins near wing margin [Subgenus: *Griseosilvius*] .... **Si 3 *quadrivittatus***

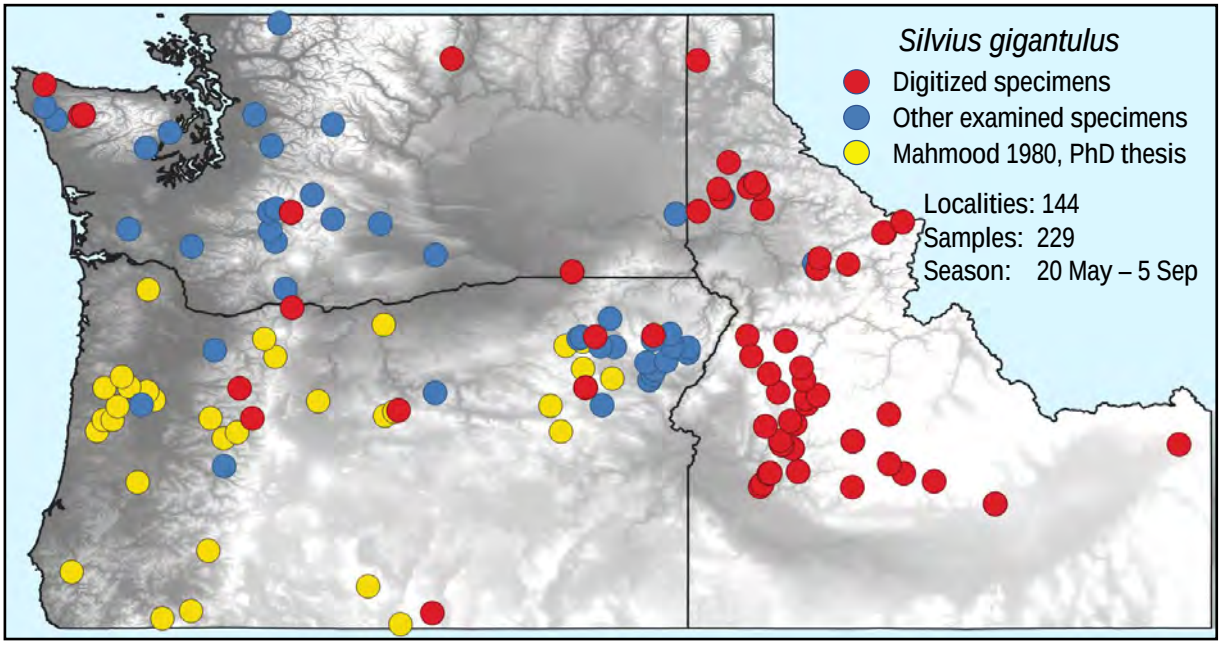
-- No spots near wing margin [Subgenus: *Griseosilvius*] ..... **Si 4 *notatus***

Si 3 *Silvius quadrivittatus*



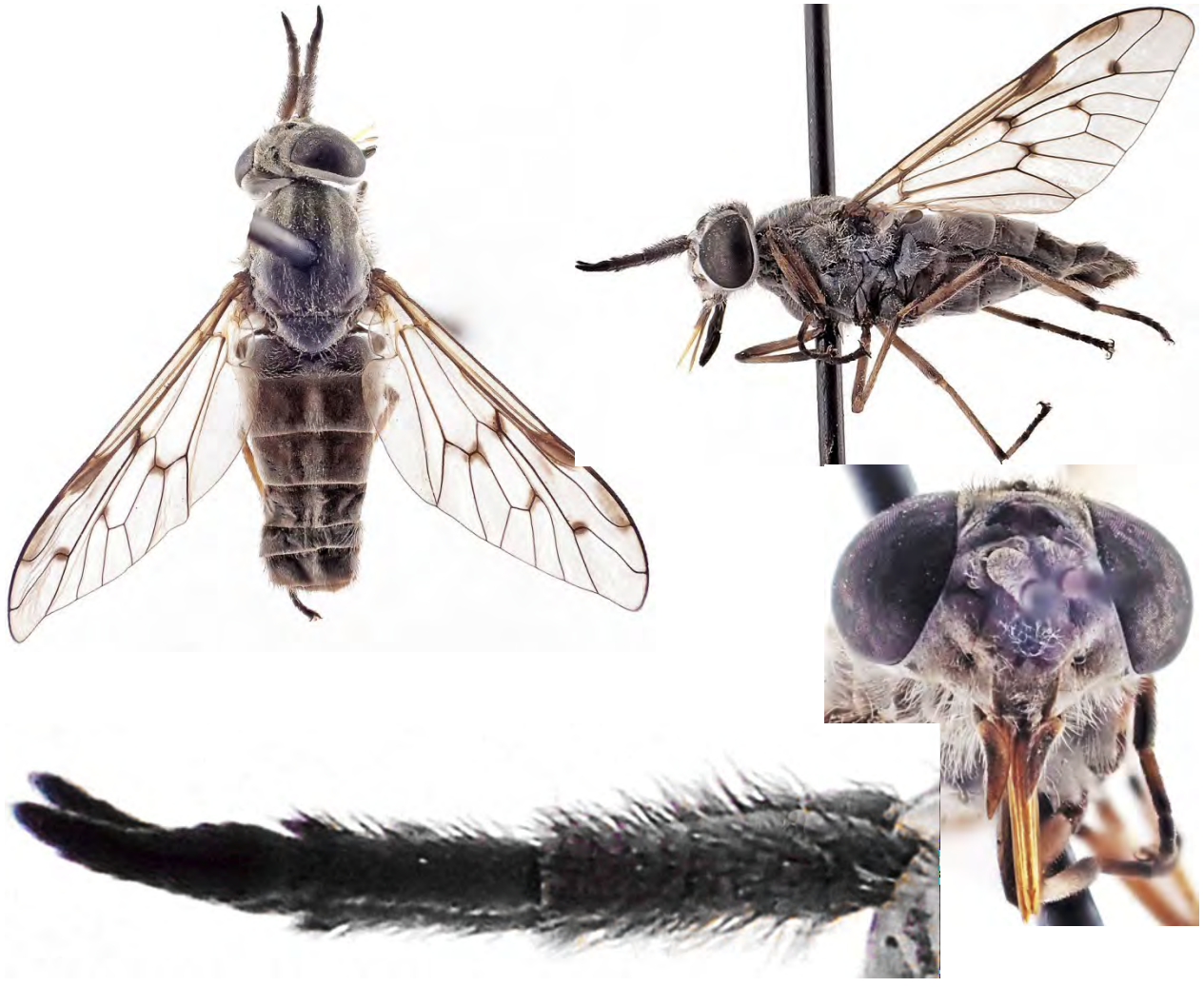
Si 4 *Silvius notatus*

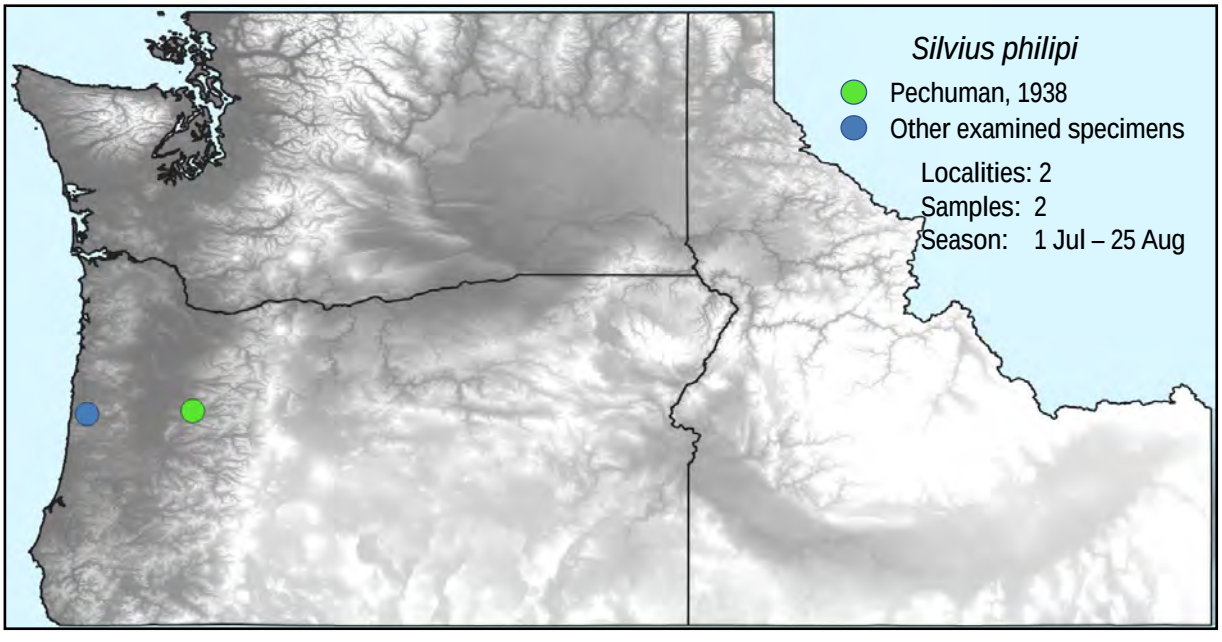
Silvius* (*Silvius*) *gigantulus (Loew) Si 1



Diagnosis: Length 10-12 mm. A large orange *Silvius* with an immaculate wing, apart from the light infuscation at fork. **Distribution:** BC to Manitoba, south to California and New Mexico (Burger, 1995). BC to Washington, Idaho, western Montana, Oregon, California, and Baja California (Teskey, 1990).

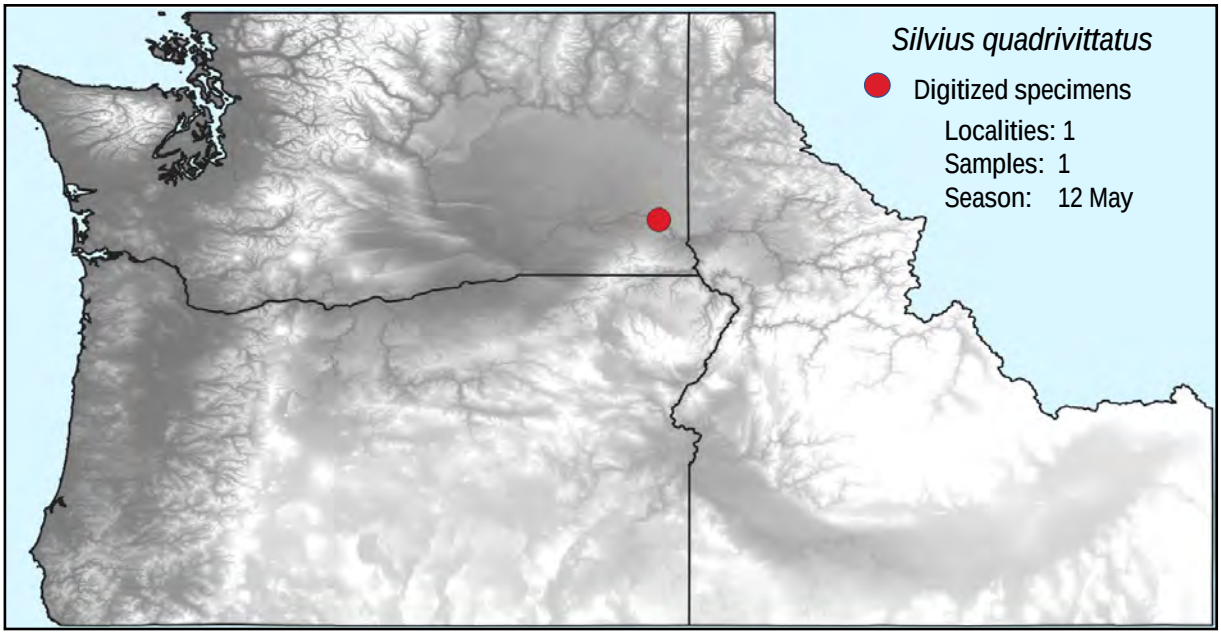
Silvius* (*Zeuximyia*) *philipi Pechuman Si 2





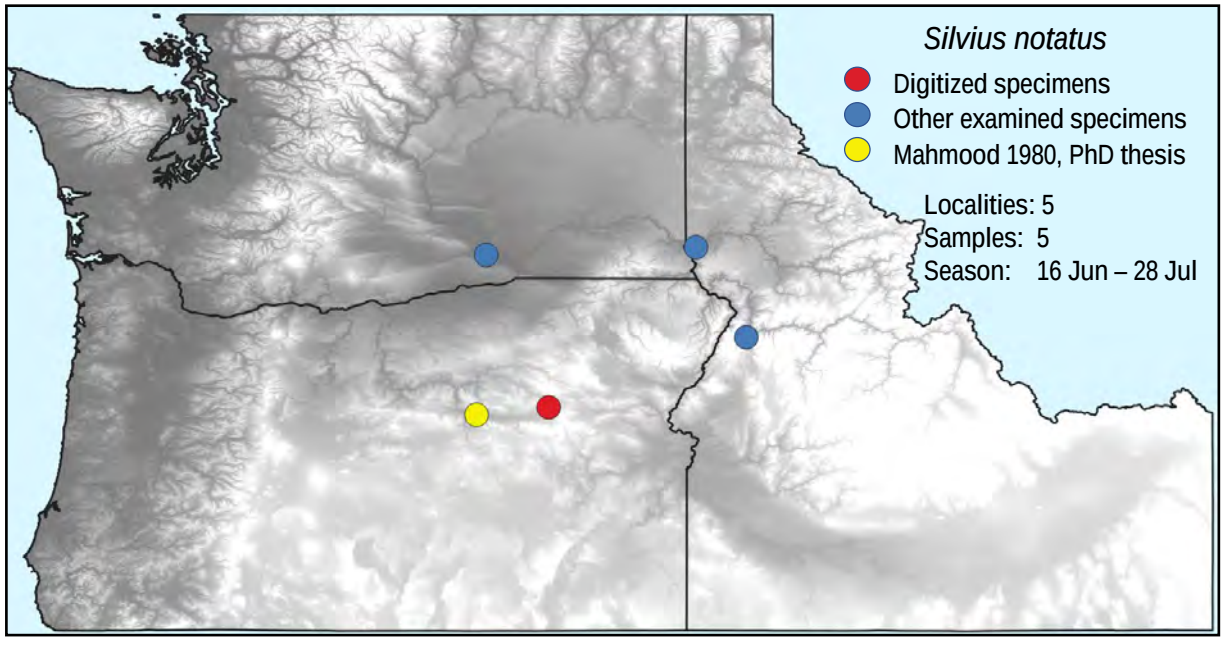
Diagnosis: Length 8-9 mm. Characterized by the elongated pedicel making it equal in length to the flagellum. **Distribution:** Oregon, northern and central California.

Silvius* (*Griseosilvius*) *quadrivittatus (Say) Si 3



Diagnosis: Length 7-10 mm. A yellowish-gray species with four rows of black spots on the tergites, the center pair larger than the lateral spots. Position of spots on wing also separate it from *Silvius notatus* and *S. philipi*. **Distribution:** Montana to Illinois, south to California and Mississippi, Mexico.

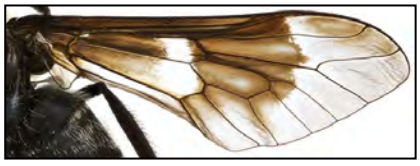
Silvius* (*Griseosilvius*) *notatus (Bigot) Si 4



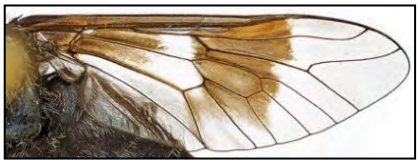
Diagnosis: Length 7-8 mm. A gray species with a broad quadrate black spot beneath the scutellum, posteriorly emarginate and not reaching posterior border of tergite 1. Tergites 2 & 3 with paired heavy midline black dashes, and similar smaller dashes present on tergites 4 & 5. Basal callus broad.
Distribution: California, Washington, Oregon, Idaho.

SF 2 Chrysopsinae 2.2 *Chrysops*
Identification plate 1: wings, sequence as separated in key

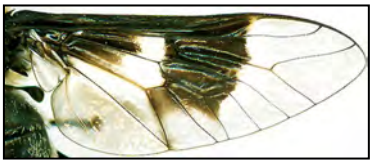
left-click image for species page



Ch 1 *noctifer*



Ch 2 *ater*



Ch 3 *mitis*

Ch 4 *excitans*

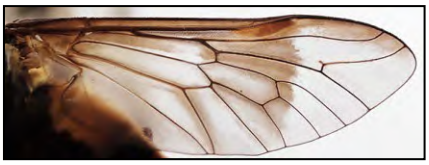
Ch 5 *discalis*

Ch 6 *proclivis*

Ch 7 *surdus*

Ch 8 *furcatus*

Ch 9 *aestuans*



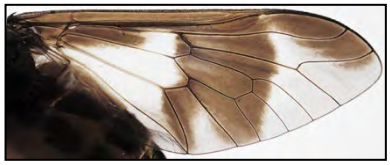
Ch 10 *bishoppi*

Ch 11 *asbestos*

Ch 12 *frigidus*

Ch 13 *fulvaster*

Ch 14 *coloradensis*



Ch 15 *wileyae*

Chrysops identification plate 2: dorsal, sequence as separated in key

Ch 1 *noctifer*

Ch 2 *ater*

Ch 3 *mitis*

Ch 4 *excitans*

Ch 5 *discalis*

Ch 6 *proclivis*

Ch 7 *surdus*

Ch 8 *furcatus*

Ch 9 *aestuans*

Ch 10 *bishoppi*

Ch 11 *asbestos*

Ch 12 *frigidus*

Ch 13 *fulvaster*

Ch 14 *coloradensis*

Ch 15 *wileyae*

SF 2 Chrysopsinae 2.2 *Chrysops*
Key to species; followed by species pages, sequence as separated in key

Key to *Chrysops* females*
when fresh wing marking often black, as specimens age the black fades to a reddish brown

1 Abdominal tergites entirely black. Hairs gray, but never any pale-yellow-orange markings on the integument [*noctifer, ater, mitis*] **2**

-- Abdomen never entirely black, always with pale-yellow-orange markings **4**

couplet 1
3 spp.

noctifer

ater

mitis

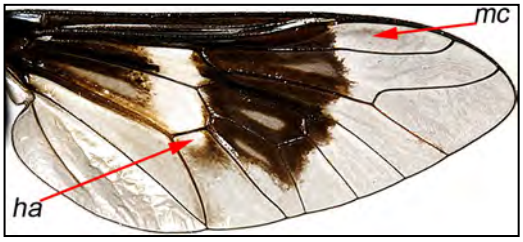
2(1) Apex of wing with an apical spot (as) beyond crossband ..... (in part) **Ch 1 *noctifer***

-- Apex hyaline, lacking apical spot; in *ater* a very faint shadow in marginal cell (mc)..... **3**

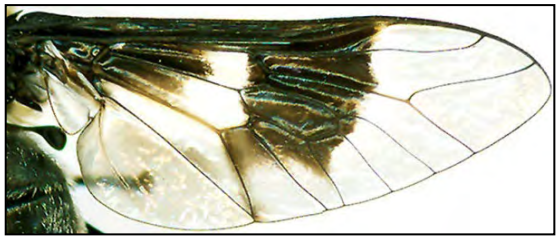
3(2) 5th posterior cell in wing with small hyaline area (ha) at base ..... **Ch 2 *ater***

-- 5th posterior cell infuscated at base..... **Ch 3 *mitis***

Ch 1 *Chrysops noctifer*



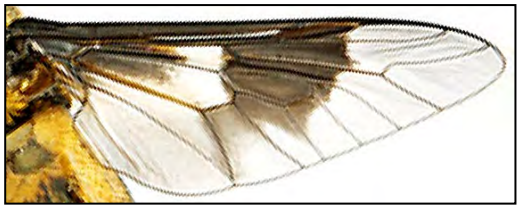
Ch 2 *Chrysops ater*



Ch 3 *Chrysops mitis*

4(1) Apex of wing hyaline, no apical spot ..... **Ch 4 *excitans***

-- Apex of wing with a variable-sized apical spot **5**



Ch 4 *Chrysops excitans*

couplet 4--

* After getting a tentative ID using the key, check the species page for images with greater detail

Key to *Chrysops* females continuing

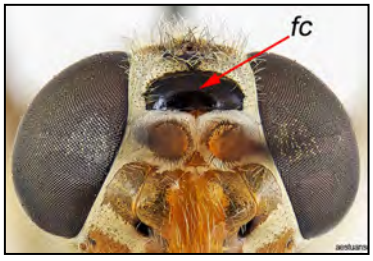
5(4) Pale-yellow-orange on the tergites restricted to sides of 1&2, remainder of tergites black but with white hair ..... (in part) **Ch 1 *noctifer***

-- Pale-yellow-orange on tergites more extensive **6**

Ch 1 *Chrysops noctifer*

6(5) Frontal callus (fc) entirely black [*aestuans, asbestos, bishoppi, discalis, frigidus, furcatus, proclivis, surdus*] **7**

-- Frontal callus brownish-orange, with lateral borders black [*fulvaster, coloradensis, wileyae*] **14**



aestuans

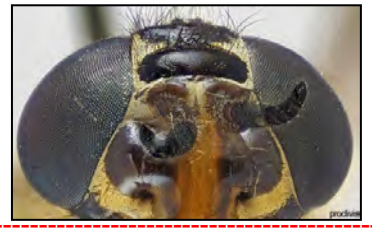
asbestos

bishoppi

discalis

frigidus

furcatus



proclivis

couplet 6

surdus

couplet 6--

fulvaster

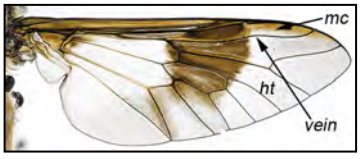
coloradensis

wileyae

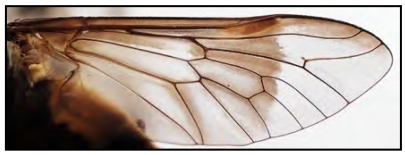
Key to *Chrysops* females continuing

7(6) Hyaline triangle (ht) crosses R_1 vein and enters into marginal cell (mc) [*aestuans, bishoppi, discalis, furcatus, proclivis, surdus*] **8**

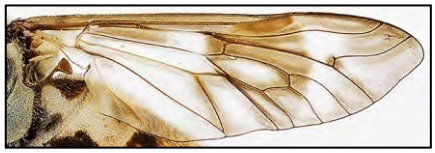
-- Hyaline triangle never crosses into marginal cell [*asbestos, frigidus*] **13**



aestuans



bishoppi



discalis

furcatus

proclivis

surdus

couplet 7

couplet 7--

asbestos

frigidus

8(7) Clypeus (cl) with a median pale pruinose stripe ..... **Ch 5 *discalis***

-- Clypeus shiny, not pruinose [*aestuans, bishoppi, furcatus, proclivis, surdus*] **9**

Ch 5 *Chrysops discalis*

couplet 8--

Key to *Chrysops* females continuing

9(8) Hyaline triangle (ht) reaches costa (c) separating apical spot from crossband (cb). 1st basal cell (1st bc) infuscated but with a small subhyaline ventral spot at apex [*proclivis, surdus*]..... **10**

-- Hyaline triangle does not reach costa, does not separate apical spot from crossband. 1st basal cell a quarter or more hyaline [*aestuans, furcatus, bishoppi*] **11**

couplets 9+10, Ch 6 *Chrysops proclivis*

couplets 9+10, Ch 7 *Chrysops surdus*

10(9) Apical spot relatively wide covering about two-thirds of the apical area of marginal cell ..... **Ch 6 *proclivis***

-- Apical spot (as) a narrow band along the costa (c) occupying less than one-half the apical area of marginal cell (mc) ..... **Ch 7 *surdus***

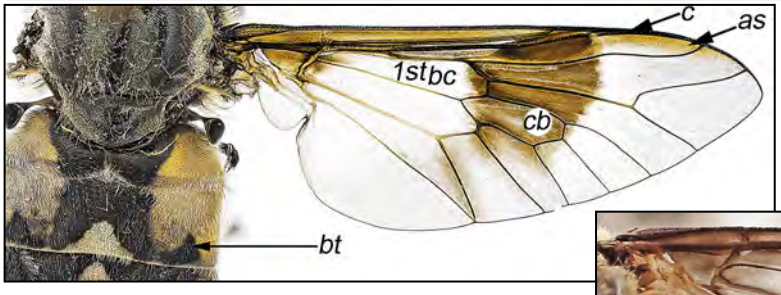
11(9) Apical spot expands considerably beyond the crossband (as). 1st basal cell about one-third infuscated ..... **Ch 8 *furcatus***

-- Apical spot (as) uniformly narrow along inner edge of costa (c). 1st basal cell (1st bc) hyaline or lightly infuscated [*aestuans, bishoppi*] **12**

Ch 8 *Chrysops furcatus*

12(11) 1st basal cell (1st bc) hyaline, crossband (cb) does not reach posterior wing border. Second abdominal tergite with a black triangle (bt) either side of the dark median mark .....**Ch 9 *aestuans***

-- 1st basal cell about ¾ infuscated, crossband reaches posterior wing border. Second abdominal tergite lacking lateral spots ..... **Ch 10 *bishoppi***



couplets 11-- +12, Ch 9 *Chrysops aestuans*

couplets 11-- + 12--, Ch 10 *Chrysops bishoppi*

Key to *Chrysops* females continuing

13(7) Tergites 3-6 with broad black and discrete yellow bands ..... **Ch 11 *asbestos***

-- Tergites 3-6 mostly black, with more diffuse yellow patches ..... **Ch 12 *frigidus***

Ch 11 *Chrysops asbestos*

Ch 12 *Chrysops frigidus*

14(6) Hyaline triangle (ht) crosses into marginal cell (mc) and almost reaches the costa (c)..... **Ch 13 *fulvaster***

-- Hyaline triangle just reaches into marginal cell [*coloradensis, wileyae*] **15**

Ch 13 *Chrysops fulvaster*

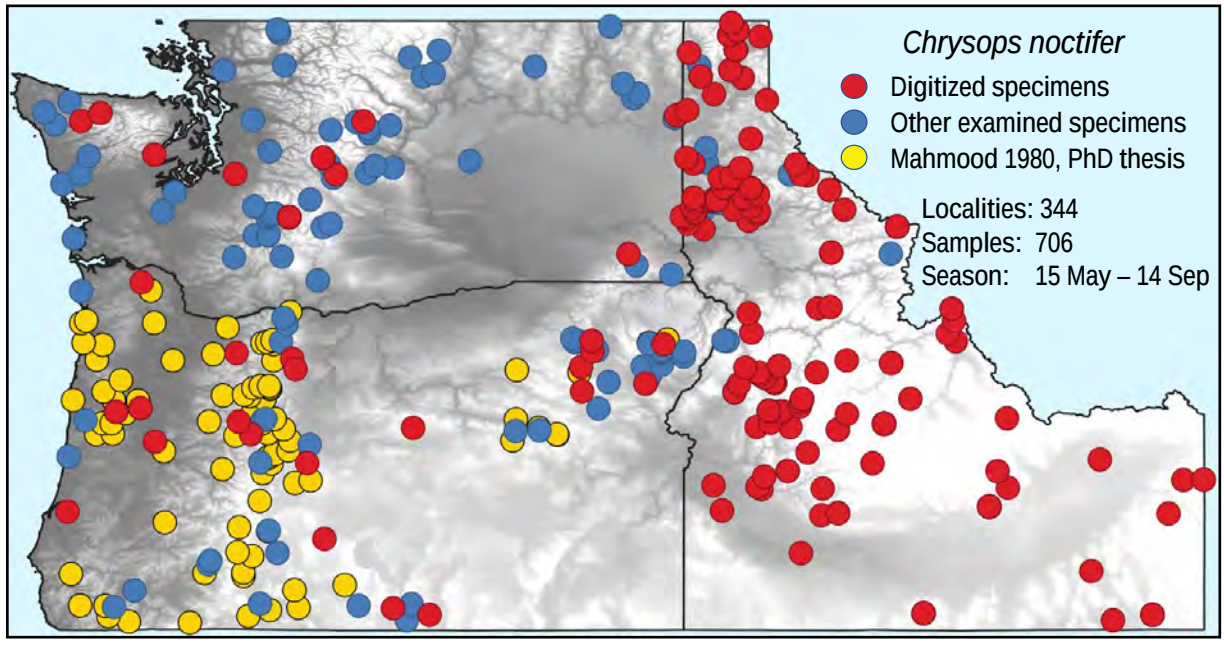
15(14) Crossband (cb) just reaches posterior wing margin. 5th posterior cell (5pc) about 90% hyaline ..... **Ch 14 *coloradensis***

-- Crossband broadly reaches posterior margin of wing 5th posterior cell about 50% hyaline ..... **Ch 15 *wileyae***

Ch 14 *Chrysops coloradensis*

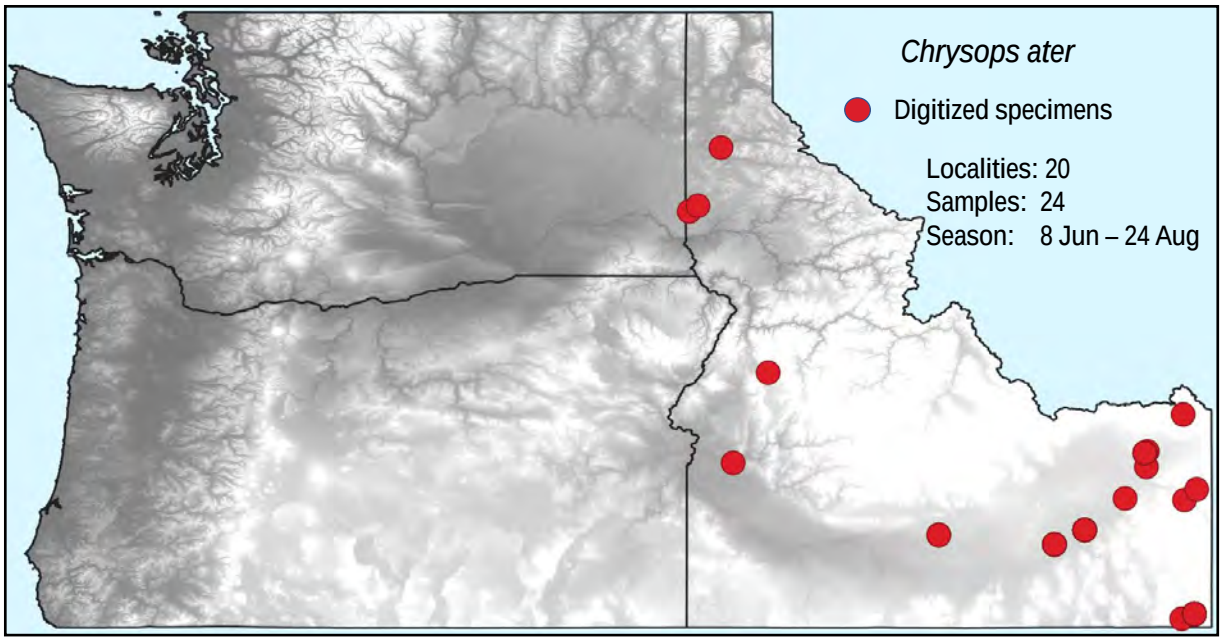
Ch 15 *Chrysops wileyae*

key **_Chrysops noctifer_** Osten Sacken Ch 1



Diagnosis: Length 8-11 mm. Wing pattern diagnostic, a dilute apical spot isolated from the crossband. Abdomen can be all black or can have pale orange-yellow patches laterally on tergites 1 & 2.
Distribution: Yukon Territory through BC and extreme western Alberta, south to Montana and California.

key **_Chrysops ater_** Macquart Ch 2

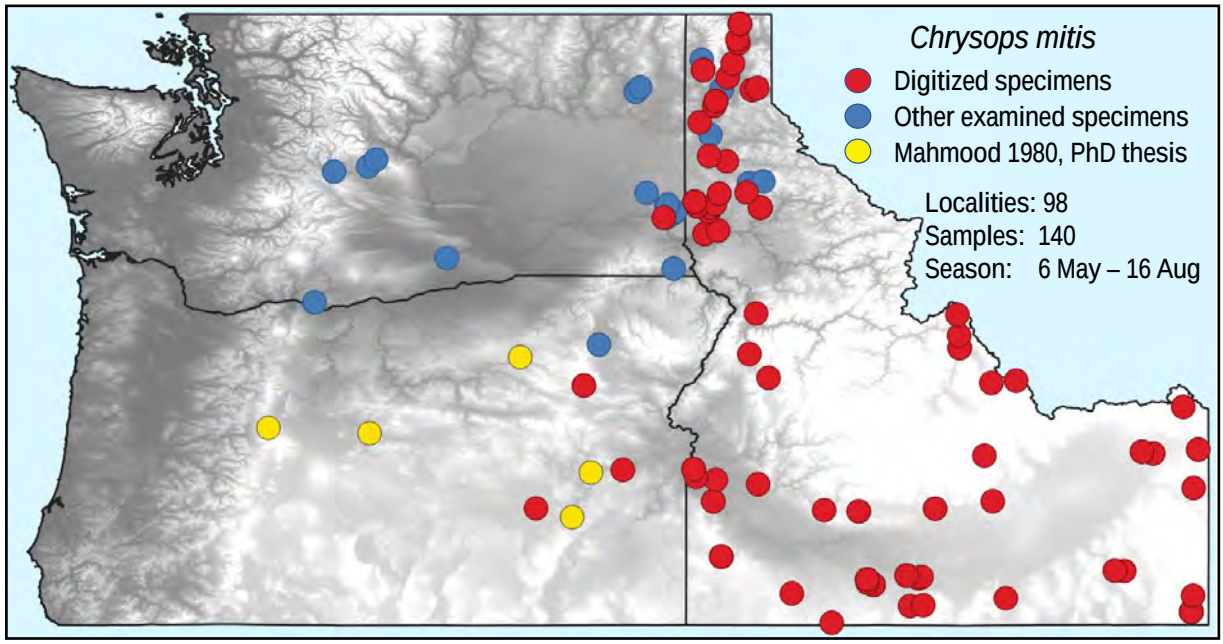


Diagnosis: Length 7-10 mm. A black species with apex of wing hyaline, black face with yellow pruinose stripe. Only likely to be confused with *Chrysops mitis*. *C. ater* has a hyaline spot at the base of the 5th posterior wing cell; no such spot in *C. mitis.* **Distribution:** Alaska to Newfoundland, south to Utah and West Virginia.

key

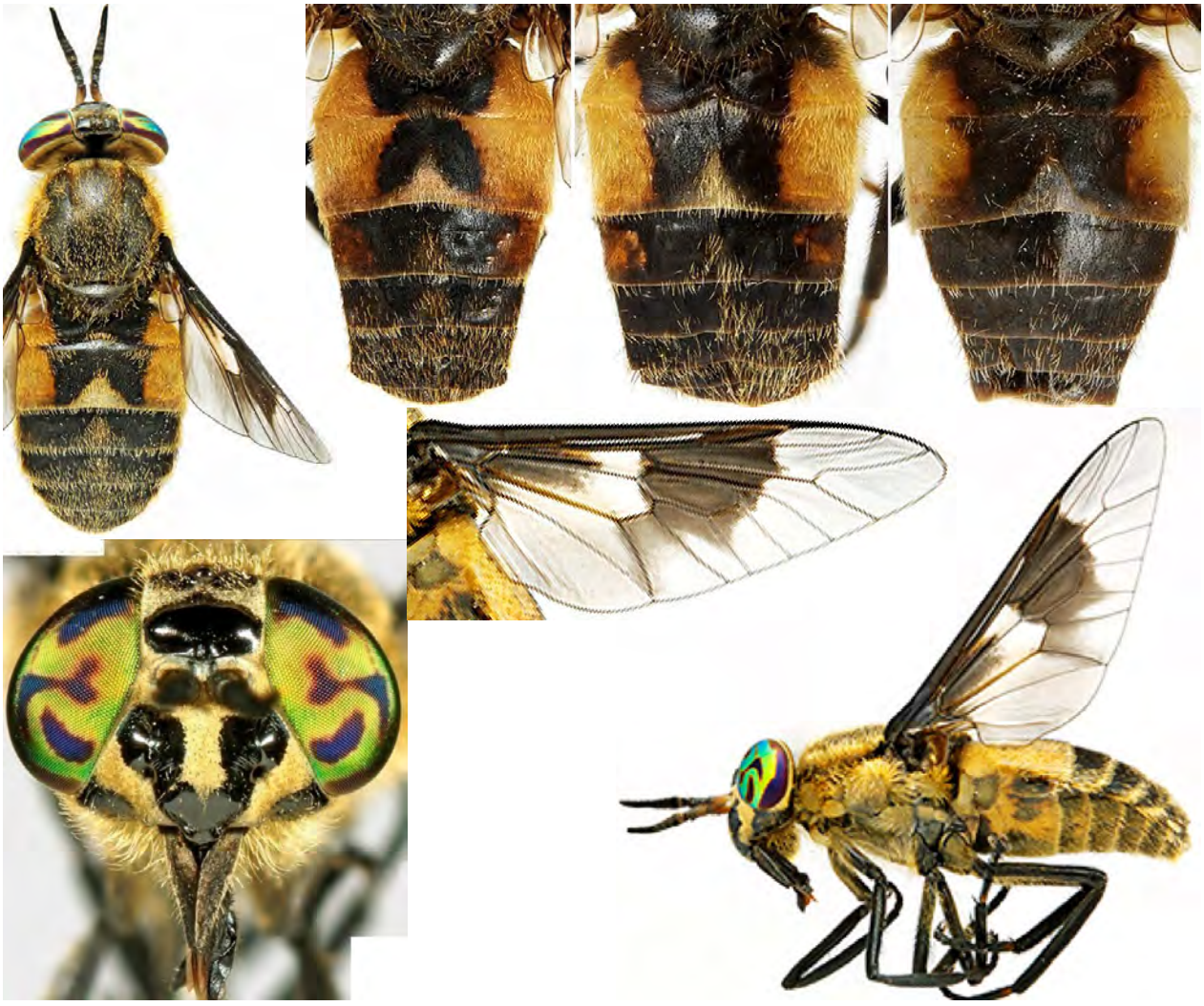
Chrysops mitis Osten Sacken

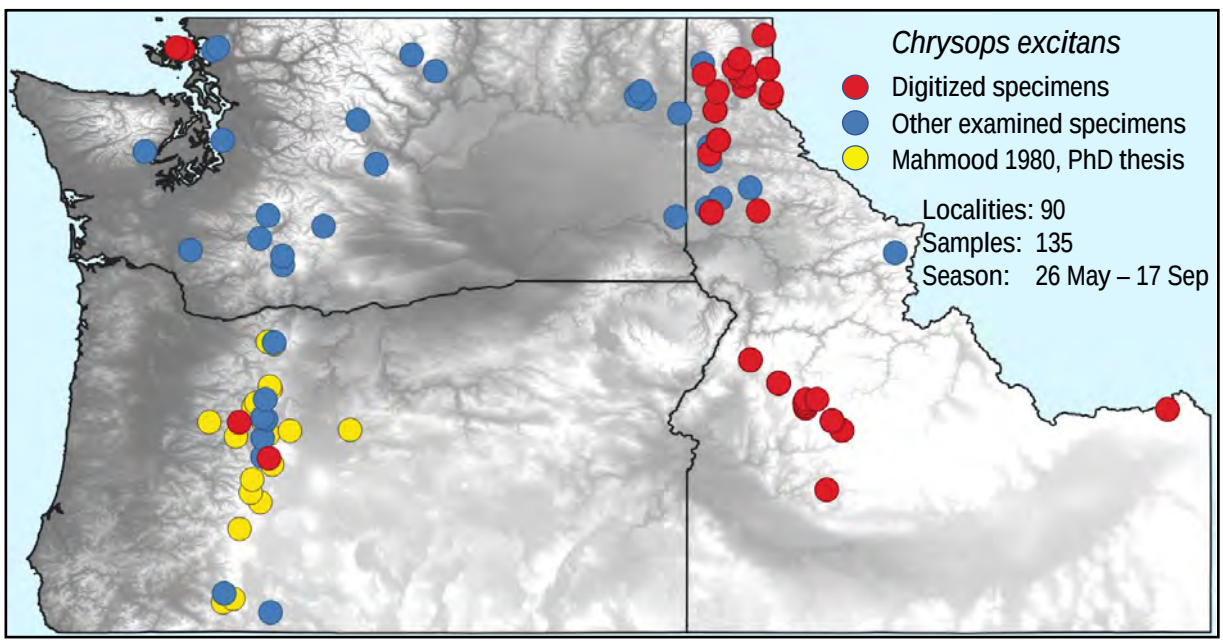
Ch 3



Diagnosis: Length 8-11 mm. Black species with wing apex hyaline, black face with yellow pruinose stripe. Similar to, but usually larger than, *Chrysops ater*. Best differentiated by *mitis* having the 5th posterior cell of the wing completely infuscated at its base. **Distribution:** Alaska to Newfoundland, south to Colorado and West Virginia.

key **_Chrysops excitans_** Walker Ch 4





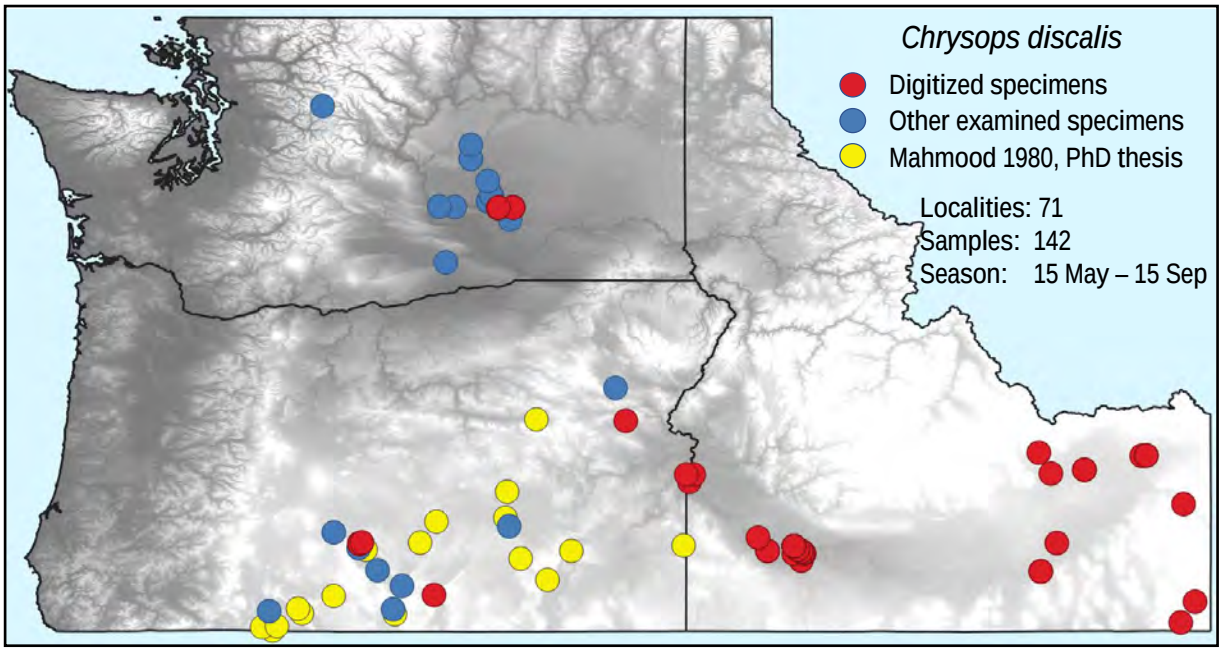
Diagnosis: Length 9-12 mm. Wing apex hyaline, black clypeus with yellow pruinose stripe, and abdominal pattern make identification easy. **Distribution:** Alaska to Labrador, south to California and West Virginia.

key

Chrysops discalis Williston

Ch 5

note hyaline center in discal cell

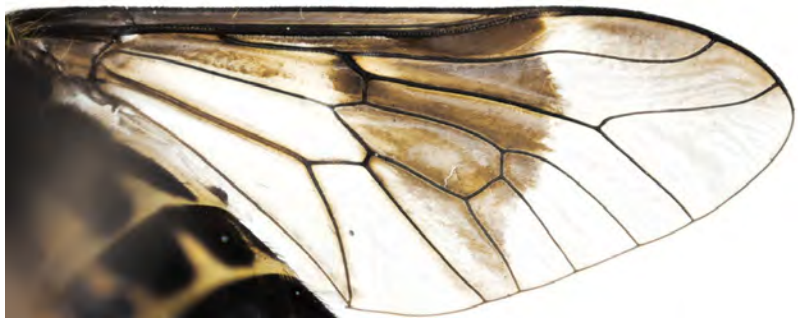


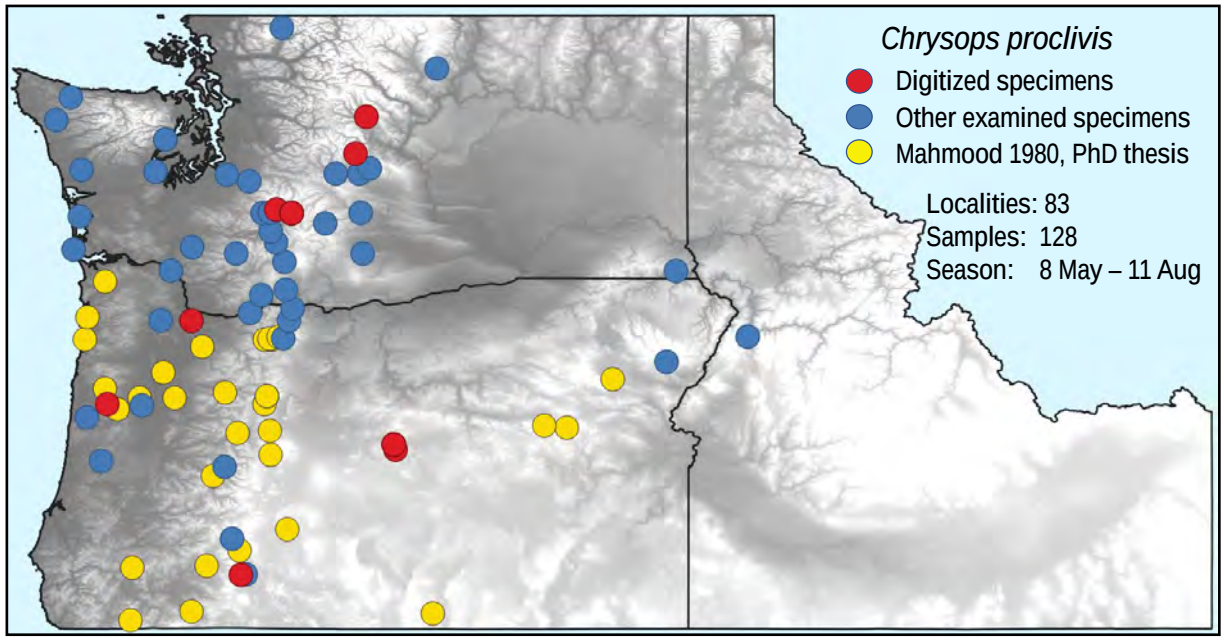
Diagnosis: Length 8-11 mm. A pale yellow-brown species only to be confused with *Chrysops fulvaster.* Both species have a hyaline center of the discal cell but *C. fulvaster* lacks the infuscation at the fork. The pruinose stripe on the clypeus extends much further than the stripe in *C. fulvaster*. **Distribution**: BC to Manitoba, south to California and Nebraska.

key

Chrysops proclivis Williston

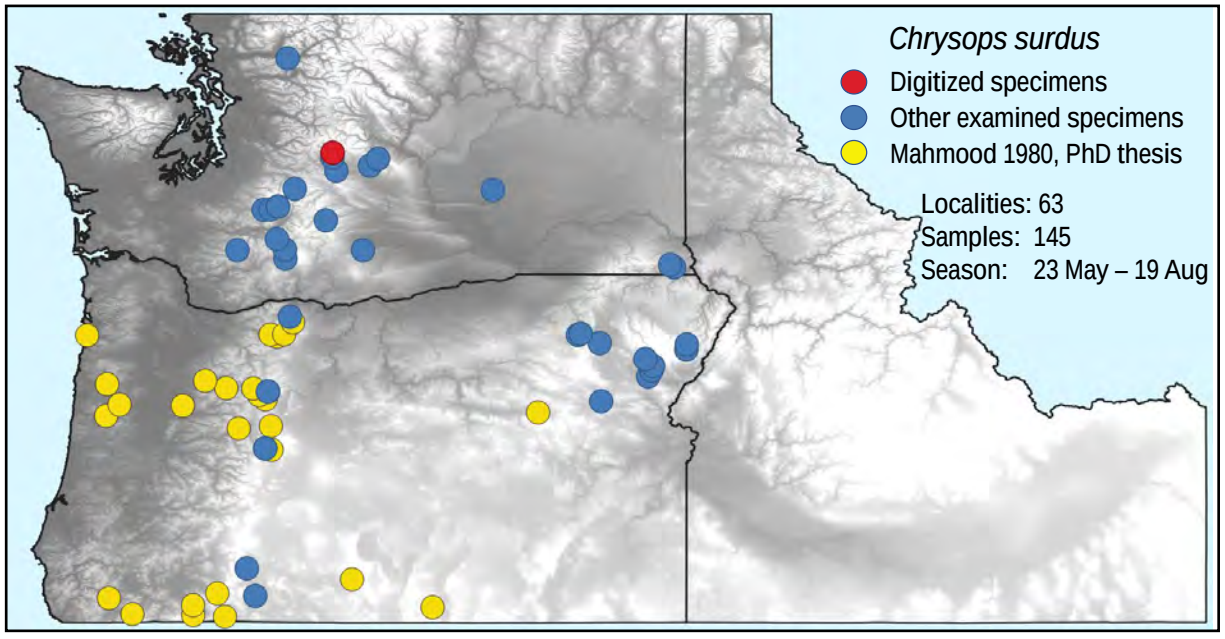
Ch 6





Diagnosis: Length 7-10 mm. A black and yellow species similar to *Chrysops furcatus* and *C. surdus*. The three species are differentiated by wing pattern (see key couplets 10 and 11 in key). **Distribution:** BC to Alberta, south to California and Colorado.

key **_Chrysops surdus_** Osten Sacken Ch 7

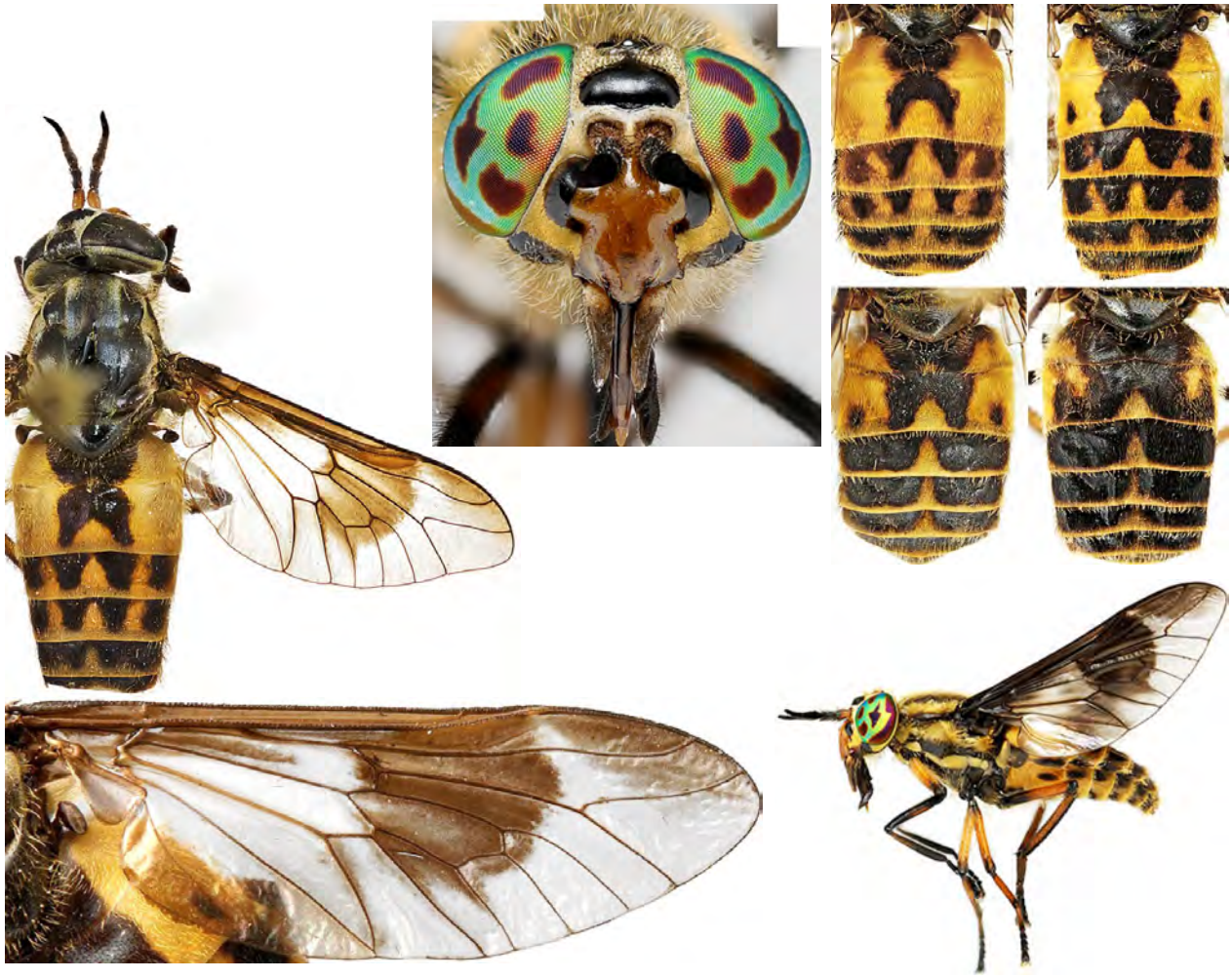


Diagnosis: Length 6.5-8 mm. A black and yellow species once considered as a subspecies of *Chrysops proclivis.* Differs from *C. proclivis* in being smaller, having more extensive yellow markings on the tergites and a narrower apical spot. **Distribution:** BC to California and Nevada.

key

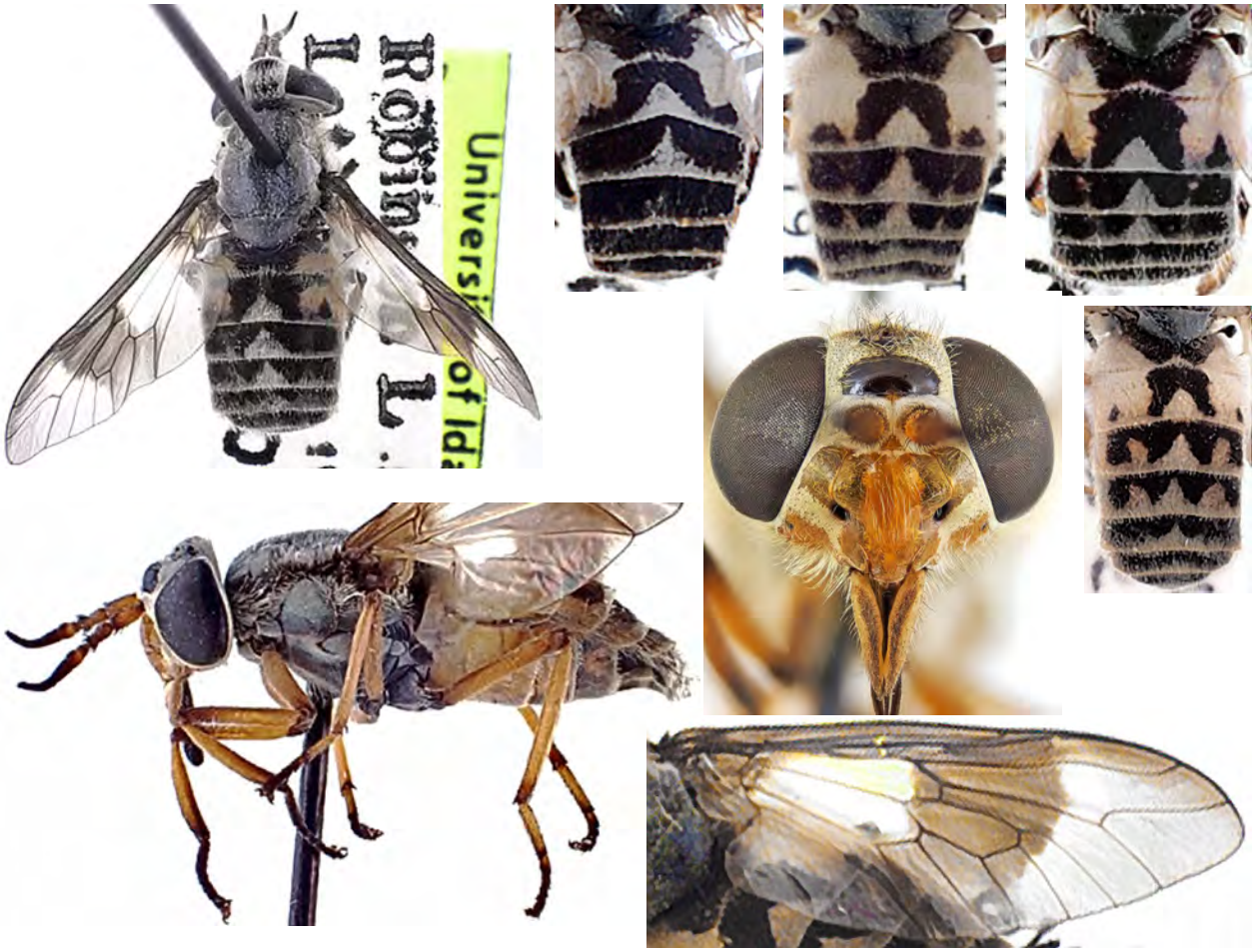
Chrysops furcatus Walker

Ch 8



Diagnosis: Length 7-10 mm. Abdomen variable. Best differentiated, from similar species, by the hyaline apex of the 1st basal cell, the hyaline triangle crossing into the marginal cell but not reaching the costa and the apical spot expands considerably beyond the crossband. **Distribution:** Alaska to Newfoundland, south to California and Michigan.

key **Chrysops aestuans** van der Wulp Ch 9

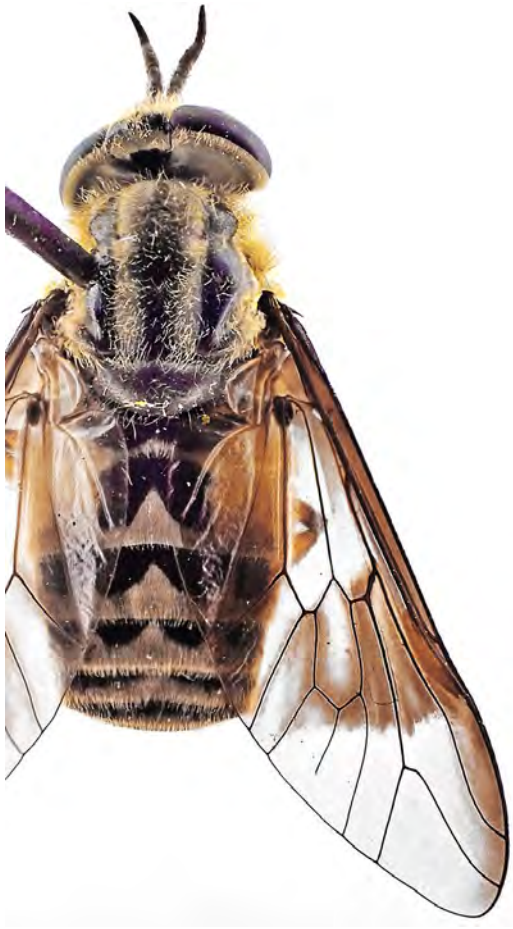


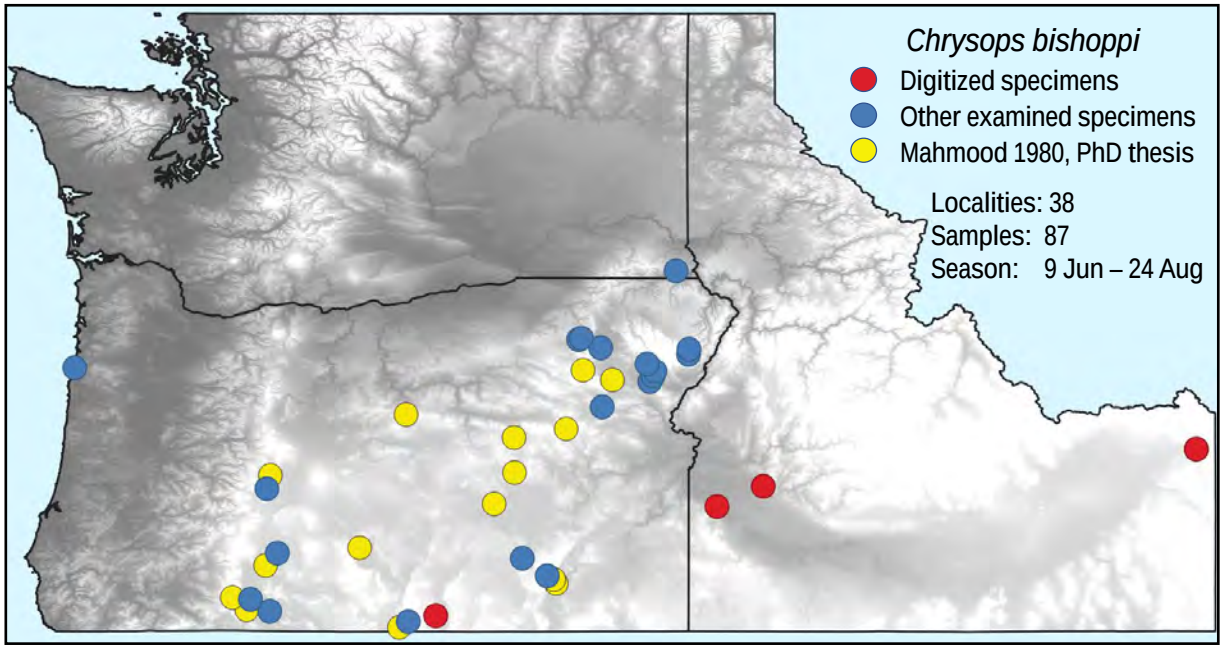
Diagnosis: Length 8-10 mm. Specimens from NS west to the eastern shore of Lake Superior show little variation in leg color (black) or ventral abdomen color (black), sublateral black triangles are connected to the median spot, and apical spot is narrow. PNW specimens have moderate to extensive yellow markings on legs and ventral abdomen, have a wider apical spot and smaller sublateral triangles, often detached from the central black chevron (inverted V). Philip (1941) regarded such western species as ssp. *abaestuans*. **Distribution:** BC to Nova Scotia, south to California, New Mexico, Oklahoma and Pennsylvania.

key

Chrysops bishoppi Brennan

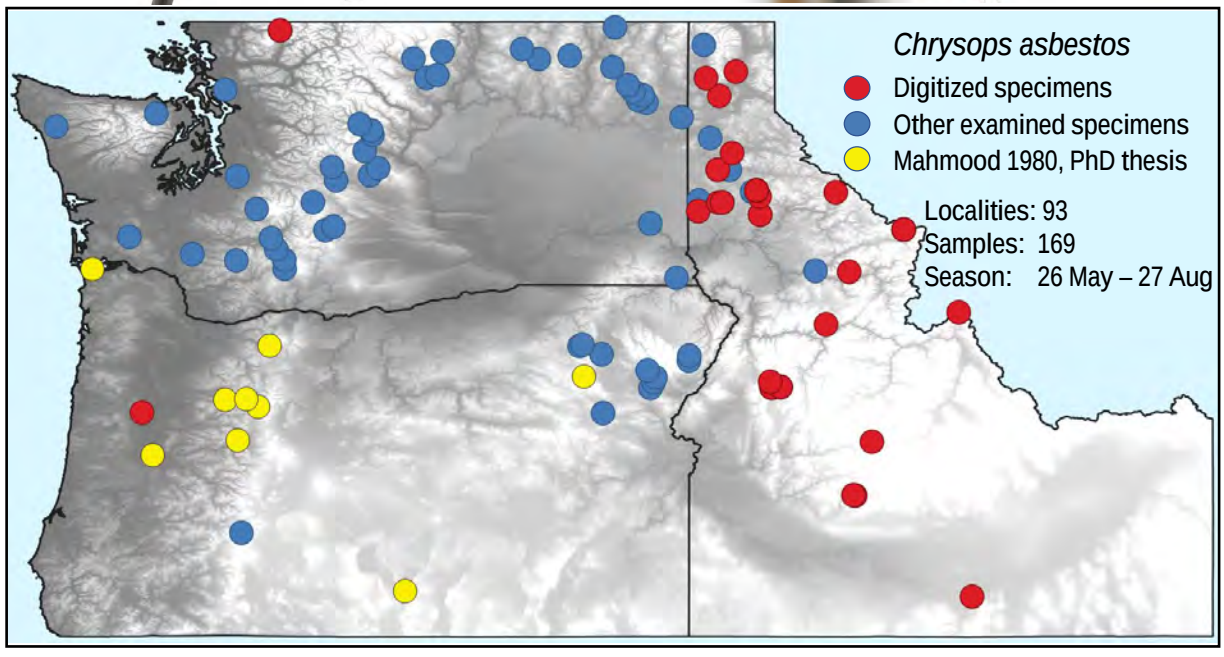
Ch 10





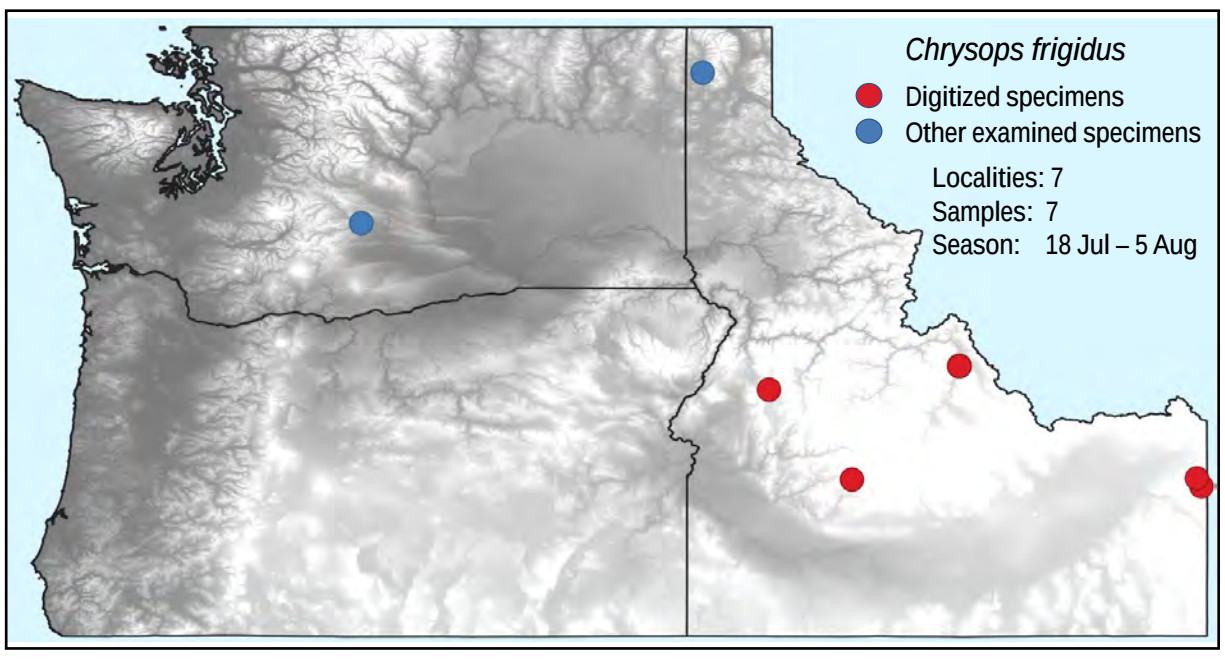
Diagnosis: Length 8-10 mm**.** A predominantly yellow species, especially in lateral view. Black frontal callus, 1st basal cell of wing partially infuscated, narrow apical spot, and inverted V-shaped black mark on tergite 2 distinguish this species. **Distribution:** California, Oregon (Burger, 1995) to which we add Washington and Idaho.

key **_Chrysops asbestos_** Philip Ch 11



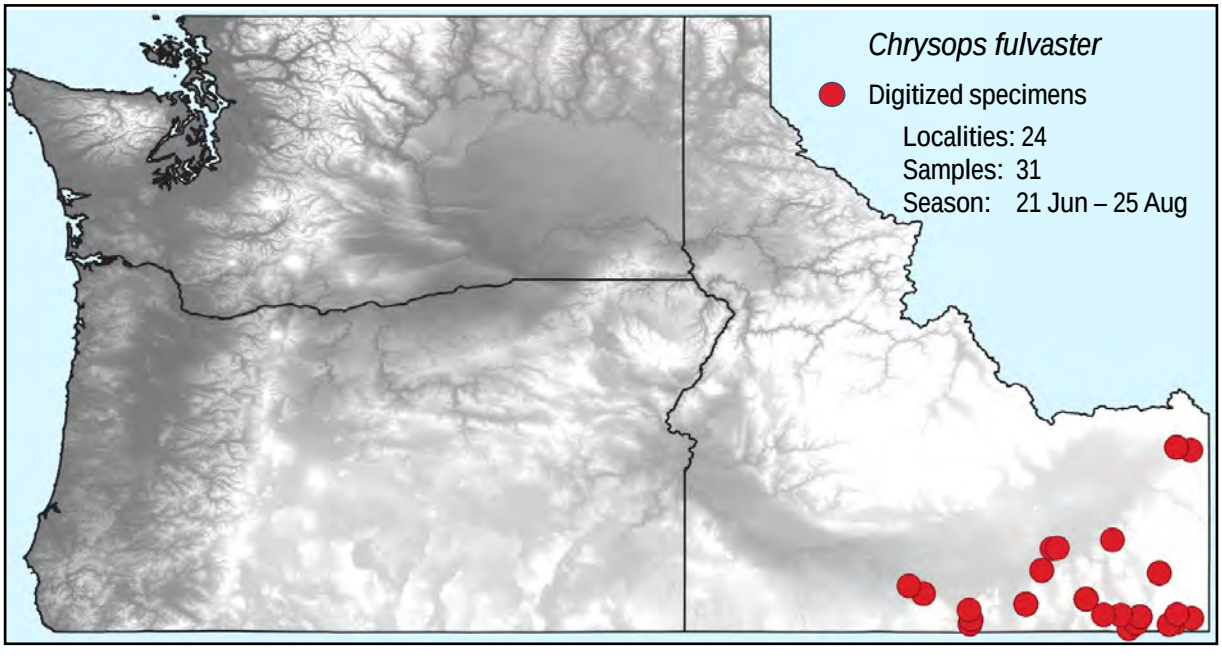
Diagnosis: Length 7-10 mm. Distinctive bright yellow and black banded abdomen. **Distribution:** BC and extreme SW Alberta, south to California and Wyoming.

key **_Chrysops frigidus_** Osten Sacken Ch 12



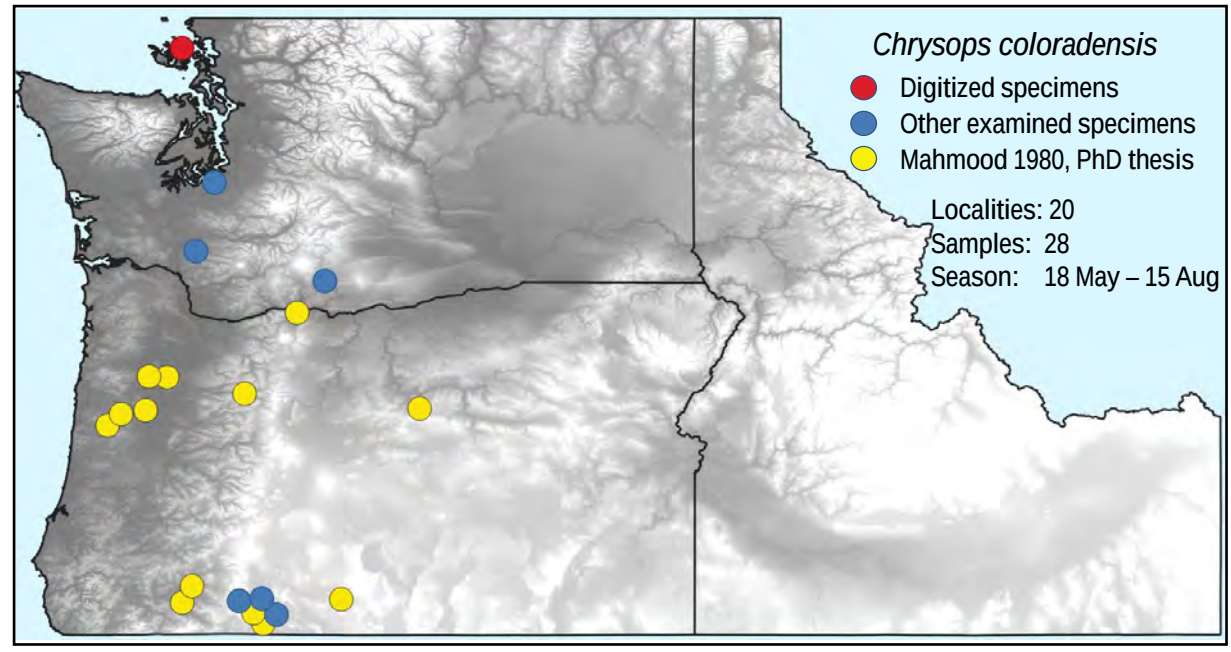
Diagnosis: Length 6-9 mm. A small black and orange-yellow species with quite variable abdominal coloring; from extensively yellow (ssp. *xanthas* of Philip) to predominantly black. Legs also vary from predominantly yellow to entirely black. Together, face, abdomen and wing patterns are distinctive.
Distribution: Alaska to Labrador, south to Colorado, Iowa and Pennsylvania.

key **_Chrysops fulvaster_** Osten Sacken Ch 13



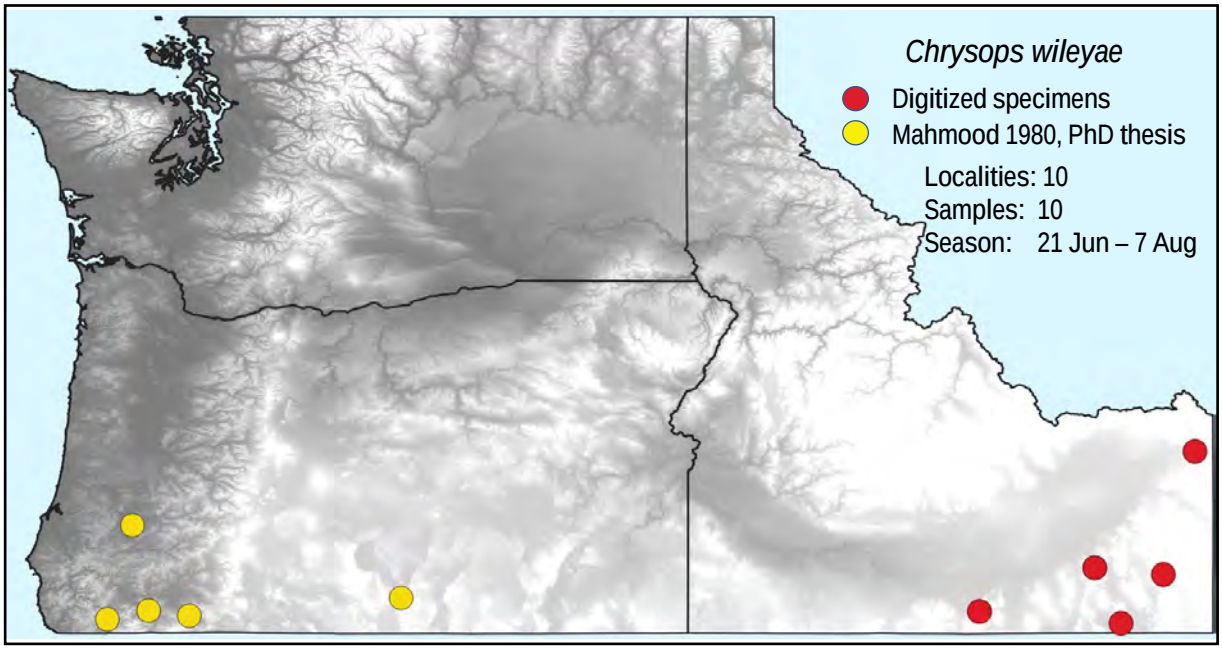
Diagnosis: Length 6-8 mm. A brown species superficially similar to *Chrysops discalis*. *C. fulvaster* lacks an infuscation at the fork, the pruinose stripe on the clypeus is much shorter than the stripe in *C. discalis* and the frontal callus is brown (black in *C. discalis*). Scape swollen. **Distribution:** Alberta to Minnesota, south to California and Oklahoma.

key **_Chrysops coloradensis_** Bigot Ch 14



Diagnosis: Length 8-10 mm. Black and yellow, similar to *Chrysops furcatus* but frontal callus yellow (black in *C. furcatus*), crossband reaches posterior margin of wing and hyaline triangle does not cross vein R_1 and does not enter marginal cell [see couplet 7(6), page 36]. **Distribution:** BC to California and Colorado, Baja California.

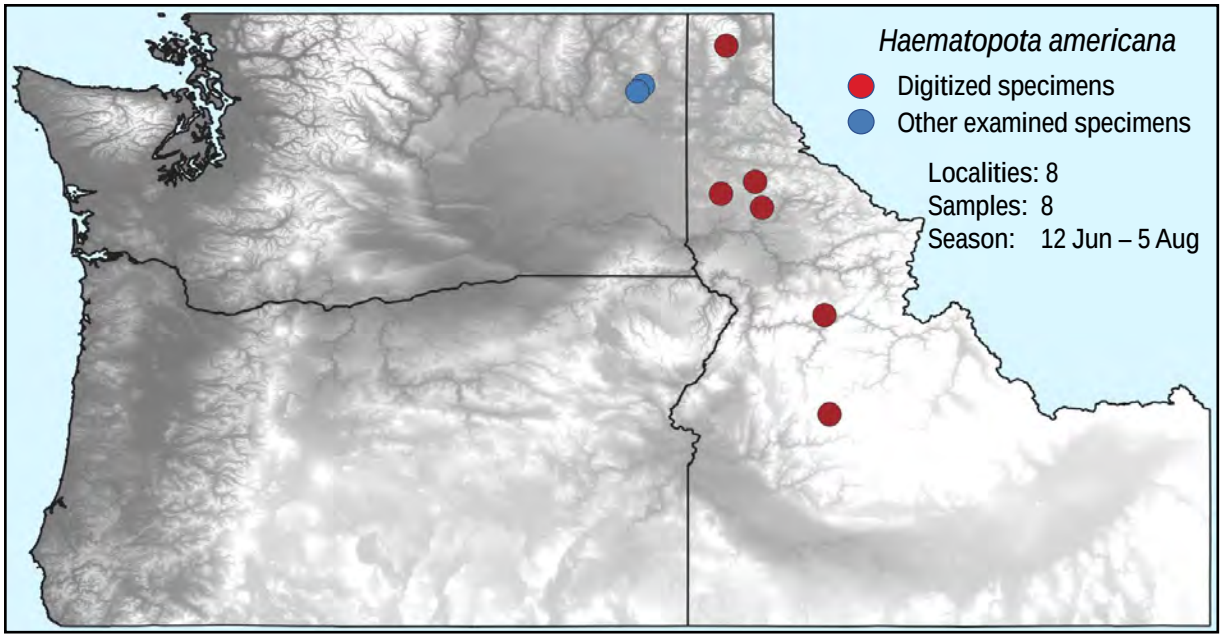
key **_Chrysops wileyae_** Philip Ch 15



Diagnosis: Length 7.5-9 mm. A black and yellow species. Antenna scape swollen, flagellum slightly shorter than scape and pedicel combined. Abdomen and wing patterns characteristic. **Distribution:** Oregon to Utah, south to California, extending into Baja California.

SF 3 Tabaninae 3.1 *Haematopota*
Only one species in the PNW

Haematopota americana Osten Sacken **Ha 1**



Diagnosis: Length 9-11 mm. Distinctive, the only species in the genus in the PNW, a 2nd species in California. **Distribution:** Alaska to Labrador, south to California, New Mexico and South Dakota.

SF 3 Tabaninae 3.2 *Tabanus*
Identification plate: dorsal, sequence as separated in key

left-click image for species page

Ta 1 *punctifer*

Ta 2 *aegrotus*

Ta 3 *kesseli*

Ta 4 *sequax*

Ta 5 *tetropsis*

Ta 6 *monoensis*

Ta 7 *reinwardtii*

Ta 8 *fratellus*

Ta 9 *similis*

Ta 10 *marginalis*

Ta 11 *laticeps*

Ta 12 *stonei*

SF 3 Tabaninae 3.2 *Tabanus*

Key to species; followed by species pages, sequence as separated in key

Key to *Tabanus* females*

1 Large black species with entire dorsal surface of thorax with contrasting creamy hair; distinctive ..... **Ta 1 *punctifer***

-- Dorsal surface of thorax not with contrasting creamy hair..... **2**

Ta 1 *Tabanus punctifer*

2(1) Sides of thorax completely black-haired [*aegrotus, kesseli*] **3**

-- Sides of thorax with at least some pale hairs **4**

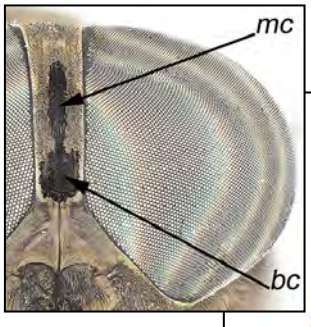
couplet 2

couplet 2--

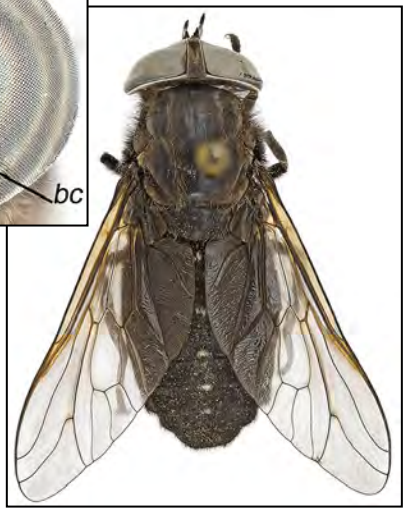
3(2) Median callus broadly joined to basal callus and tapered dorsally. Abdomen completely black ..... **Ta 2 *aegrotus***

-- Median callus (mc) slender, narrowly joined to basal callus (bc). Abdominal tergites black with a median row of tufts of white hair ..... **Ta 3 *kesseli***

Ta 2 *Tabanus aegrotus*



Ta 3 *Tabanus kesseli*

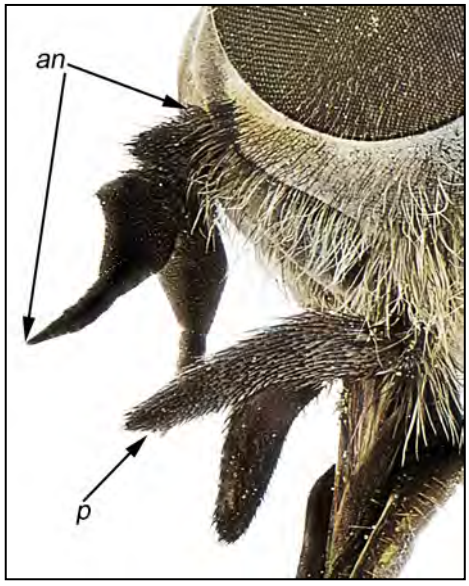


* After getting a tentative ID using the key, check the species page for images with greater detail

Key to *Tabanus* females continuing

4(2) Antenna (an) and palpus (p) black with black hairs ..... **Ta 4 *sequax***

-- Antenna and/or palpus never completely black; antenna often partly brown, palpus often white. **5**



Ta 4 *Tabanus sequax*

couplet 4--

5(4) Long spur vein (sv) at fork, on wing ..... **Ta 5 *tetropsis***

-- No spur vein at fork **6**

Ta 5 *Tabanus tetropsis*

6(5) Conspicuous dark spot at fork and crossveins [*monoensis*, *reinwardtii*] **7**

-- No spots at fork and crossveins [*fratellus, laticeps, marginalis, similis, stonei*] **8**

couplet 6

Key to *Tabanus* females continuing

7(6) Predominantly black, small dense white hairs below wing base ..... **Ta 6 *monoensis***

-- Black & white, entire side of thorax white ..... **Ta 7 *reinwardtii***

Ta 6 *Tabanus monoensis*

Ta 7 *Tabanus reinwardtii*

8(6) Antennal flagellum (fl) very short, 3 or 4 fused apical flagellomeres ..... **Ta 8 *fratellus***

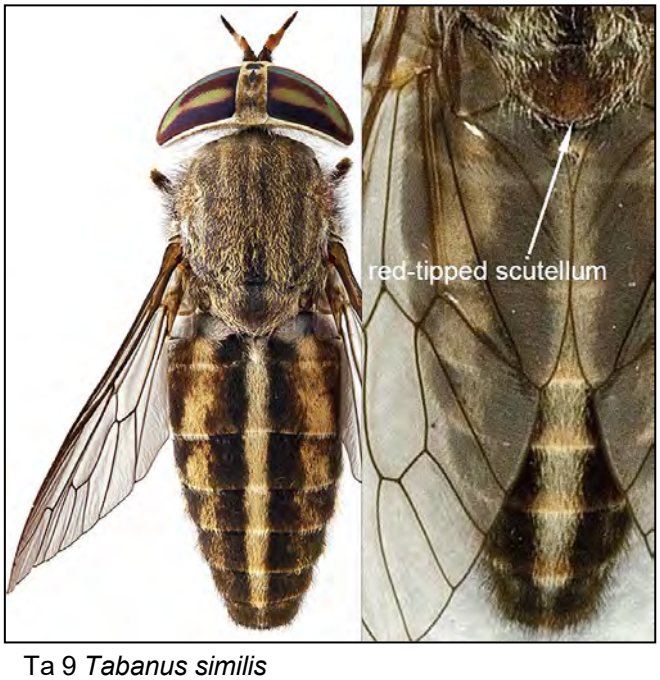
-- Apical flagellomeres not fused..... **9**

Ta 8 *Tabanus fratellus*

couplet 8--

9(8) Abdominal tergites with median markings forming a pale uninterrupted parallel-sided stripe bordered by a black uninterrupted stripe with pale offset dashes laterally. Tip of scutellum red ..... **Ta 9 *similis***

-- Median markings not forming a parallel-sided uninterrupted stripe, at most median dashes arising from pale posterior border of tergites (e.g., *stonei*). Tip of scutellum concolorous [*marginalis, laticeps, stonei*] **10**



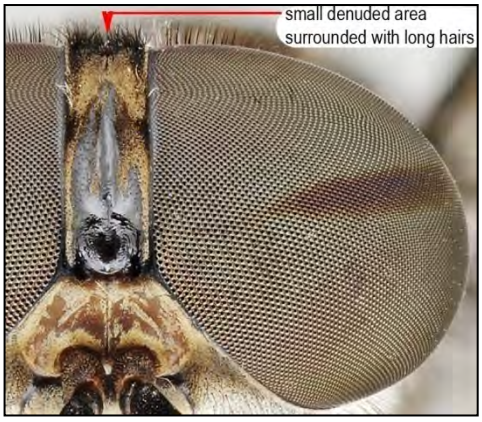
Ta 9 *Tabanus similis*

couplet 9--*Tabanus stonei*

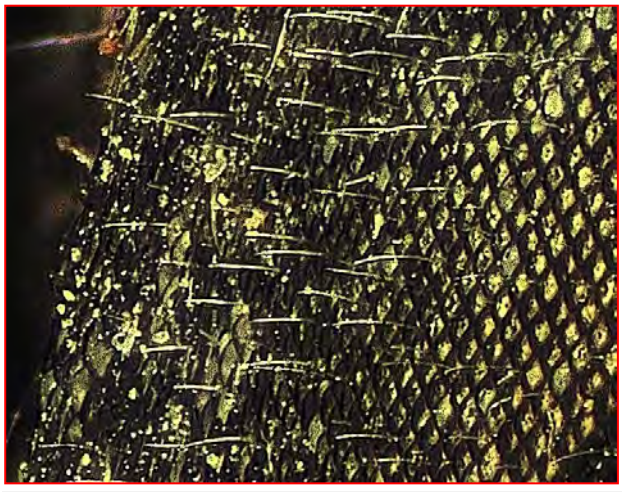
Key to *Tabanus* females continuing

10(9) Eyes bare (no hairs), in life, brown with an incomplete darker brown stripe
Body black, with very small pale median triangles on abdominal tergites and large oblique pale patches that form an offset tapered lateral stripe.
Vertex with small central denuded spot surrounded by long black hairs ..... **Ta 10 *marginalis***

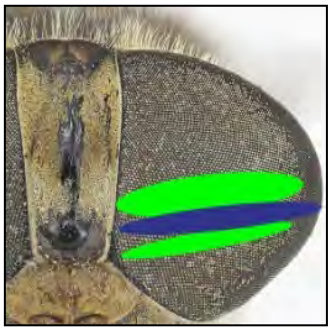
-- Anterior lower portion of eye with long hairs. Eyes in life colored green and purple.
Abdomen brownish, not with the above markings. Vertex with denuded area
[*laticeps, stonei*] **11**



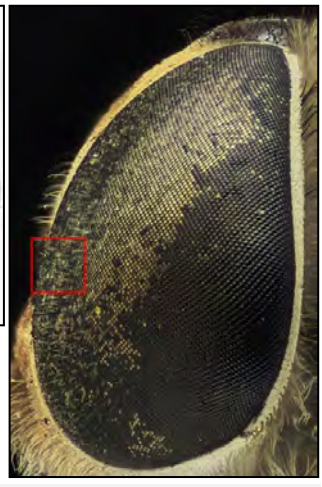
Ta 10 *Tabanus marginalis*



couplet 10-- closeup of red area showing hairs on eye longer than diameter of facets



laticeps eye pattern



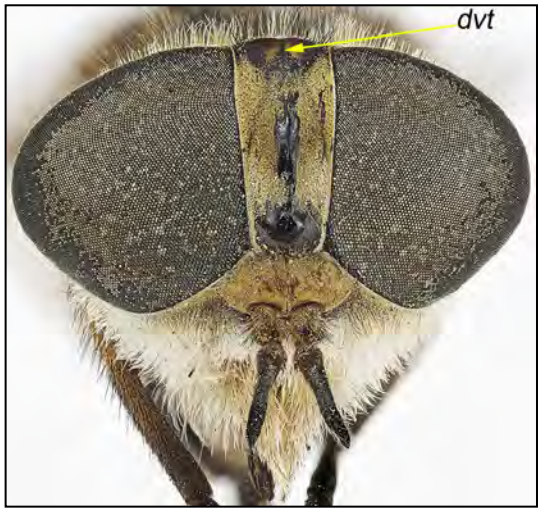
couplet 10-- eye in lateral view, red area enlarged. Note denuded area at vertex

couplet 10--
Tabanus laticeps, left;
Tabanus stonei, right

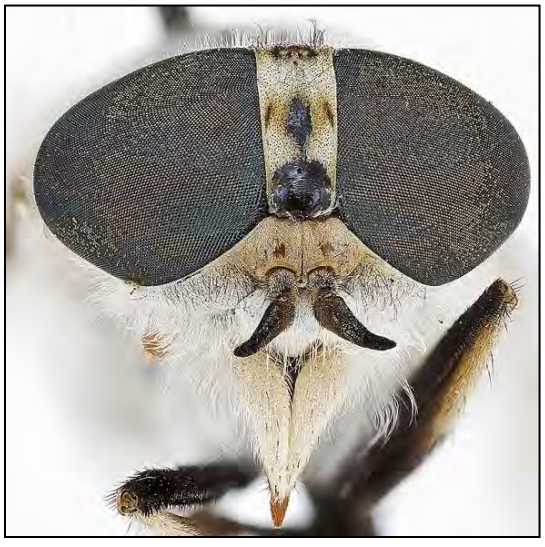
Key to *Tabanus* females continuing

11(10) Abdominal tergites dark brown to black medially with pale reddish oblique patches laterally. Pale posterior margins of tergites may extend anteriorly into pale triangles. Denuded area of vertex wide (dvt), almost touching eyes ..... **Ta 11 *laticeps***

-- Each abdominal tergites with a wide gray median stripe, that does not form a continuous uninterrupted stripe with other tergites, and bordered by oblique black dashes which themselves are bordered by oblique pale dashes largest on tergite 2. Denuded area of vertex less wide ..... **Ta 12 *stonei***

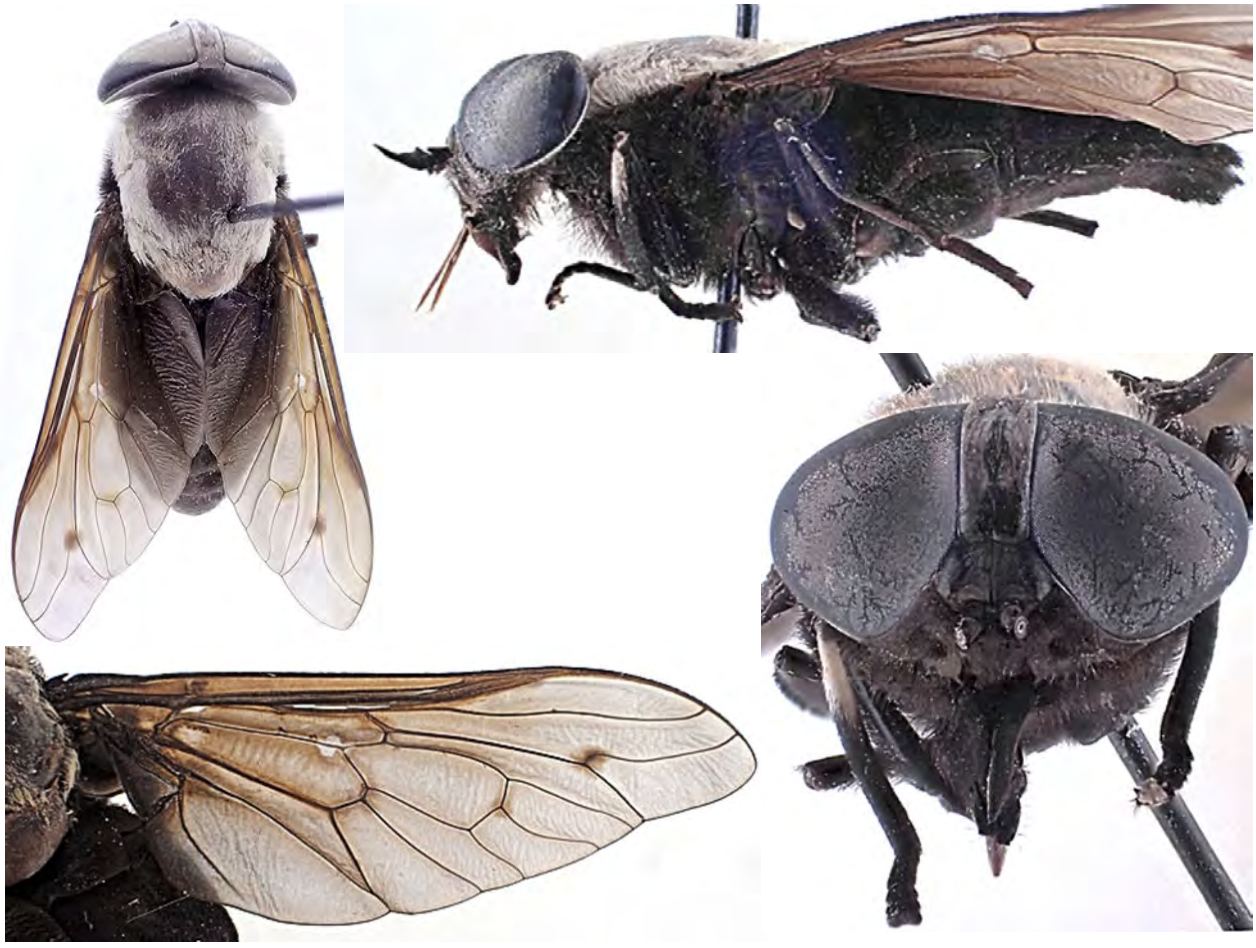


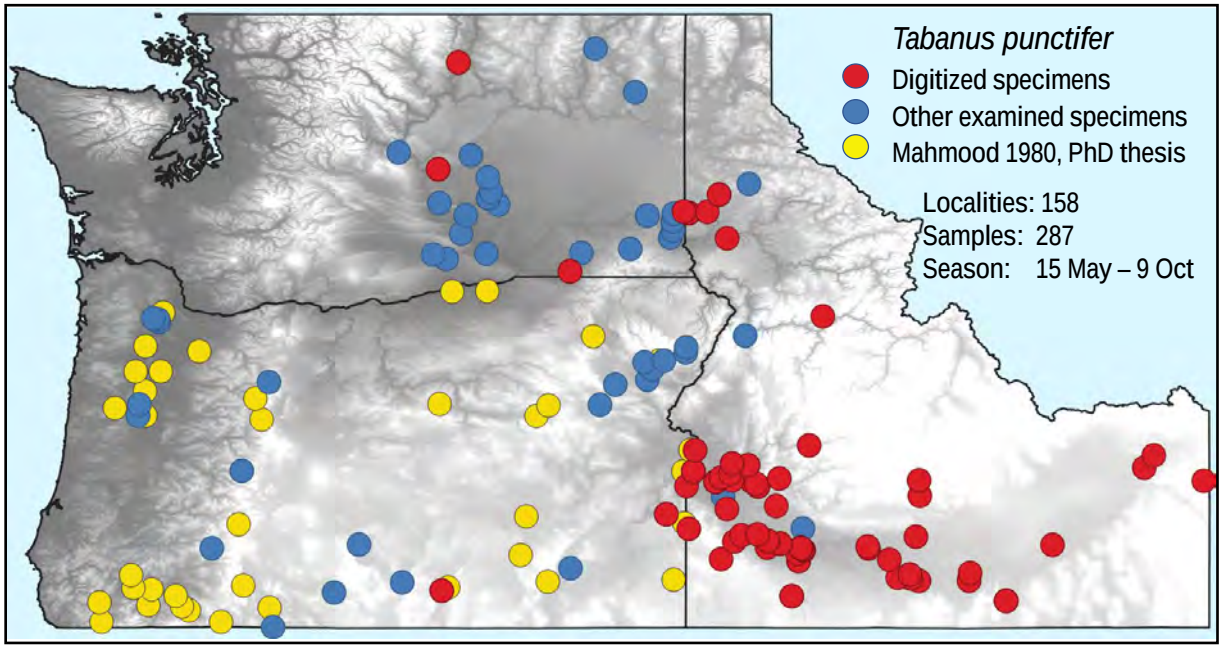
Ta 11 *Tabanus laticeps*



Ta 12 *Tabanus stonei*

key **_Tabanus punctifer_** Osten Sacken Ta 1



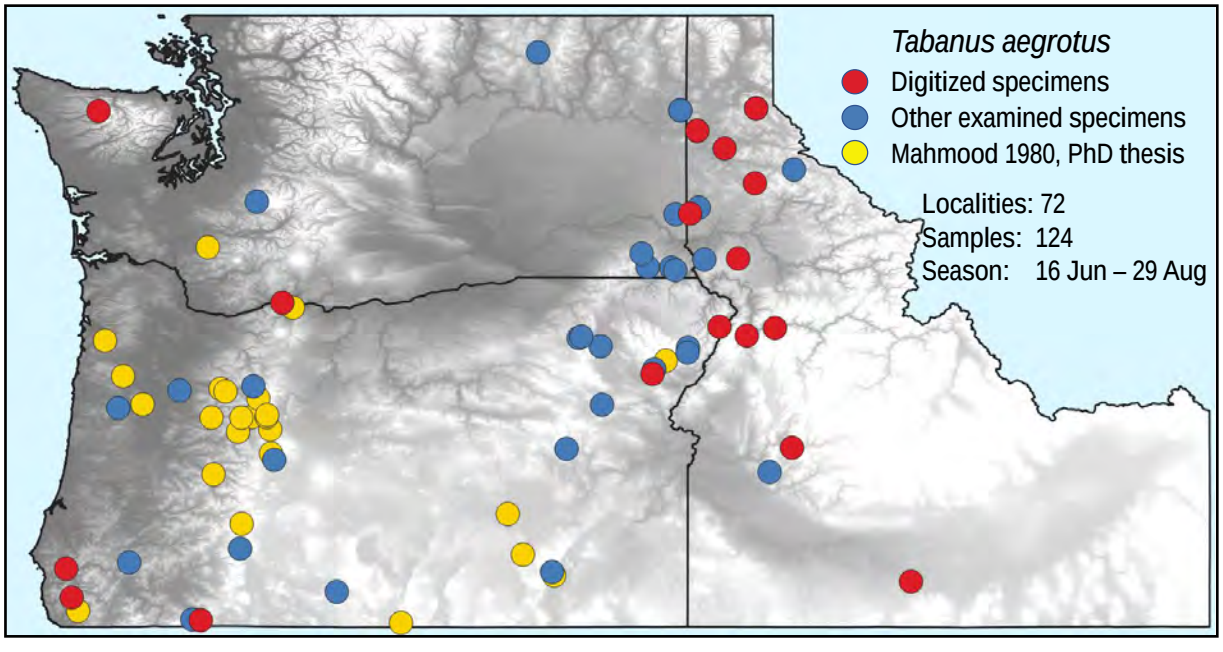


Diagnosis: Length 19-22 mm. Distinctive large black species with dorsal thorax covered with creamy hair. **Distribution:** BC to North Dakota, south to California, Texas and Mexico.

key

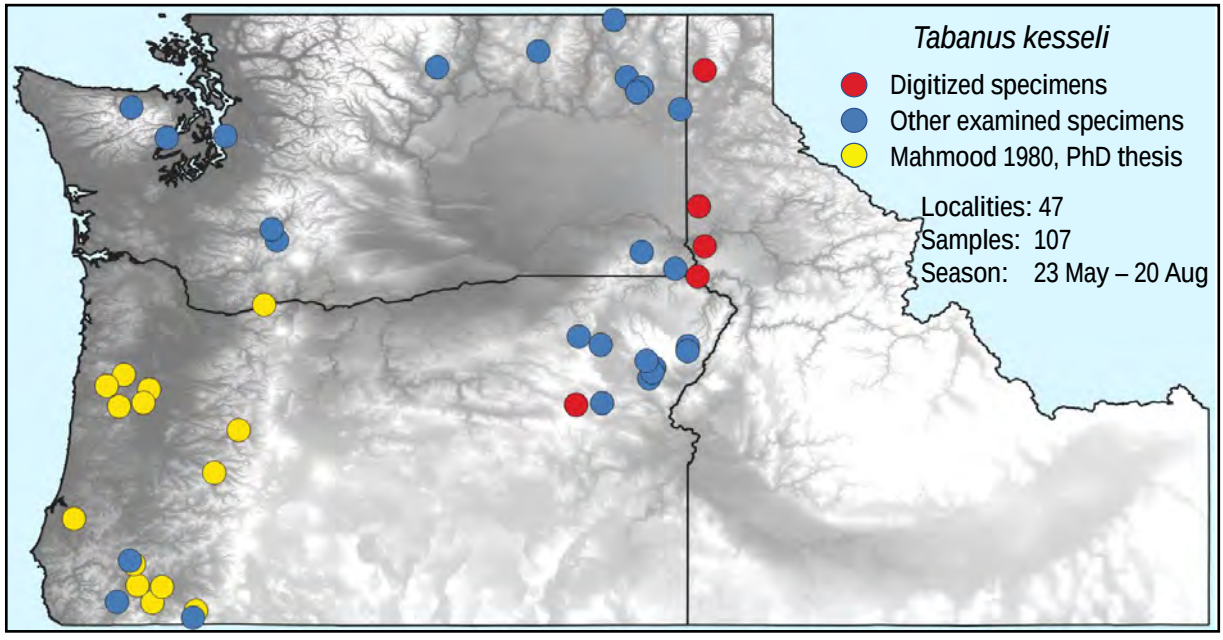
Tabanus aegrotus Osten Sacken

Ta 2



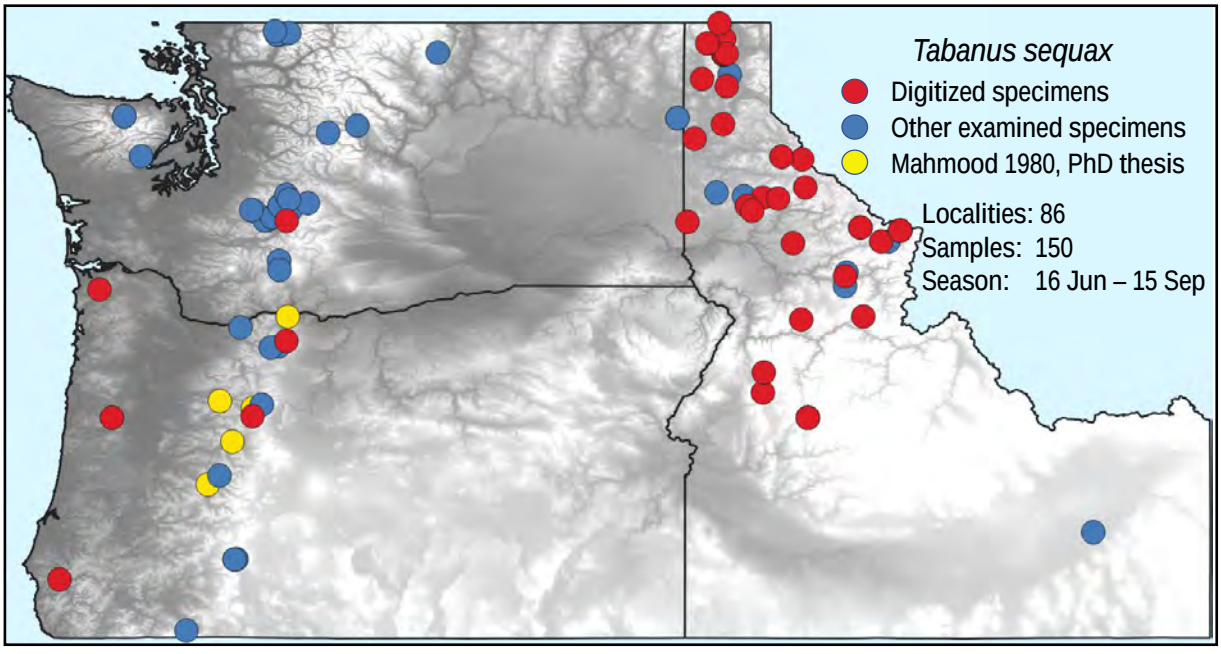
Diagnosis: Length 18-23 mm. A very large all-black species almost identical to *T. kesseli.* See couplet 3 for distinguishing features, mainly on the frons and abdomen. **Distribution:** BC to Montana, south to California and Utah.

key **_Tabanus kesseli_** Philip Ta 3



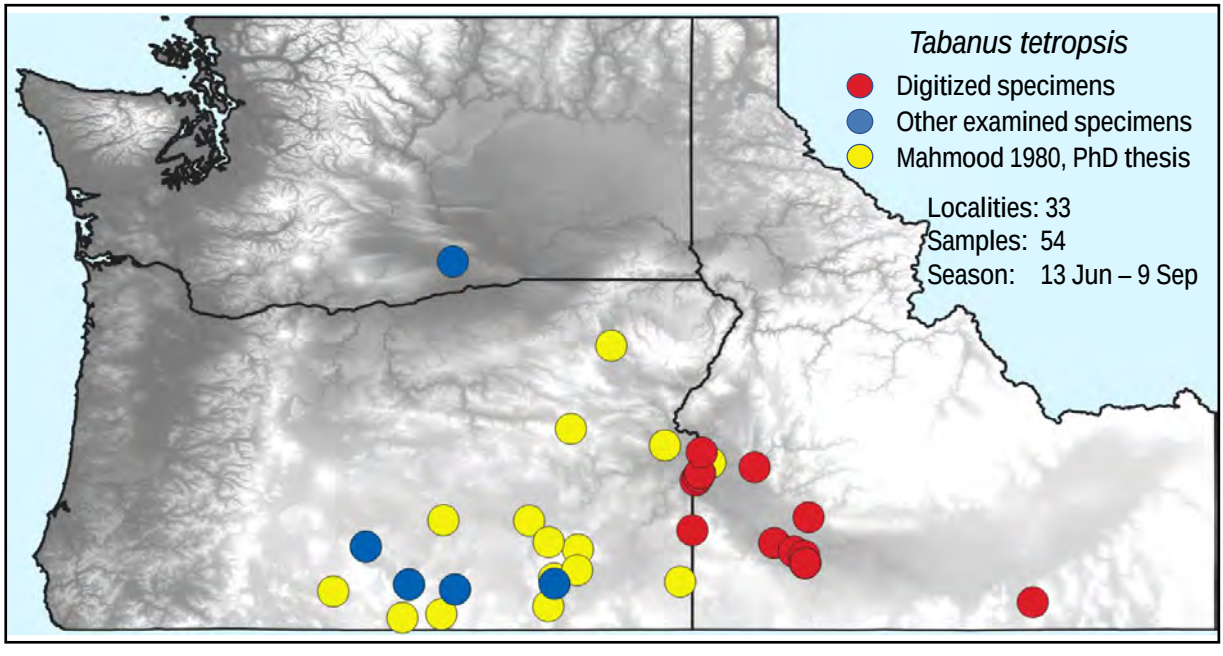
Diagnosis: Length 16-19 mm. A large black species almost identical to *T. aegrotus*. See couplet 3 for distinguishing features, mainly on the frons and abdomen. **Distribution**: BC to Montana, south to California, Utah and Wyoming.

key **_Tabanus sequax_** Williston Ta 4



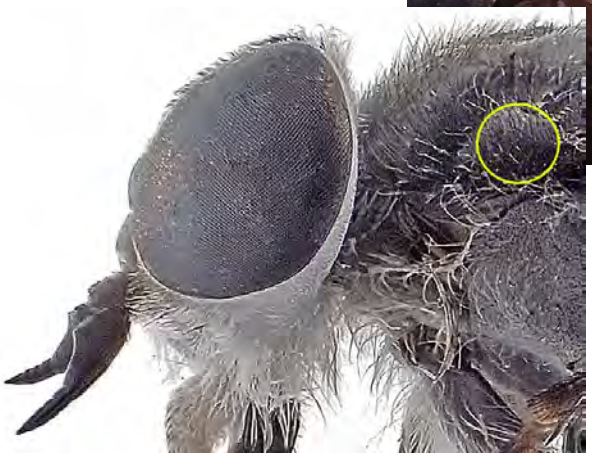
Diagnosis: Length 12-16 mm. A black and white species with densely hairy eyes, more typical of *Hybomitra* than *Tabanus*. Wing with dark spots at fork and crossveins. **Distribution:** BC to Montana, south to Oregon and Idaho.

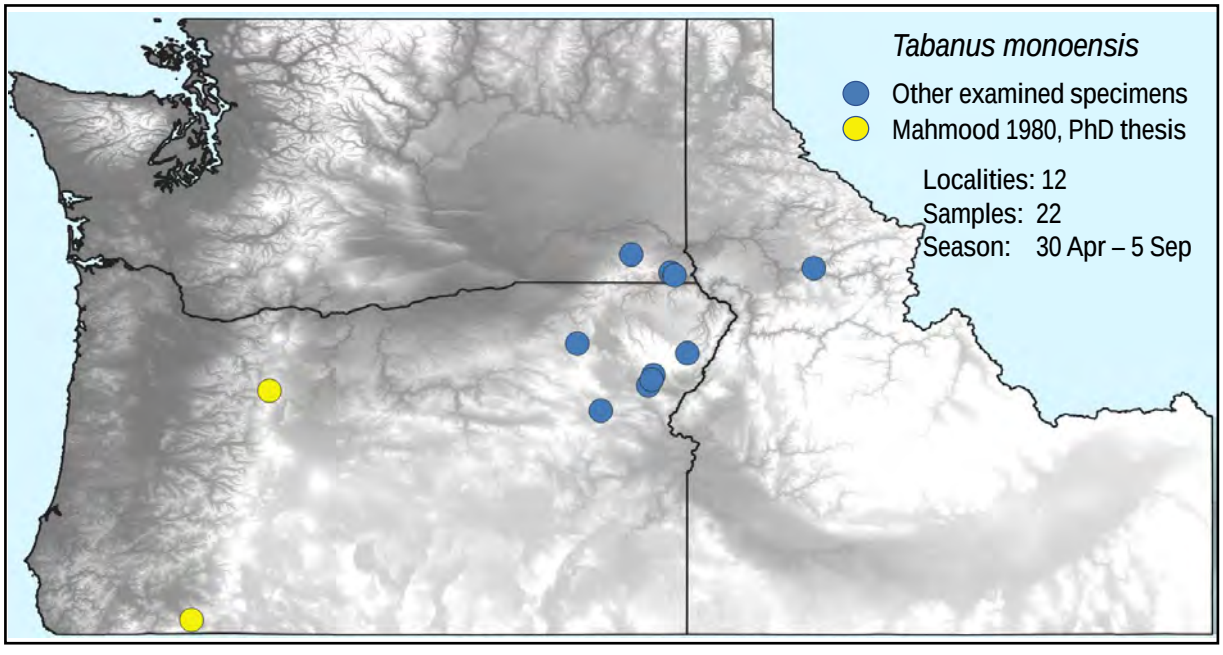
key **_Tabanus tetropsis_** Bigot Ta 5



Diagnosis: Length 10-12 mm. A small grayish-brown species with distinctive long spur at fork. Abdomen with light grayish median stripe on slightly darker tergites. **Distribution:** Washington to Montana, south to California and New Mexico.

key **_Tabanus monoensis_** Hine Ta 6





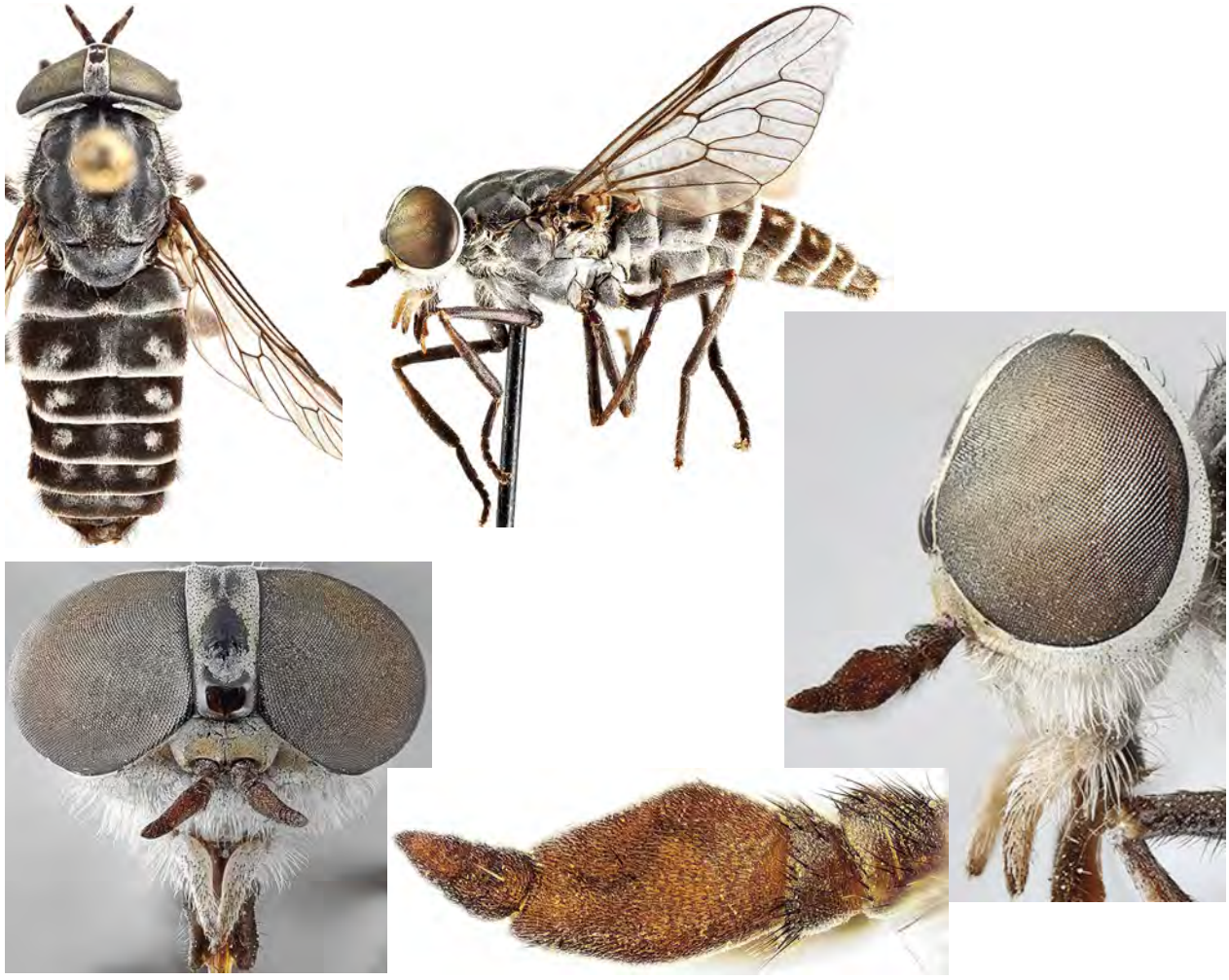
Diagnosis: Length 13-14 mm. A variable species with respect to some of the features used to separate species. Color predominantly black varies to orange-red on abdomen; legs black varying to warm brown; antenna black varying to red scape, pedicel and part of basal plate; prescutal lobe concolorus with thorax, black varying to red. Wing with dark spots at fork and crossveins. **Distribution:** California, Oregon, Washington, Idaho.

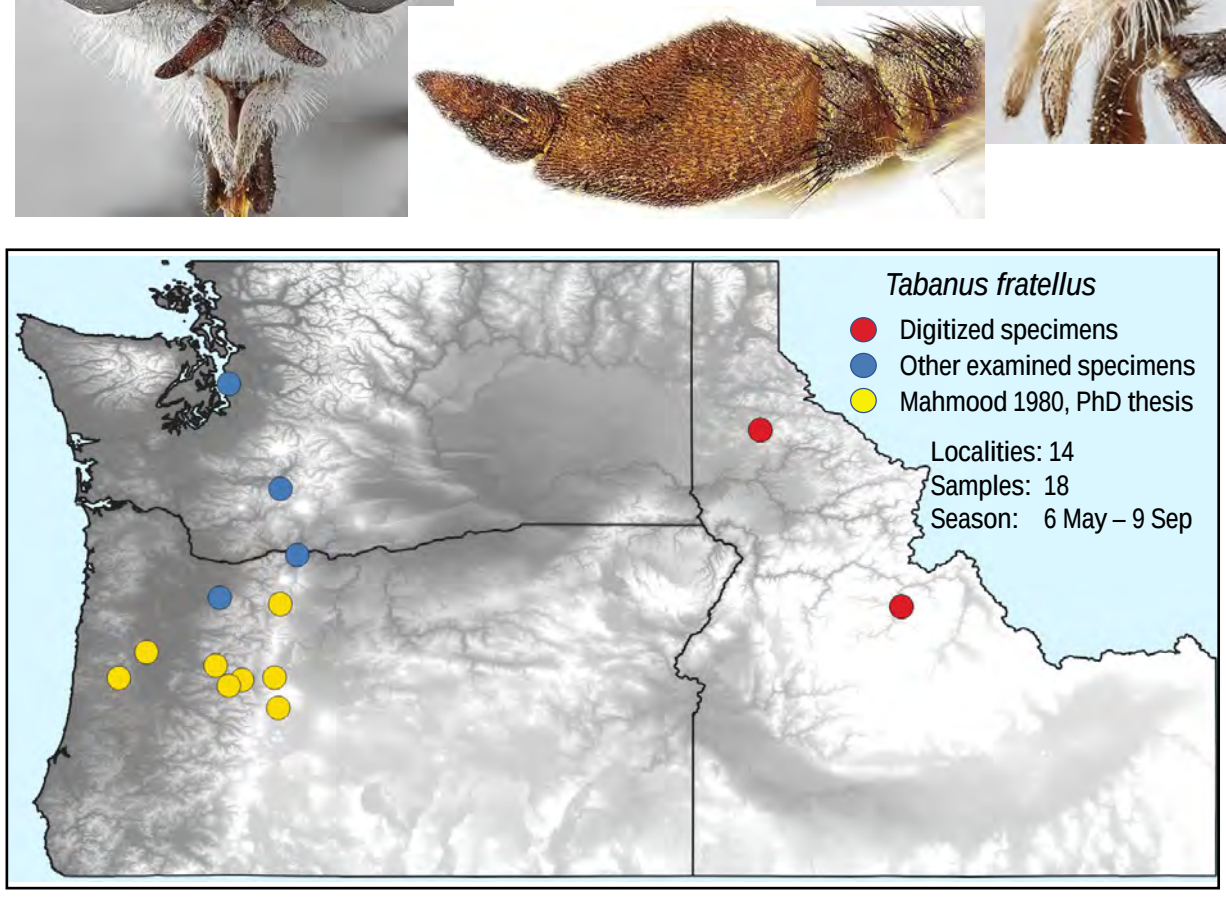
key **_Tabanus reinwardtii_** Wiedemann Ta 7

Diagnosis: Length 13-18 mm. A black and white species with a pinkish tinge and distinctive heavily-spotted wings. Abdomen superficially similar to *Tabanus marginalis* but differs in size of sublateral gray dashes. **Distribution:** BC to Nova Scotia, south to Colorado and Georgia. Not yet known from the PNW.

Known from extreme southern BC and southern Alberta. Adults infrequently collected but Teskey (1990) reports the larvae as being amongst the most commonly collected. I found them to be very common along drainage streams in Alberta. The distribution in BC and Alberta to Colorado, and Georgia in the east, suggests that the species is likely present in the PNW (look for larvae!).

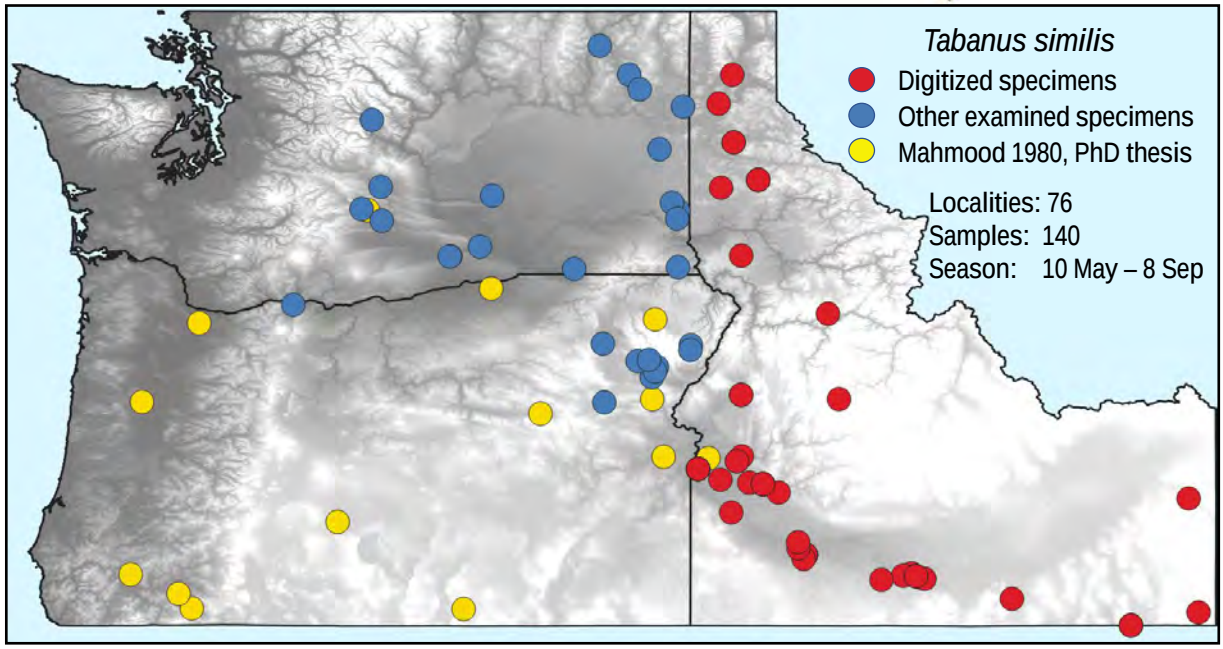
key **_Tabanus fratellus_** Williston Ta 8





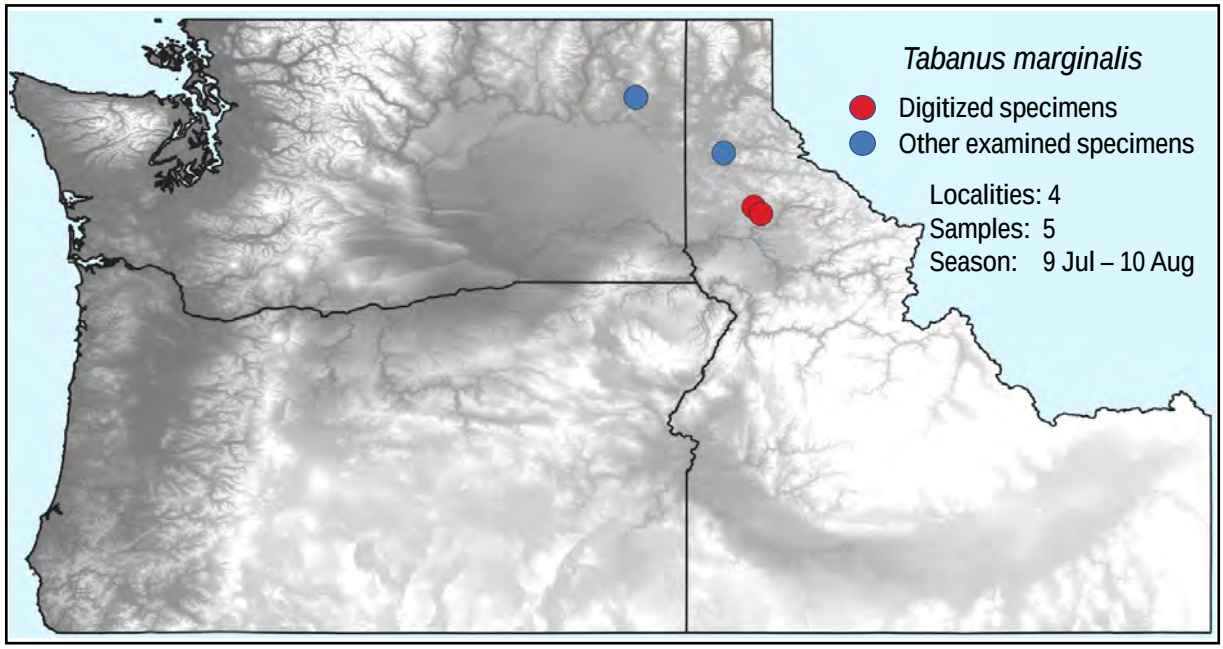
Diagnosis: Length 8-12 mm. A small black and gray species with a unique antenna, the terminal flagellomeres very short, much shorter than length of basal plate. Sometimes treated as a genus or subgenus (*Glaucops*). **Distribution:** Alaska south to northern California and Montana.

key **_Tabanus similis_** Macquart Ta 9



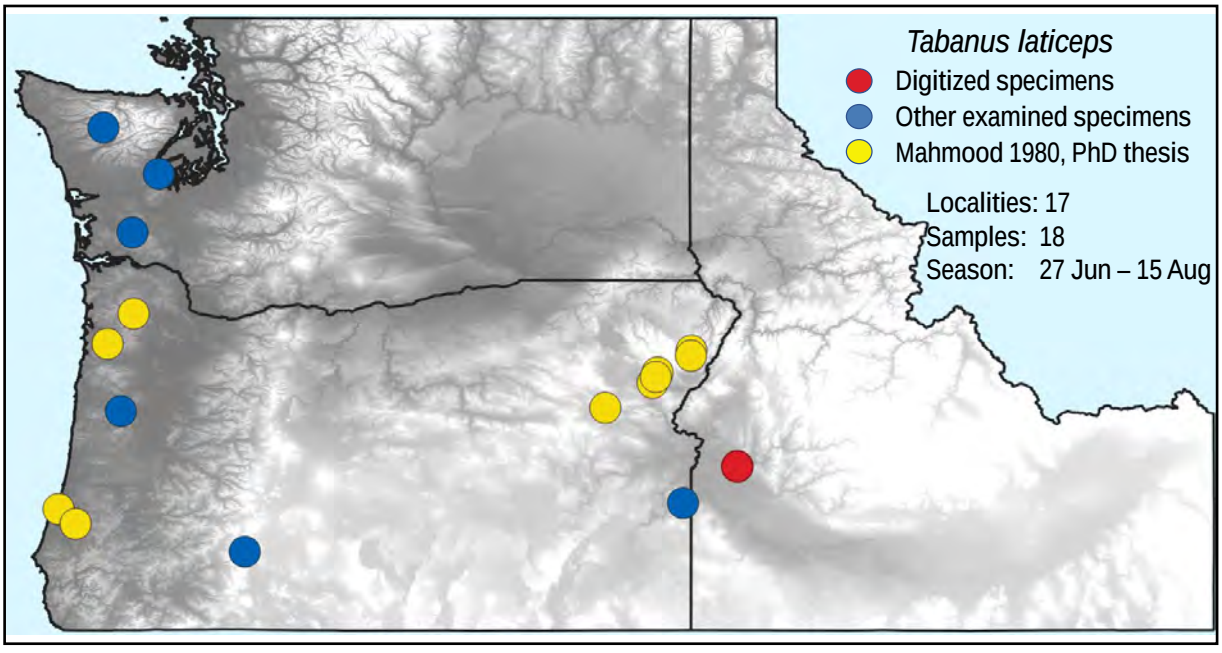
Diagnosis: Length 11-17 mm. Abdomen with a medial pale stripe bordered by a black stripe which is bordered by pale offset patches forming a ragged stripe. Tip of scutellum reddish. Eye pattern, in life, is diagnostic of *T. similis* among all PNW species of *Tabanus.* **Distribution:** BC to Nova Scotia, south to California, northern Arizona and North Carolina.

key **_Tabanus marginalis_** Fabricius Ta 10



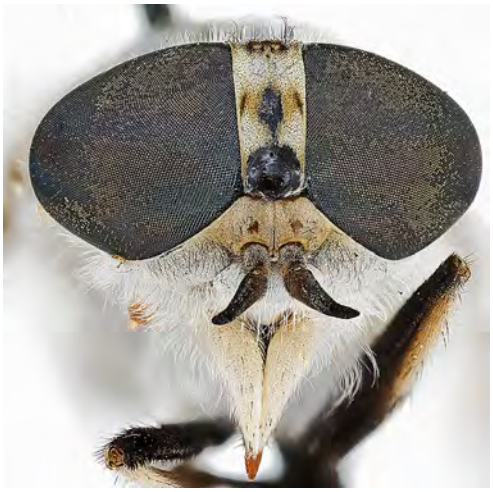
Diagnosis: Length 11-15 mm. A black and white species with wide gray-white patches that extend the full length of the tergites, especially obvious on tergite 2; median pale triangles very small. Small lateral eye stripe useful for separating *marginalis* from similar eastern species. **Distribution:** BC to Nova Scotia, south to Colorado and Virginia.

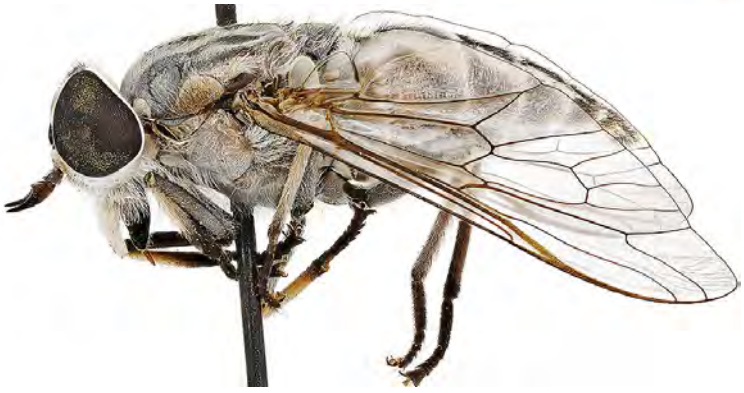
key **Tabanus laticeps** Hine Ta 11

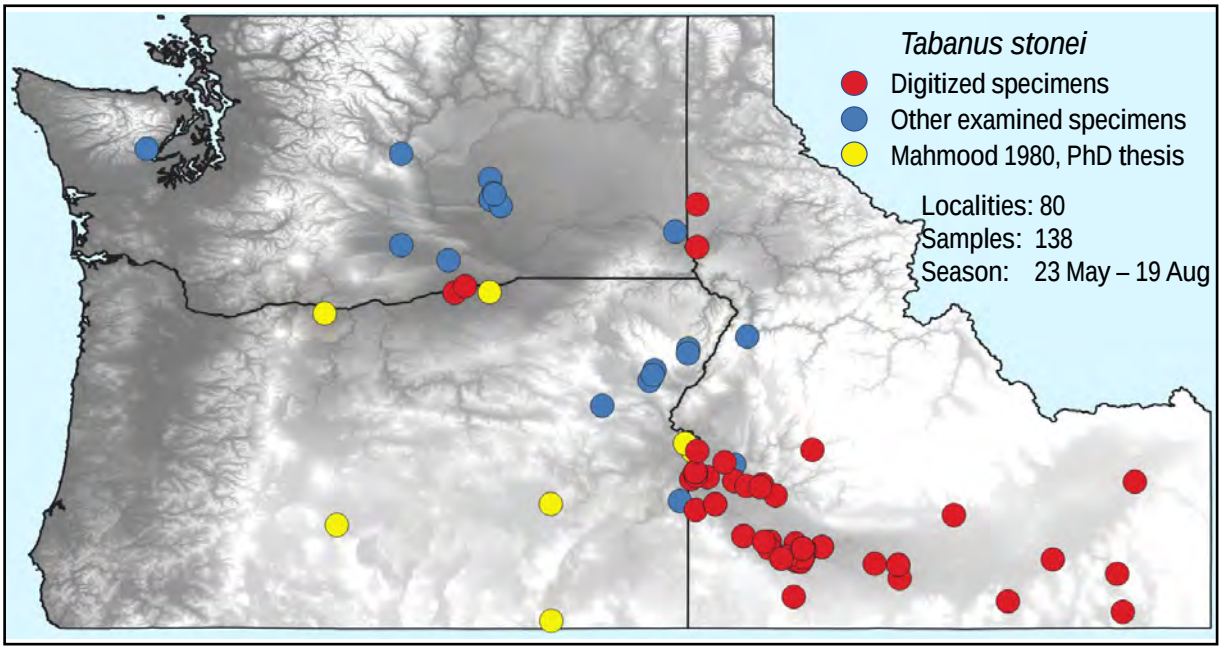


Diagnosis: Length 12-15 mm. Abdomen dark brown to black medially, brownish red to yellow laterally. Vertex with raised large brownish black denuded area and short hairs on eyes. In the past, this species had been placed in *Hybomitra*. Similar to *T. stonei* (see couplet 11 for differentiation). **Distribution:** BC to California, Mexico.

key **_Tabanus stonei_** Philip Ta 12







Diagnosis: Length 13-16mm. Similar to *T. laticeps* but has a much smaller denuded center area on the vertex. Eyes similarly with short hairs. Abdomen with pale median stripe bordered by black oblique dashes which are bordered by pale oblique dashes. **Distribution:** BC to Montana, south to California and Texas.

SF 3 Tabaninae 3.3 *Atylotus*
Key to species; followed by species pages, sequence as separated in key

Key to *Atylotus* females

1 Dorsal abdomen basically yellow-orange-red laterally, with dark median area **2**

-- Dorsally not with this pattern, predominantly black or with pale median stripe **3**

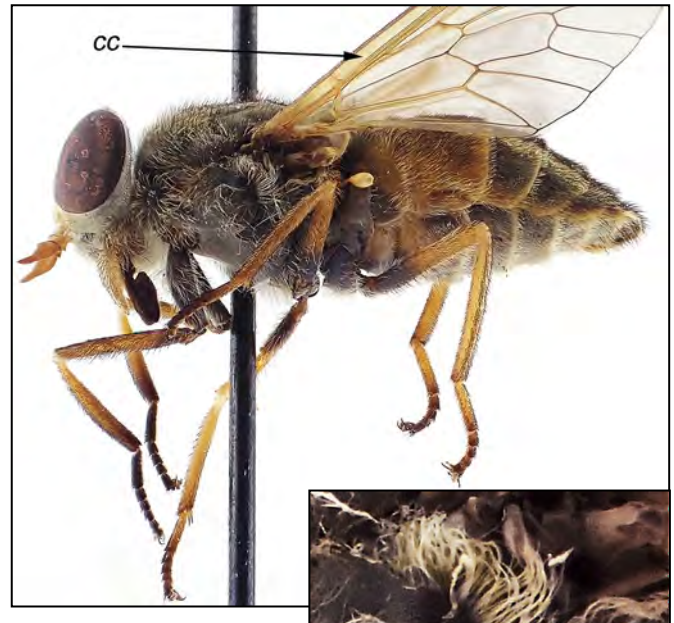
key couplet 1

key couplet 1--

2(1) Body hair almost completely white; black hair only on antenna, palpus, notopleural lobe, tibia, and tarsus. Notopleural lobe (nl) paler than dorsal thorax. Costal cell hyaline…….. **At 1 *utahensis***

-- Body hairs yellow. Notopleural lobe black not contrasting with thorax. Tuft of yellow hairs below wing base (insert). Costal cell (cc) yellow ..... **At 2 *tingaureus***

At 1 *Atylotus utahensis*



At 2 *Atylotus tingaureus*

Key to *Atylotus* females continuing

3(1) Abdomen grayish-fawn as a result of large pale median triangles and sublateral patches on each tergite forming wide stripes ..... **At 3 *calcar***

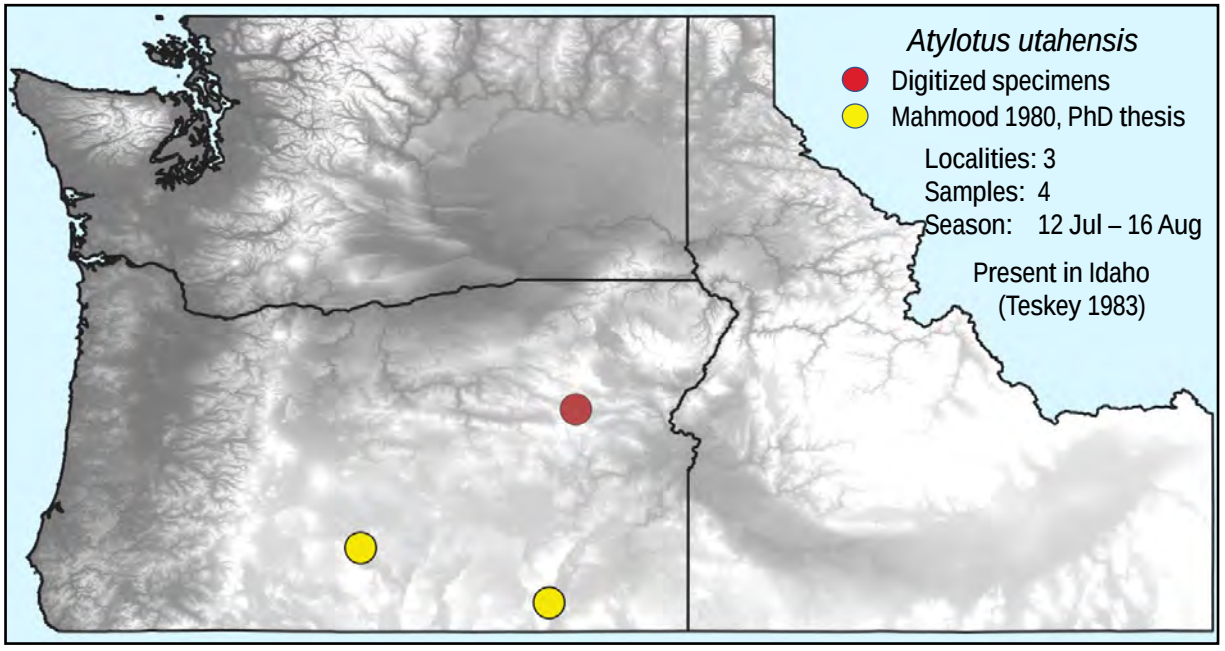
-- Abdomen dominantly black with little evidence of median and sublateral pale areas on tergite ..... **At 4 *insuetus***

At 3 *Atylotus calcar*

At 4 *Atylotus insuetus*

key

Atylotus utahensis (Rowe & Knowlton) At 1

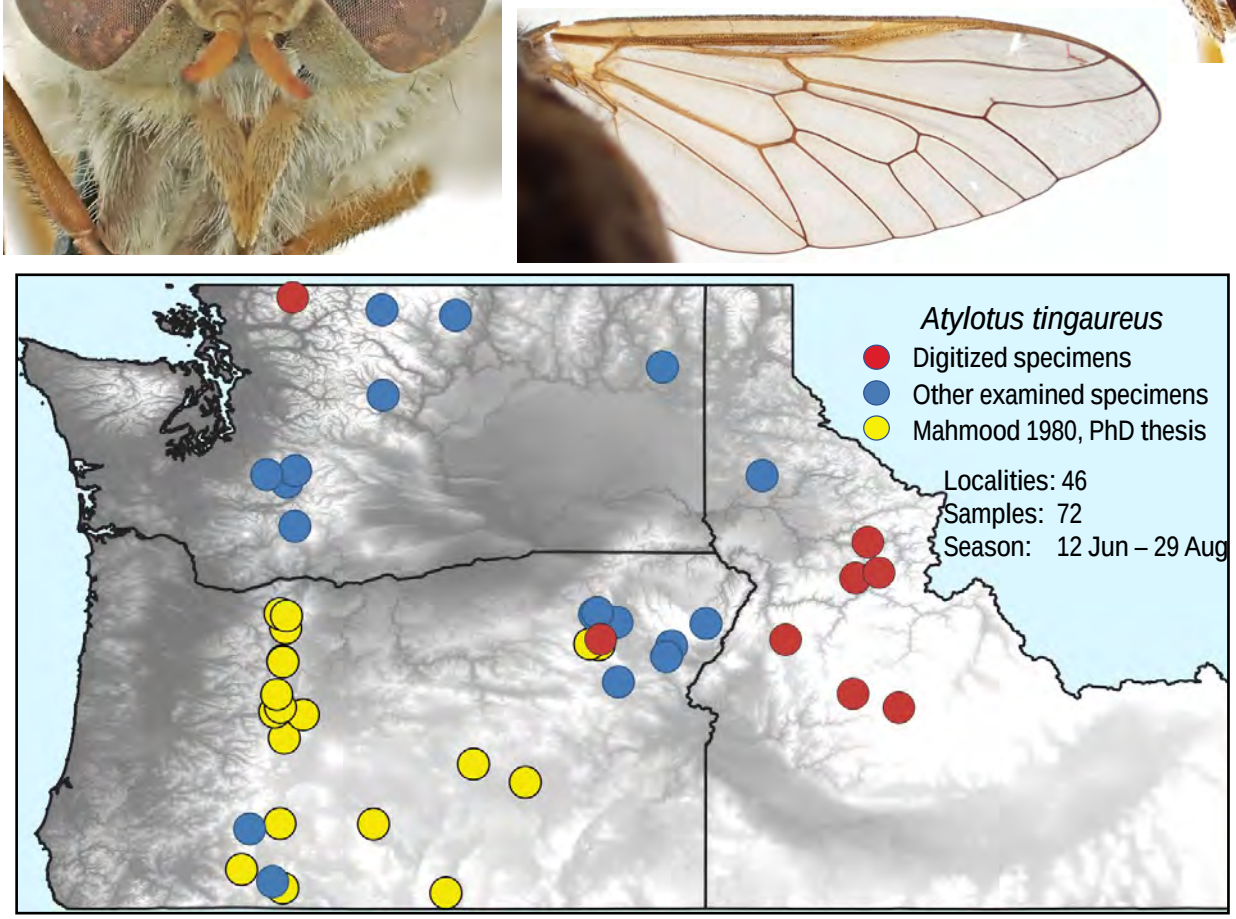


Diagnosis: Length 9-12 mm. A mostly white-haired species. Two narrow frontal calli, about one-half or less the width of frons. Eye with short narrow stripe. Antenna uniformly pale. Notopleural lobe paler than adjacent thorax. Costal cell hyaline. **Distribution:** Oregon to Wyoming, south to California and Utah.

key

Atylotus tingaureus (Philip)

At 2

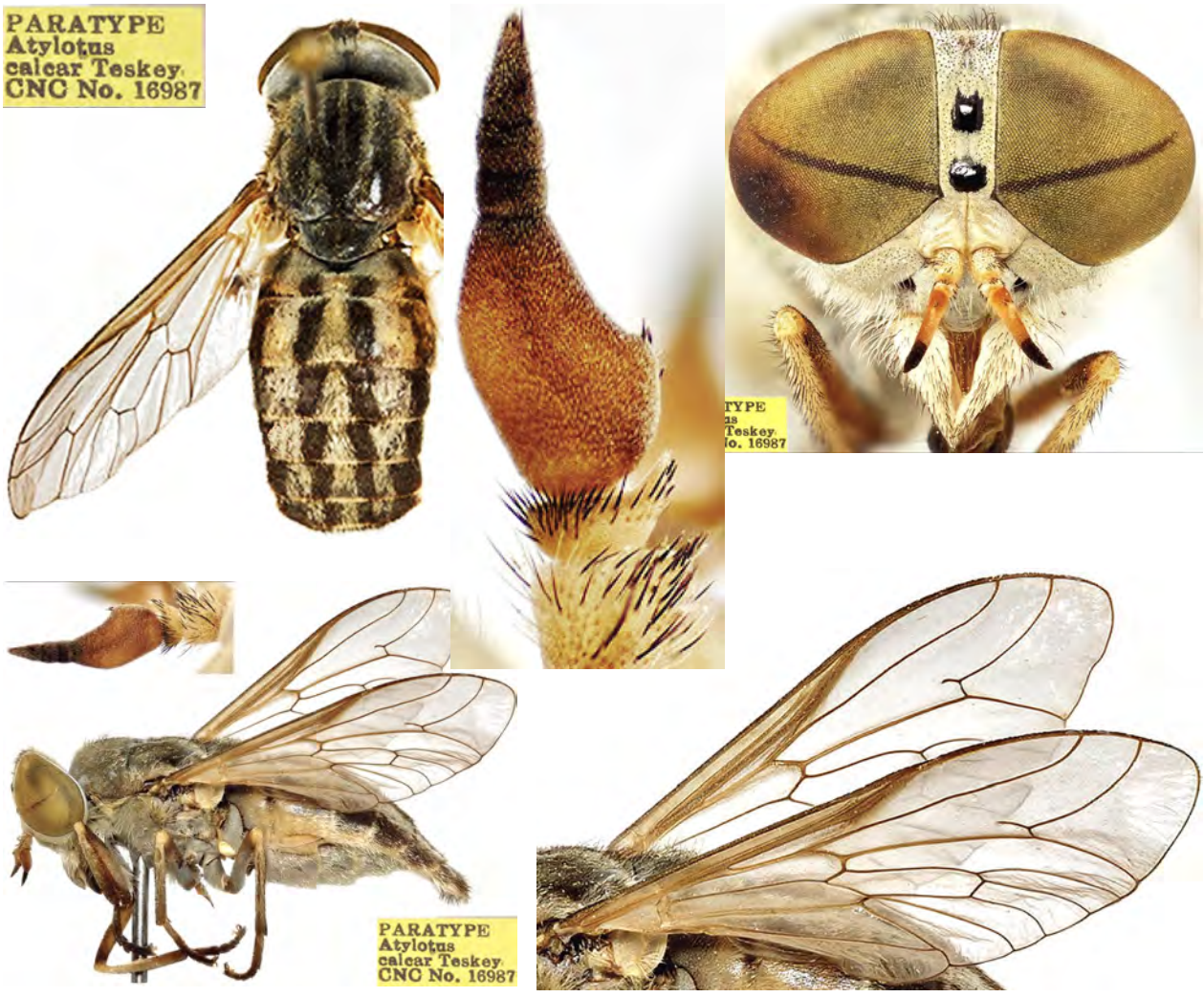


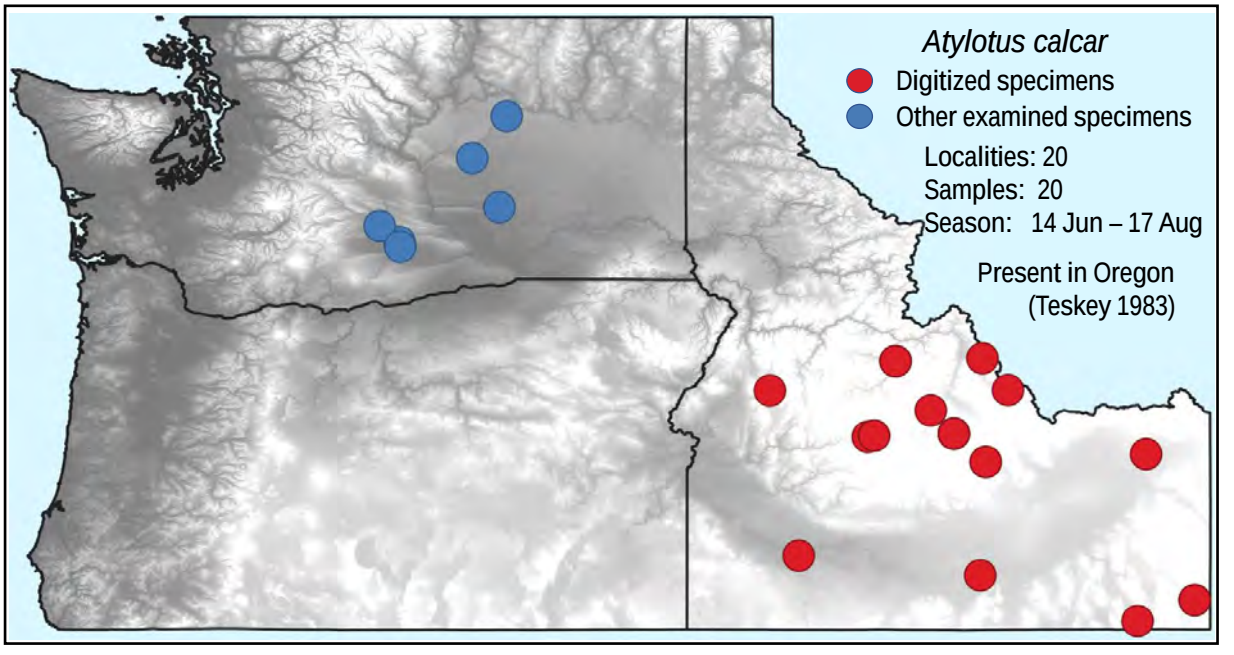
Diagnosis: Length 11-13 mm. Abdomen with broad black mid-dorsal stripe; tergites 1-3 orange laterally. Antenna uniformly orange. Thorax and notopleural lobe black; tuft of yellowish hair below wing base. Legs yellowish-orange. Femur base black. Costal cell yellow. **Distribution:** Alaska to Montana, south to California.

key

Atylotus calcar Teskey

At 3



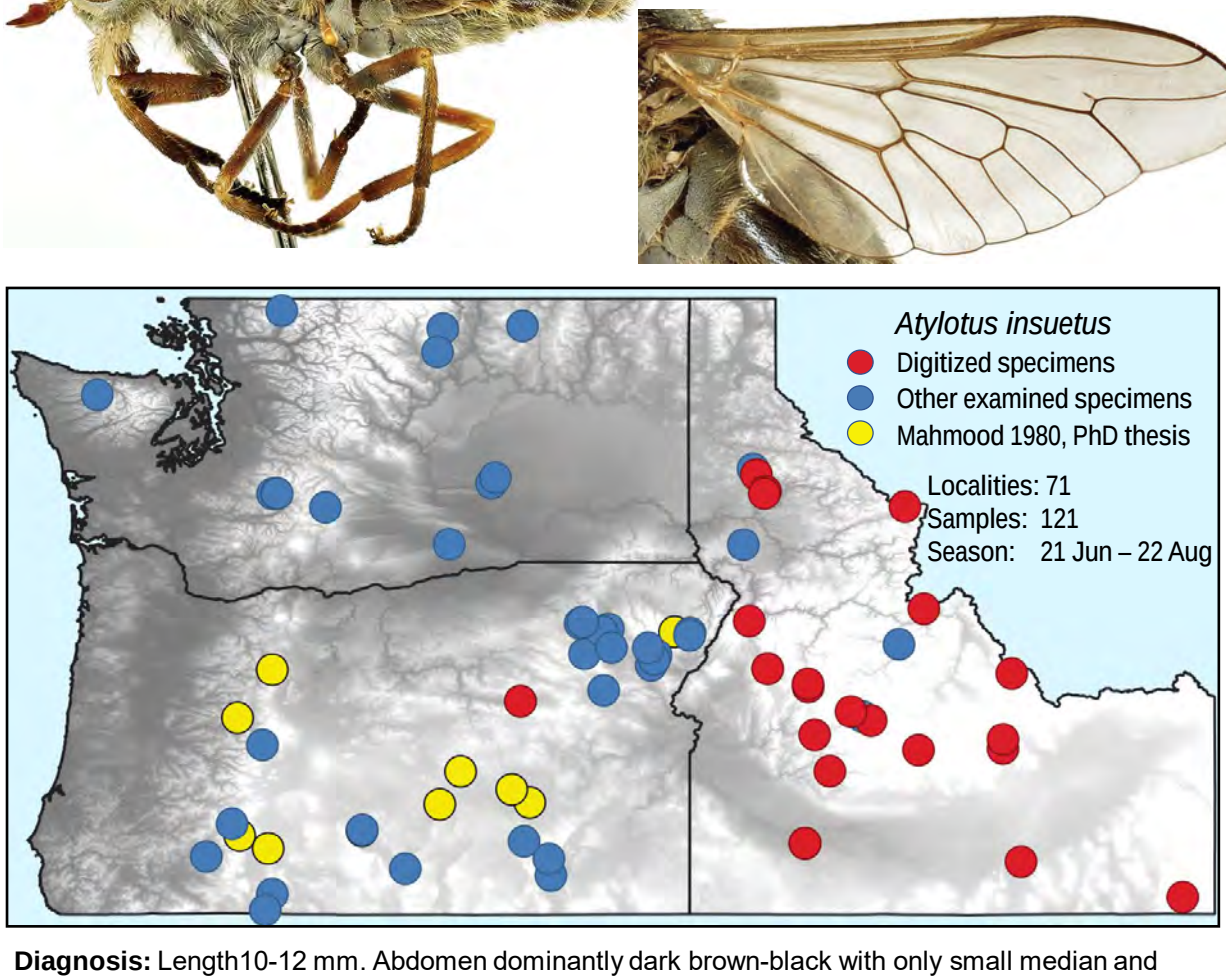


Diagnosis: Length 10-13 mm. Abdomen dark brown but overlain with large pale grayish triangles, in midline, and wide pale dashes sublaterally. Antenna with apical flagellomeres darker than basal. Fork with long spur. **Distribution:** Yukon to Manitoba, south to California and Arizona.

key

Atylotus insuetus Osten Sacken

At 4



Diagnosis: Length10-12 mm. Abdomen dominantly dark brown-black with only small median and sublateral areas of pale hairs. Antenna orange-yellow. Fork with short stump. Costal cell colored.
Distribution: Alaska to Manitoba ? (1 record), south to California and Arizona. A species of montane areas.

SF 3 Tabaninae 3.4 *Hybomitra*
Identification plate 1: dorsal, sequence as separated in key

left-click image for species page

Hy 1 *zonalis*

Hy 2 *procyon*

Hy 3 *lanifera*

Hy 4 *lasiophthalma*

Hy 5 *agora*

Hy 6 *rupestris*

Hy 7 *osburni*

Hy 8 *rhombica*

Hy 9 *liorhina*

Hy 10 *aasa*

Hy 11 *lurida*

Hy 12 *nuda*

Hy 13 *captonis*

Hy 14 *melanorhina*

Hy 15 *tetrica*

Hy 16 *calfornica*

Hy 17 *epistates*

Hy 18 *atrobasis*

Hybomitra identification plate 2: dorsal, sequence as separated in key

Hy 19 *phaenops*

Hy 20 *sonomensis*

Hy 21 *enigmatica*

Hy 22 *trepida*

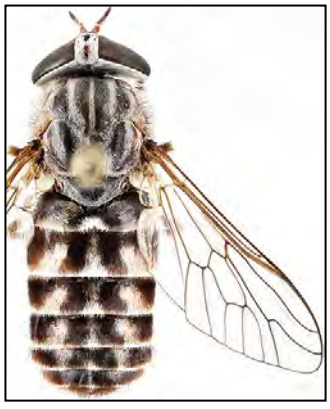
Hy 23 *zygota*

Hy 24 *arpadi*

Hy 25 *fulvilateralis*

Hy 26 *affinis*

Hy 27 *hearlei*



Hy 28 *itasca*

Hy 29 *pechumani*

Hy 30 *illota*

Hy 31 *pediontis*

Hy 32 *opaca*

Hy 15 *tetrica**

Hy 33 *frontalis*

* Hy 15 *tetrica,* morph with the pruinose subcallus that keys out before *frontalis.*

SF 3 Tabaninae 3.4 *Hybomitra*
Key to species; followed by species pages, sequence as separated in key

Key to *Hybomitra* females*

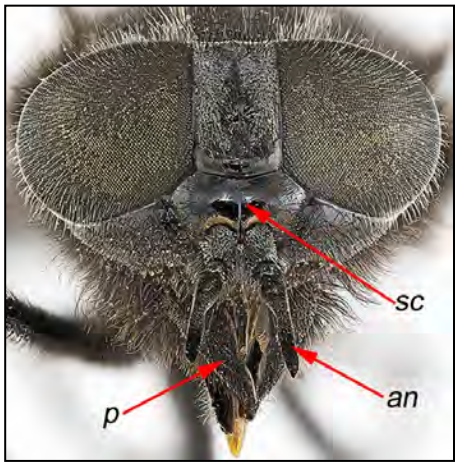
1 Abdominal tergites black with yellow posterior band ..... **Hy 1 *zonalis***

-- Tergites not black and yellow **2**

Hy 1 *Hybomitra zonalis*

2(1) Entirely black, including palpus (p), antenna (an) and legs. Subcallus (sc) glossy black ..... **Hy 2 *procyon***

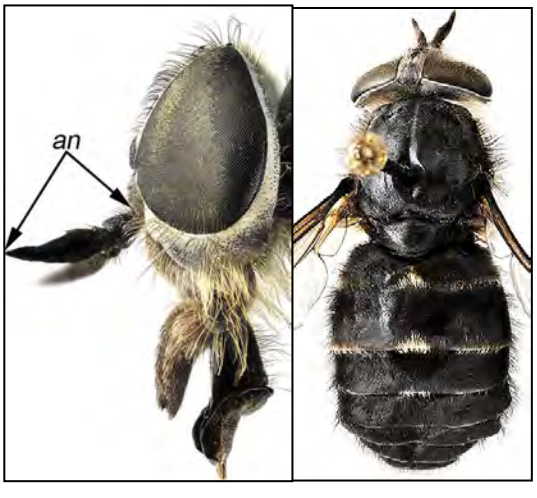
-- Not entirely black, parts of palpus, antenna, legs, and tergites with pale areas. Subcallus glossy or pruinose **3**



Hy 2 *Hybomitra procyon*

3(2) Predominantly black, including antenna (an). Tergites 1-3 with small white-haired triangles in the mid-line. .... **Hy 3 *lanifera***

-- Tergites with more extensive markings. Antenna not entirely black, always with some orange-red (o-r)……,,,……...…….....4



Hy 3 *Hybomitra lanifera*

couplet 3--

* After getting a tentative ID using the key, check the species page for images with greater detail

Key to *Hybomitra* females continuing

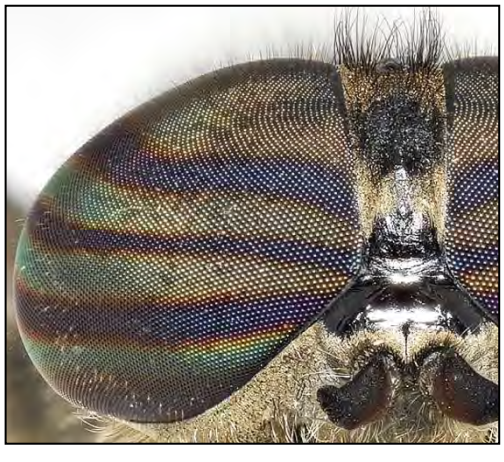
4(3) Wing membrane bordering all crossveins and fork with dark pigmentation.
Abdomen orange-red with black median stripe and pale midline triangles.
Subcallus (sc) denuded, shiny black ..... **Hy 4 *lasiophthalma***

-- Wing membrane not with the above combination of dark pigmentation.
Abdomen and subcallus variable **5**

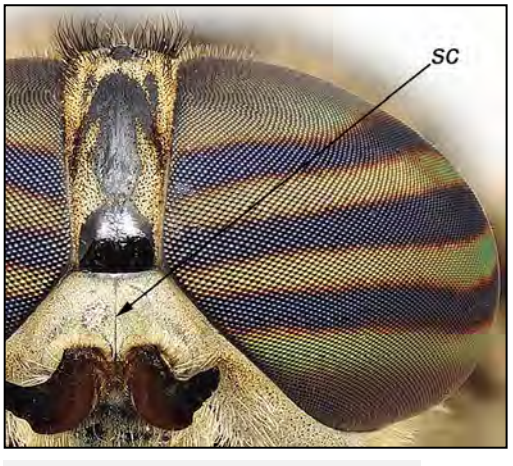
Hy 4 *Hybomitra lasiophthalma*

5(4) Subcallus at least 50% denuded, usually 100%, and glossy [*aasa, agora, captonis, liorhina, lurida, melanorhina, nuda, osburni, rhombica, rupestris,* some *tetrica*] **6**

-- Subcallus (sc) pruinose [*affinis, arpadi, atrobasis, californica, enigmatica, epistates, frontalis, fulvilateralis, hearlei, illota, itasca, opaca, pechumani, pediontis, phaenops, sonomensis, trepida, zygota,* some *tetrica*] **17**



couplet 5 denuded subcallus

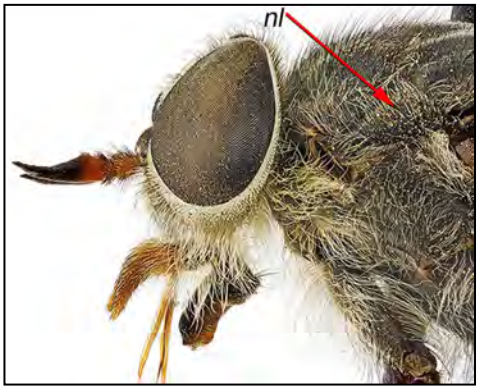


couplet 5-- pruinose subcallus

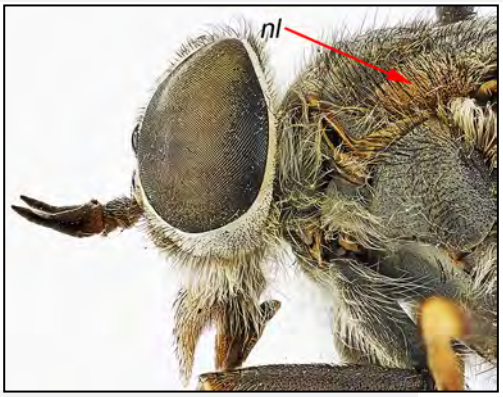
Key to *Hybomitra* females continuing

6(5) Notopleural lobe (nl) black (may be partially obscured by pale hairs) and not contrasting with adjacent areas of thorax [*agora, osburni, rhombica, rupestris*] **7**

-- Notopleural lobe (nl) pale (ignore any black hairs), often reddish and contrasting with adjacent areas of thorax [*aasa, captonis, liorhina, lurida, melanorhina, nuda, tetrica*] **11**



couplet 6 notopleural lobe black



couplet 6-- notopleural lobe pale

7(6) Second abdominal tergite extensively orange or brown laterally [some *agora, rupestris*] **8**

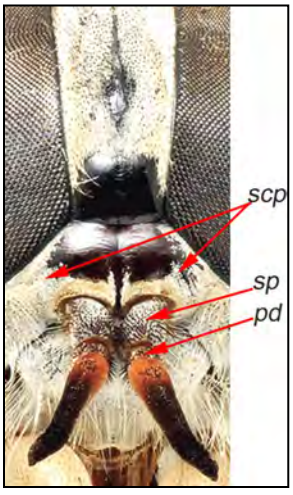
-- Second tergite not extensively orange [some *agora, osburni, rhombica*] **9**

couplet 7

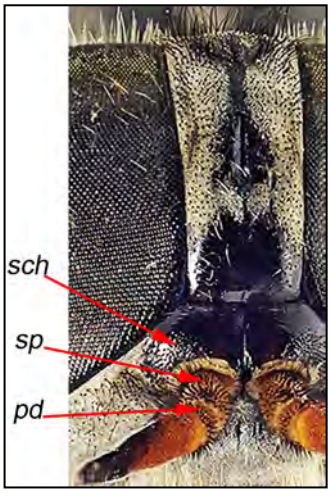
couplet 7--

8(7) Scape (sp) and pedicel (pd) gray-black. Subcallus only partly denuded, fine pruinosity laterally (scp) ..... (in part) **Hy 5 *agora***

-- Scape (sp) and pedicel (pd) orange. Subcallus completely denuded, long hairs laterally (sch)..... **Hy 6 *rupestris***



Hy 5 *Hybomitra agora*



Hy 6 *Hybomitra rupestris*

Key to *Hybomitra* females continuing

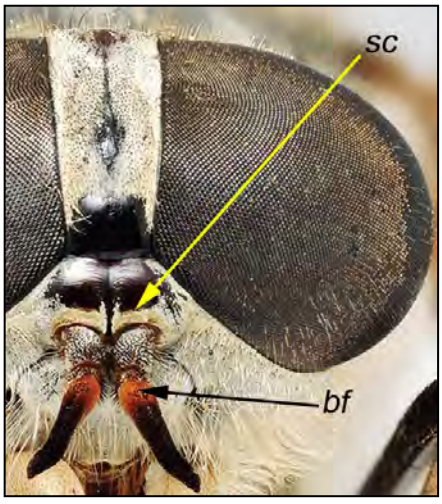
9(7) Abdomen, and thorax, shiny black in ground color. Tergites 2 & 3 with median and sublateral triangles of pale hairs extending no more than one-half the length of the tergites ..... **Hy 7 *osburni***

-- Thorax dull gray in ground color. Abdomen either dull black or brown in ground color [some *agora, rhombica*]..... **10**

Hy 7 *Hybomitra osburni*

10(9) Subcallus (sc) partly denuded, pruinose laterally. Basal flagellomere (bf) orange, remainder black. Abdomen ground color brown ..... (in part) **Hy 5 *agora***

-- Subcallus fully denuded laterally. Much of the flagellomere orange. Abdomen ground color black ..... **Hy 8 *rhombica***



Hy 5 *Hybomitra agora*

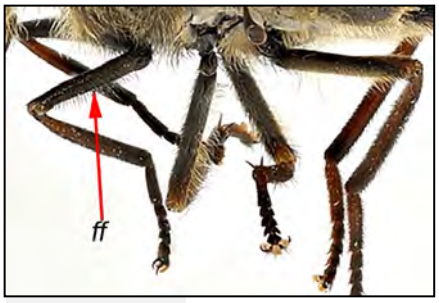
Hy 8 *Hybomitra rhombica*

Key to *Hybomitra* females continuing

11(6) Femora ground color partly or wholly yellow-brown [*aasa, liorhina*] **12**

-- At least fore femora (ff) ground color black [*captonis, lurida, melanorhina, nuda, tetrica*] **13**

couplet 11

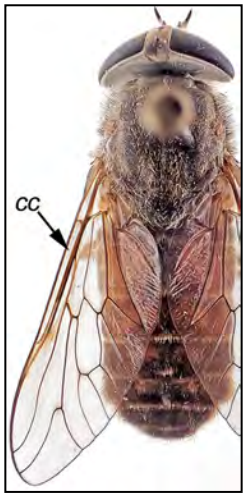


couplet 11--

12(11) Abdomen with broad black median chevrons with median gray-haired triangles; laterally with pale oblique dashes on a dark brown ground color. Costal cell clear…….. ..... **Hy 9 *liorhina***

-- Abdominal tergites orange laterally. Costal cell (cc) lightly pigmented ..... **Hy 10 *aasa***

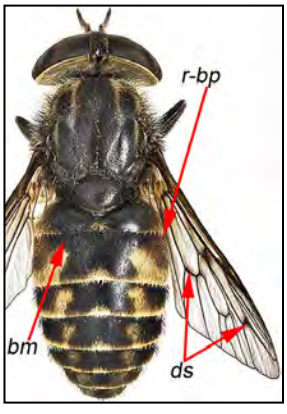
Hy 9 *Hybomitra liorhina*



Hy 10 *Hybomitra aasa*

13(11) Mostly black with, at most, small reddish-brown patch(r-bp) on anterior corner of tergite 2 and posterior corner of tergite 1. Median black mark (bm) on tergite 2 expands anteriorly along the posterior border of tergite 1. Dark spots (ds) at wing fork and edges of crossveins ..... **Hy 11 *lurida***

-- Extensive areas of orange-red on abdominal tergites. Median black mark on tergite 2 not expanding along posterior border of tergite 1 Wing hyaline [*captonis, melanorhina, nuda,* some *tetrica*] **14**



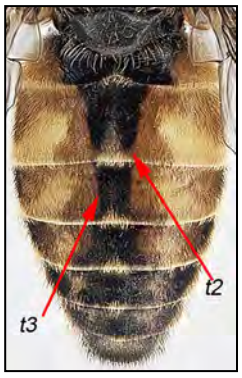
Hy 11 *Hybomitra lurida*

couplet 13--

Key to *Hybomitra* females continuing

14(13) Abdomen broadly orange brown laterally on first four tergites. Median black stripe narrowest on posterior of tergite 2 (t2) and all of tergite 3 (t3) [*nuda, captonis*] **15**

-- Abdomen not broadly orange brown laterally. Median black stripe wide, not narrowed on tergites 2 & 3 [*melanorhina,* some *tetrica*] **16**

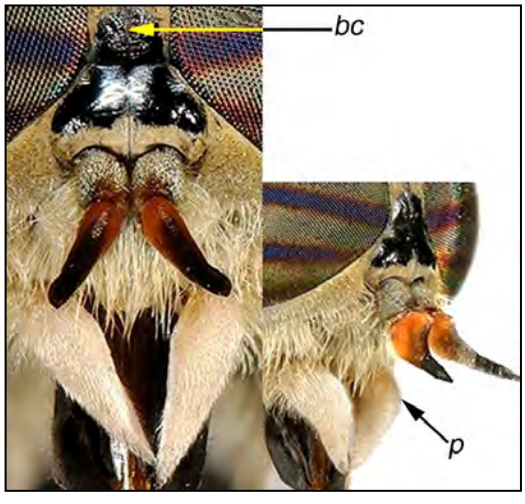


couplet 14

couplet 14--

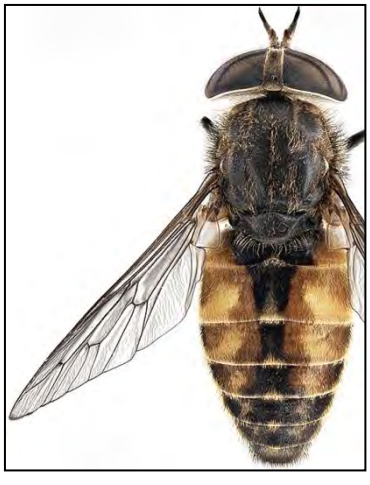
15(14) Basal callus (bc) black, flat and wrinkled and almost touching eyes. Palpus (p) swollen at base, creamy white with a few black hairs ..... **Hy 12 *nuda***

-- Basal callus dark brown, more convex and less wrinkled, well separated from eyes. Palpus not swollen at base, darker, with many black hairs ..... **Hy 13 *captonis***



Hy 12 *Hybomitra nuda*

Hy 13 *Hybomitra captonis*



Hy 12 *Hybomitra nuda*

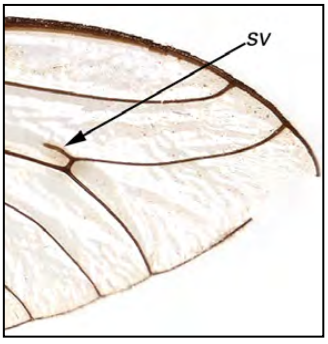
Hy 13 *Hybomitra captonis*

Key to *Hybomitra* females continuing

16(14) Stump vein absent at fork ..... **Hy 14 *melanorhina***

-- Stump vein (sv) present at fork ..... (in part) **Hy 15 *tetrica***

Hy 14 *Hybomitra melanorhina*



Hy 15 *Hybomitra tetrica*

The following key refers to species with a pruinose subcallus

17(5) Abdomen broadly orange brown laterally with median black stripe weakly parallel-sided (*arpadi*) or narrowest on tergite 2 of 3 [*affinis*, *californica*, *enigmatica*, *epistates*, *fulvilateralis, sonomensis*, *trepida*] or of wider even width [*atrobasis*, *phaenops*, *zygota*]; sublateral spots weak (except in *trepida*) **18**

-- Abdomen not broadly orange brown laterally, often black and white, or median stripe on tergite 2 widened at posterior margin; sublateral pale spots distinct [*frontalis, hearlei, illota, itasca*, *opaca*, *pechumani, pediontis, tetrica*] **29**

affinis

arpadi

californica

enigmatica

epistates

fulvilateralis

sonomensis

trepida

atrobasis

phaenops

zygota

couplet 17

couplet 17--

frontalis

hearlei

illota

itasca

opaca

pechumani

pediontis

tetrica

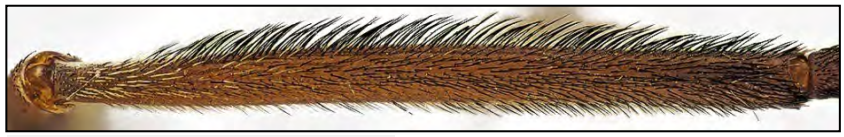
Key to *Hybomitra* females continuing

18(17) Tibial fringe (t f) of hairs on hind leg predominantly pale, yellow-orange; few black hairs interspersed. Basal plate of antenna totally orange .....**Hy 16 *californica***

-- Tibial fringe black. Basal plate (bp) darker black apically **19**

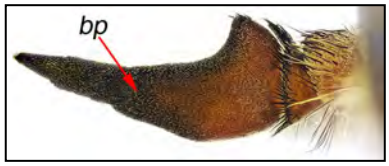
Hy 16 *Hybomitra californica*

Hy 16 *Hybomitra californica,* pale tibial fringe



couplet 18-- black tibial fringe

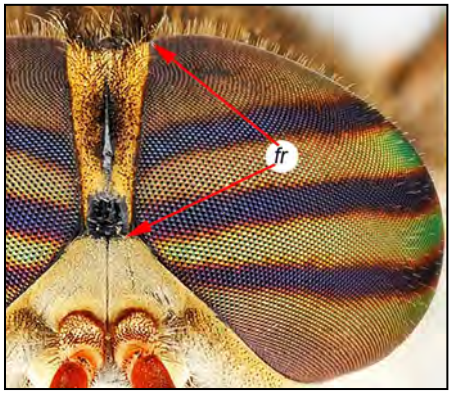
Hy 16 *Hybomitra californica,* basal plate orange



couplet 18-- antenna basal plate dark apically

19(18) Frons 4.5-5.0 times as high as basal width and strongly divergent from base to apex (fr) ..... **Hy 17 *epistates***

-- Frons less than 4.5 x as high as basal width, weakly divergent **20**



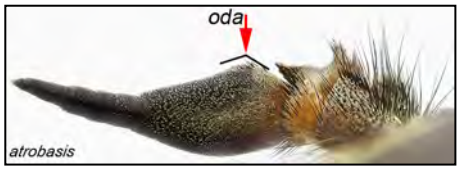
Hy 17 *Hybomitra epistates*

couplet 19--

Key to *Hybomitra* females continuing

20(19) Basal plate narrow with obtuse dorsal angle (oda) and no dorsal excavation [*atrobasis, enigmatica, phaenops, sonomensis*] **21**

-- Basal plate (bp) broader with acute dorsal angle (ada) or nearly 90 degrees, and at least a slight dorsal excavation (de) [*affinis, arpadi, fulvilateralis, trepida, zygota*] **25**



atrobasis

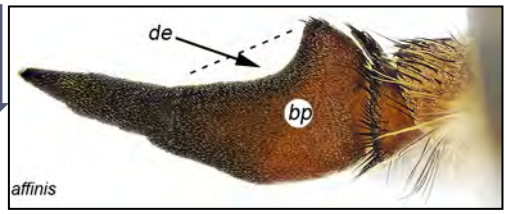
enigmatica

phaenops

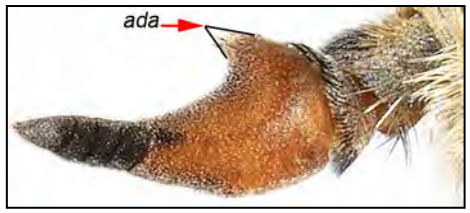
sonomensis

couplet 20

couplet 20--



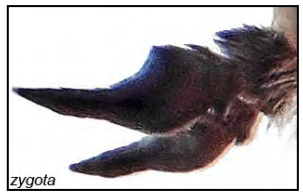
affinis



arpadi

fulvilateralis

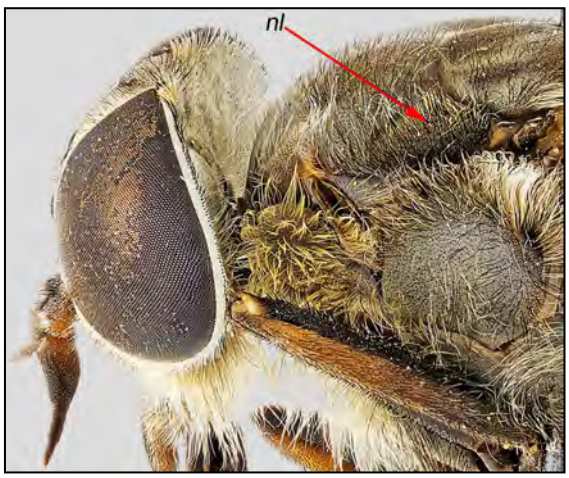
trepida



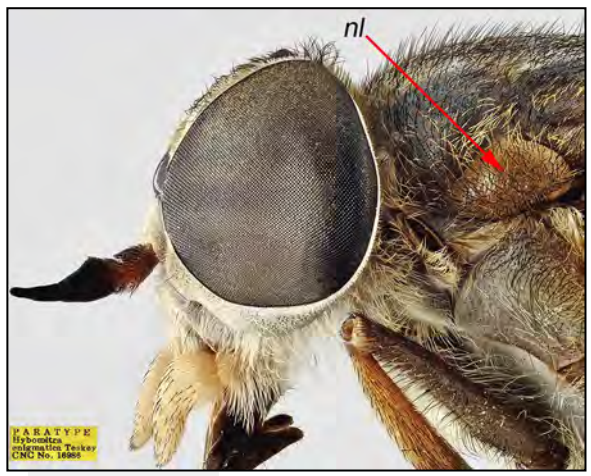
zygota

21(20) Notopleural lobe (nl) black [*atrobasis,* some *phaenops*] **22**

-- Notopleural lobe (nl) reddish brown [*enigmatica, sonomensis,* some *phaenops*]..... **23**



couplet 21

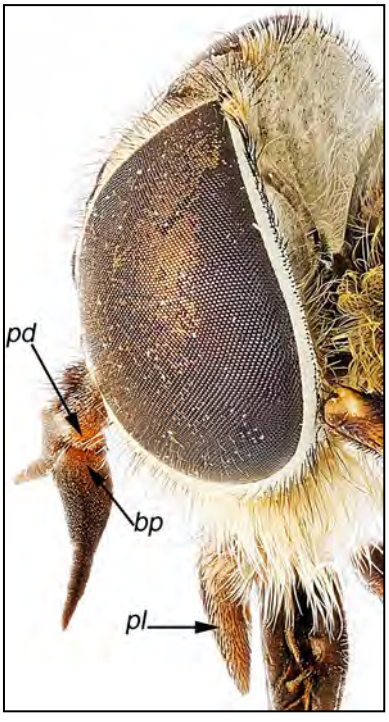


couplet 21--

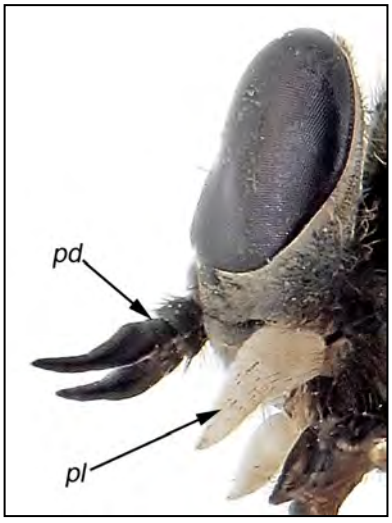
Key to *Hybomitra* females continuing

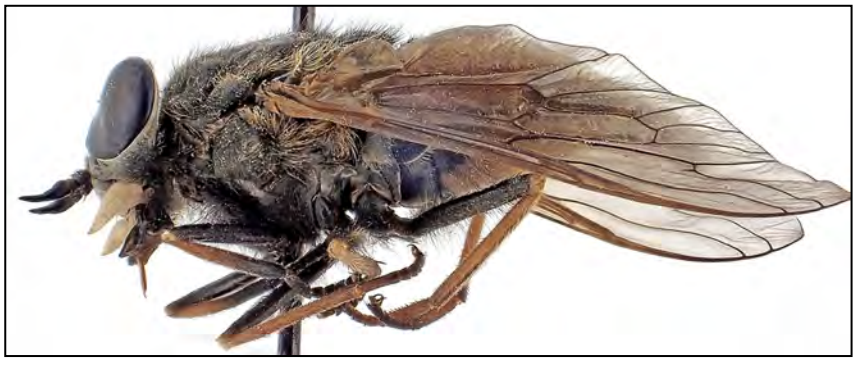
22(21) Pedicel (pd) of antenna red, basal half of basal plate (bp) red. Palpus (pl) light brown with black hair .....**Hy 18 *atrobasis***

-- Antenna totally black, including pedicel (pd). Palpus (pl) creamy white with a mix of black and white hair .....(in part) **Hy 19 *phaenops***



Hy 18 *Hybomitra atrobasis*





Hy 19 *Hybomitra phaenops*

Key to *Hybomitra* females continuing

23(21) Eye densely pilose (very many hairs). Coastal species ..... **Hy 20 *sonomensis***

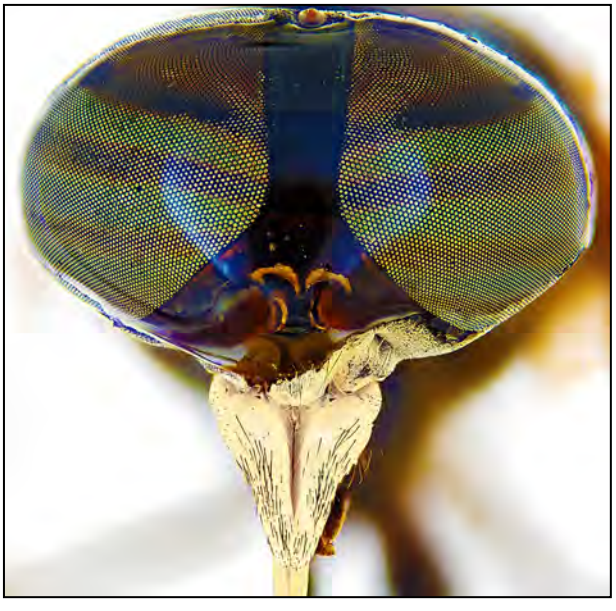
-- Eye with very few hairs. Inland, not coastal [*eigmatica,* some *phaenops*] ……..... **24**

Hy 20 *Hybomitra sonomensis*

24(23) Background eye color bright green throughout except for 3 narrow dark bluish-purplish transverse bands across middle region; the bands not reaching the lateral (posterior) margin ..... (in part) **Hy 19 *phaenops***

-- Eye bright green, 3 wide dark bluish-purplish transverse bands through middle region and concolorous, dark, patches at upper and lower margins; the bands extending, at full width, to the posterior margin ..... **Hy 21 *enigmatica***

Hy 19 *Hybomitra phaenops*



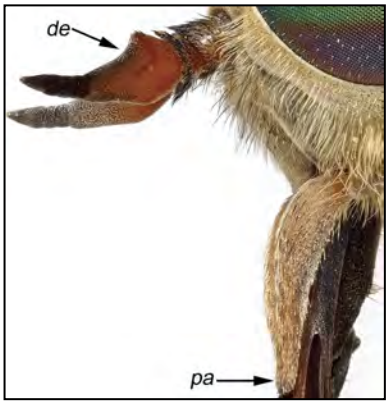
Hy 21 *Hybomitra enigmatica*

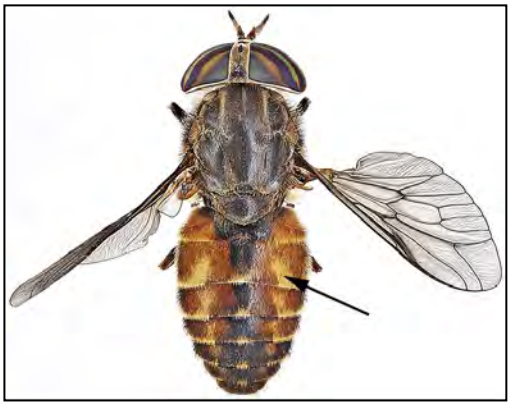
Each specimen has had its head rehydrated to show eye pattern. Head of *enigmatica* still covered with a film of water. Note the 3 very narrow eye band in *phaenops* and the much wider 3 purple bands in *enigmatica*. In life the background eye color is bright green in both species.

Key to *Hybomitra* females continuing

25(20) Palpus (pa) long and narrow, sharply pointed apically. Basal plate of antenna with shallow dorsal excavation (de). Abdomen with conspicuous lateral orange/yellow dashes ..... **Hy 22 *trepida***

-- Palpus shorter, wider, swollen basally rounded or sharply pointed apically. Basal plate with deep dorsal excavation [*affinis, arpadi, fulvilateralis, zygota*] **26**





Hy 22 *trepida*

affinis

arpadi

couplet 25--

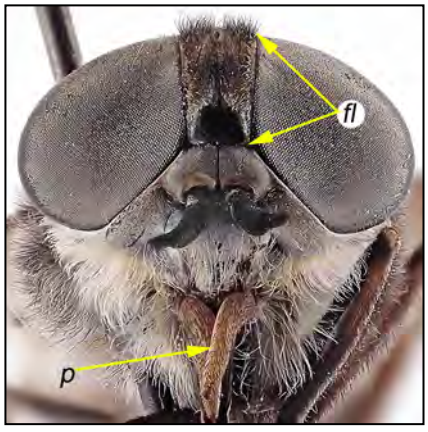
fulvilateralis

zygota

Key to *Hybomitra* females continuing

26(25) Palpus (p) brown. Frons 2.5-3.0x as long (fl) as basal width.
Notopleural lobe (nl) usually black, rarely dark reddish-orange ..... **Hy 23 *zygota***

-- Palpus pale. Frons more 3x as long as its width as basal width.
Notopleural lobe reddish brown [*affinis, arpadi, fulvilateralis*] 27



Hy23 *Hybomitra zygota*

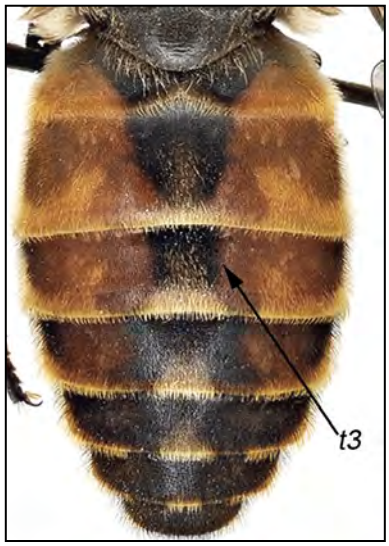
couplet 26--

affinis *arpadi* *fulvilateralis*

Key to *Hybomitra* females continuing

27(26) Basal callus (bc) wrinkled horizontally, not smooth. Abdomen with median stripe not constricted on tergite 3 (t3) .....**Hy 24 *arpadi***

-- Basal callus smooth and shiny [*affinis*, *fulvilateralis*]. Median stripe constricted on tergite 3 ... **28**



affinis *fulvilateralis*

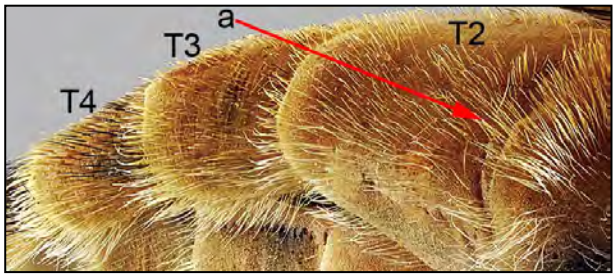
couplet 27--

Hy 24 *Hybomitra arpadi*

Key to *Hybomitra* females continuing

28(27) Side of tergite 2 (T2) with long blond hairs (a), no black hairs.
Palpus noticeably swollen at base ..... **Hy 25 *fulvilateralis***

-- Hairs on side of tergite 2 shorter and mostly black (b).
Palpus very slightly swollen at base ..... **Hy 26 *affinis***



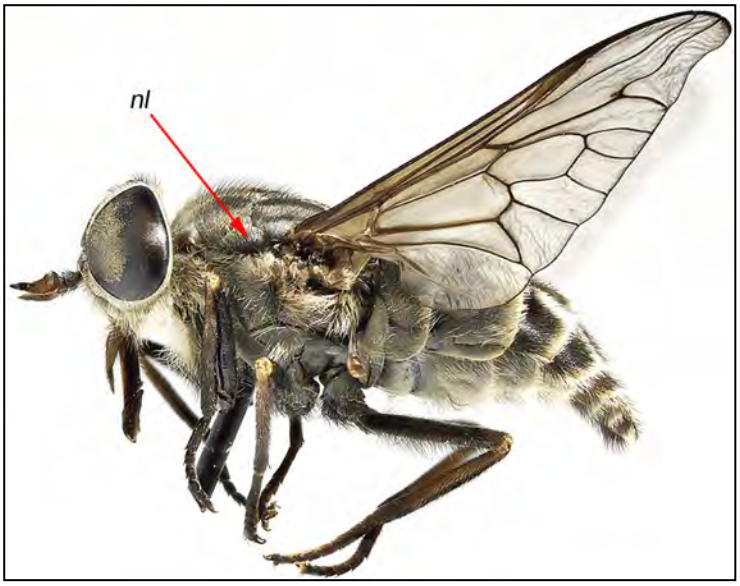
Hy 25 *Hybomitra fulvilateralis*

Hy 26 *Hybomitra affinis*

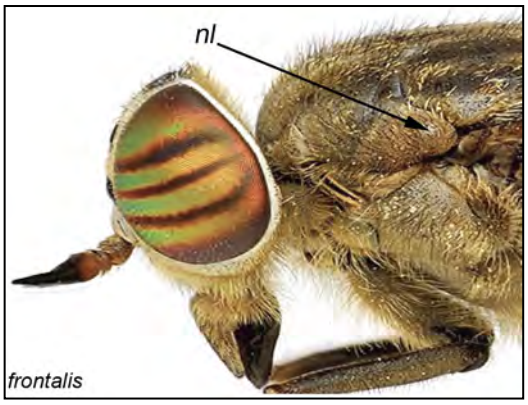
Key to *Hybomitra* females continuing

29(17) Notopleural lobe (nl) black, concolorous with thorax ..... **Hy 27 *hearlei***

-- Notopleural lobe (nl) paler than thorax, reddish [*frontalis, illota, itasca, opaca, pechumani, pediontis, tetrica*] **30**



Hy 27 *Hybomitra hearlei*



couplet 29--

30(29) Tergites black with gray-white, pinkish in *itasca*, median triangles and sublateral spots [*illota, itasca, pechumani,* some *tetrica*] **31**

-- Tergites with black median area but with extensive orange-brown lateral patches [*frontalis, opaca, pediontis,* some *tetrica*] **34**

couplet 30

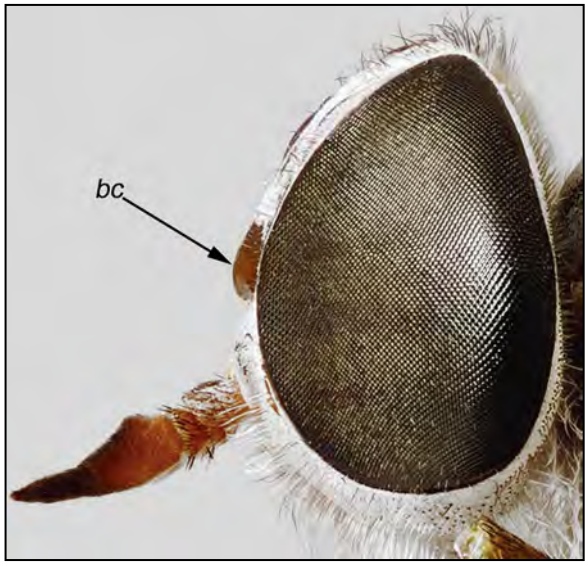
couplet 30--

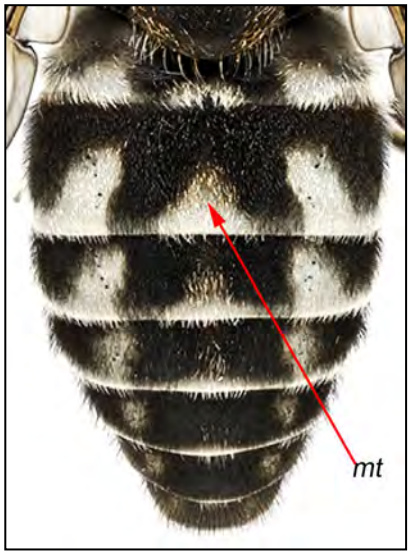
Key to *Hybomitra* females continuing

31(30) Basal callus (bc) orange-brown. Legs warm brown with only the tarsi slightly darkened. White median triangle on tergite 2 reaches anterior margin. Overall, the flies have a pinkish tinge…….…….... **Hy 28 *itasca***

-- Basal callus (bc) black. Legs dark. White median triangle (mt) on tergite 2 does not reach anterior margin. Overall, the flies are not pinkish [*illota, pechumani,* some *tetrica*] **32**

Hy 28 *Hybomitra itasca*





couplet 31--

Key to *Hybomitra* females continuing

32(31) Palpus brown and slender, about 4x as long as greatest width; hairs black, short and recumbent. Wing hyaline. Distinctive species ..... **Hy 29 *pechumani***

-- Palpus creamy white stouter at base, about 2.5-3x as long as its diameter. Wings variable [*illota,* some *tetrica*]…….…..…..…….…..…..... **33**

Hy 29 *Hybomitra pechumani*

Illota left

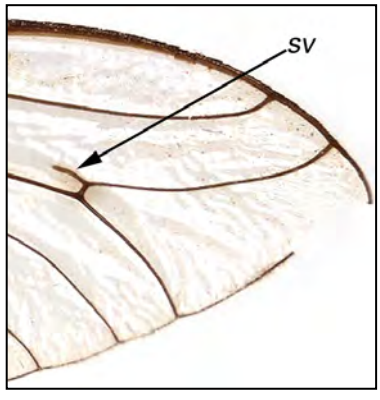
tetrica right

couplet 32--

33(32) Wing spotted. Abdomen distinctive ..... **Hy 30 *illota***

-- Wing hyaline, long spur vein (sv) at fork. Abdomen not with the above pattern..... ……. (in part) **Hy 15 *tetrica***

Hy 30 *Hybomitra illota*

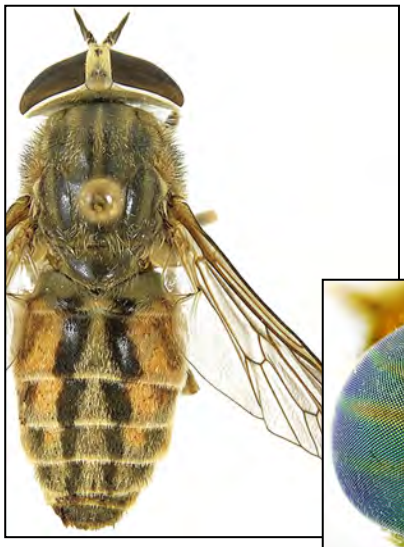


Hy 15 *Hybomitra tetrica*

Key to *Hybomitra* females continuing

34(30) Tergites with a median row of large golden-haired triangles that extend the full length of the tergites and truncated at apex. On each side of the triangles a submedian row of diverging black dashes. Lateral to the black dashes a row of salmon-orange dashes. Eye pattern, in life, bright green with 3 narrow purplish bands; when rehydrated blue and green with 3 narrow brownish…… bands ..... **Hy 31 *pediontis***

-- Not agreeing with the above. Eye much darker and bands much broader [*frontalis, opaca, tetrica*] **35**



Hy 31 *Hybomitra pediontis*

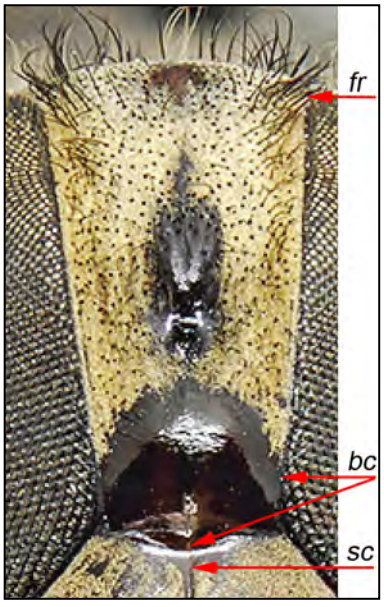
Face, rehydrated (still wet)

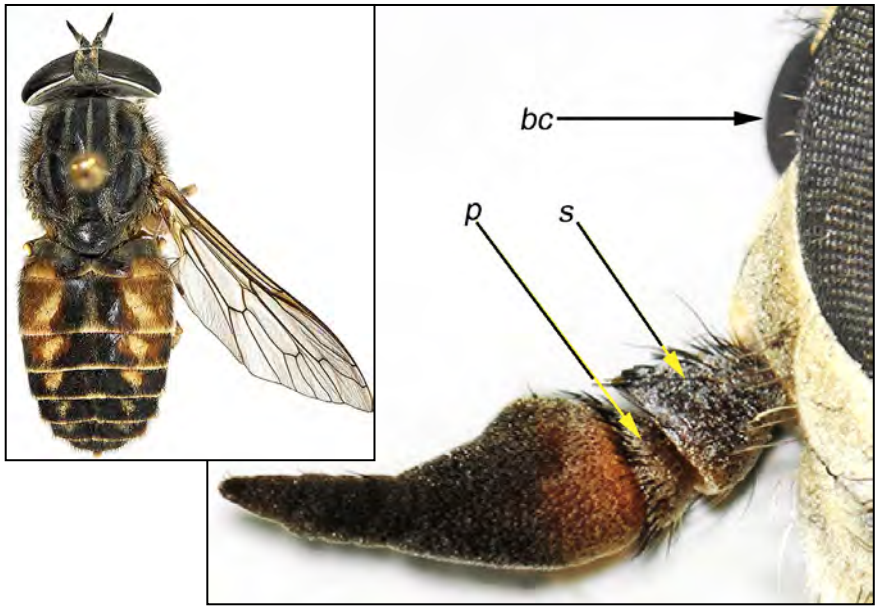
Couplet 34--

Key to *Hybomitra* females continuing

35(34) Basal callus (bc) touching eyes, strongly convex and projecting into upper margin of pruinose subcallus(sc). Frons (fr) widened above. Scape and pedicel black (rarely orange brown) with gray pruinose ..... **Hy 32 *opaca***

-- Basal callus not touching eyes and not projecting onto subcallus. Frons less wide above and slightly longer. Scape and pedicel usually orange [*frontalis, tetrica*] **36**





Hy 32 *Hybomitra opaca*

frontalis

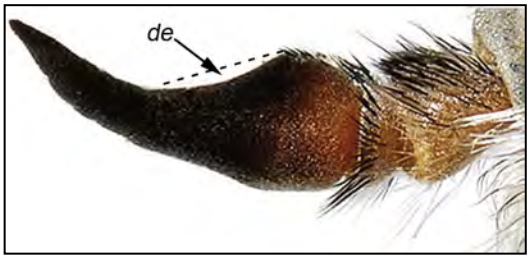
tetrica

couplet 35--

Key to *Hybomitra* females continuing

36(35) Wing hyaline with a long spur vein (sv) at fork. Costal cell (cc) clear. Antenna basal plate with shallow but distinct dorsal excavation (de). Abdomen with median pale-haired triangles extending less than half the length of the tergites; sublateral pale markings having a distinct oblique linear appearance ..... (in part) **Hy 15 *tetrica***

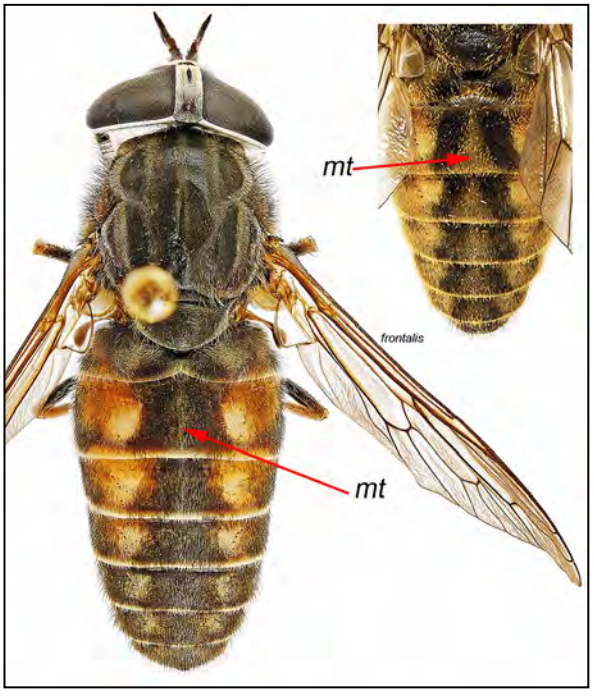
-- Wing with a faint infuscation at fork, rarely with a short spur vein. Costal cell tinted. Basal plate lacking dorsal excavation. Abdomen with median pale-haired triangles (mt), sometimes indistinct, often more than half the length of the tergites, sublateral pale markings more nearly oval or round, and oblique inclination less accentuated..... **Hy 33 *frontalis***



Hy 15 *Hybomitra tetrica*

Hy 33 *Hybomitra frontalis*

Hy 15 *Hybomitra tetrica*



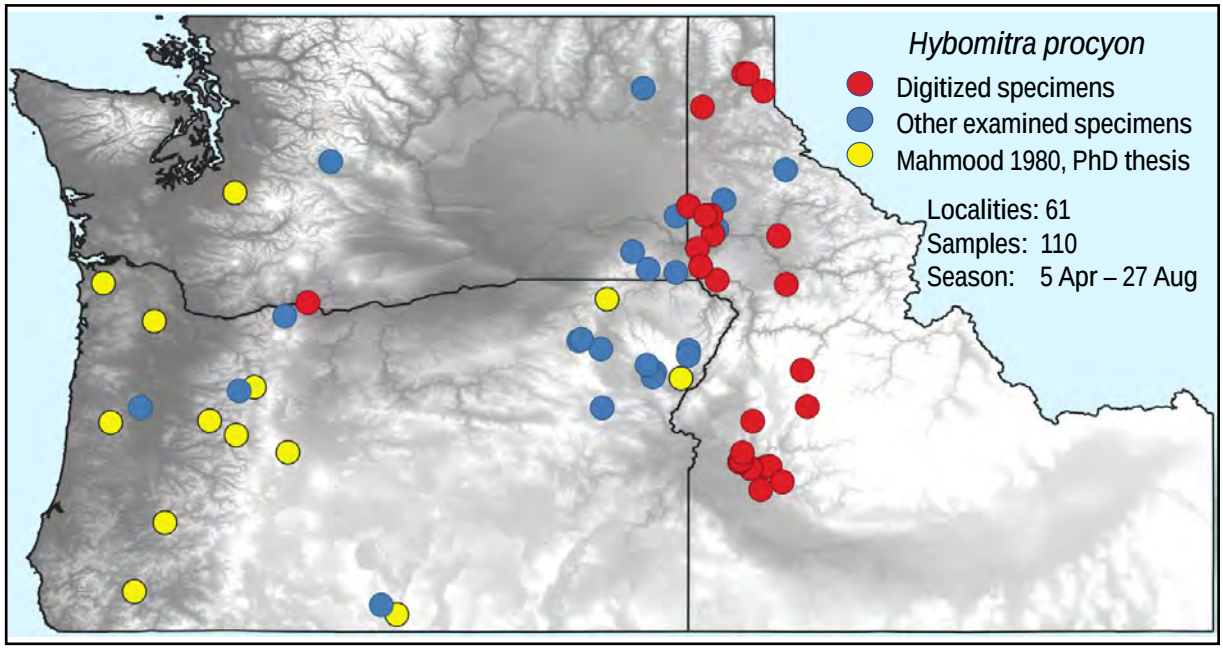
Hy 33 *Hybomitra frontalis*

key **_Hybomitra zonalis_** (Kirby) Hy 1

Diagnosis: Length 14-18 mm. Distinctive, cannot be confused with any other species in the west. A similar species, *H. aequetincta*, occurs in the northeast. **Distribution:** Transcontinental: Alaska to Labrador, south to Montana and Georgia.

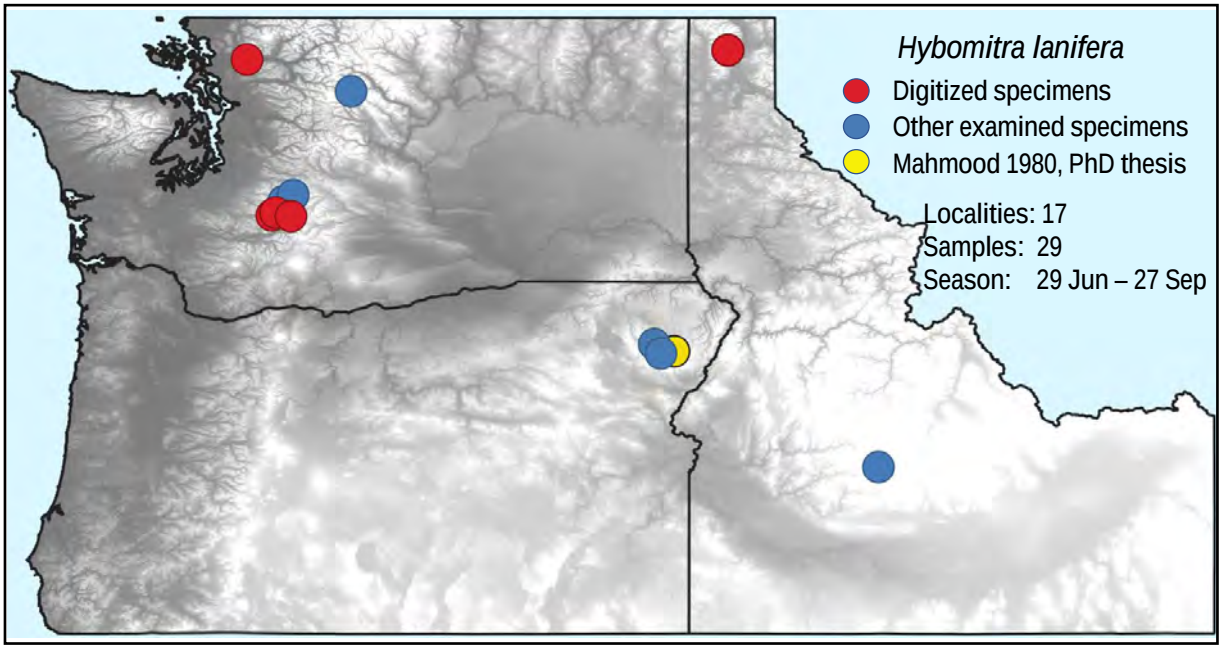
Recorded from Idaho and questioned-marked from Washington State in Turner (1985). We have not been able to confirm these records with a specimen. Burger (1995) includes Montana in the distribution, but not any other western US state (except Alaska). It is known from extreme southern BC, adjacent to the Washington border, and so possibly present in the PNW.

key **Hybomitra procyon** (Osten Sacken) Hy 2



Diagnosis: Length 13-14 mm. The only all-black species in the PNW. **Distribution:** southern BC south to California and Wyoming.

key **_Hybomitra lanifera_** (McDunnough) Hy 3

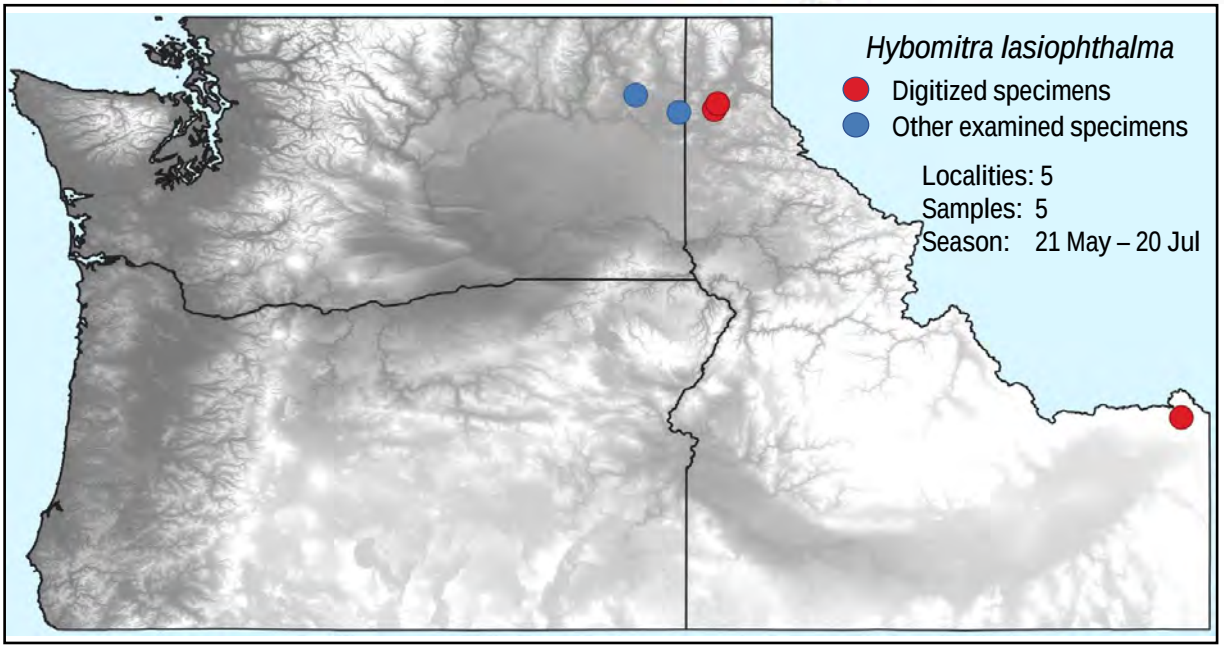


Diagnosis: Length 12-15 mm. Mostly black, tergites with narrow borders of white hairs and small white median triangles. Tergite 2 sometimes with reddish lateral spots, best seen in lateral view. **Distribution:** Alaska to Alberta, south to Oregon and Colorado.

key

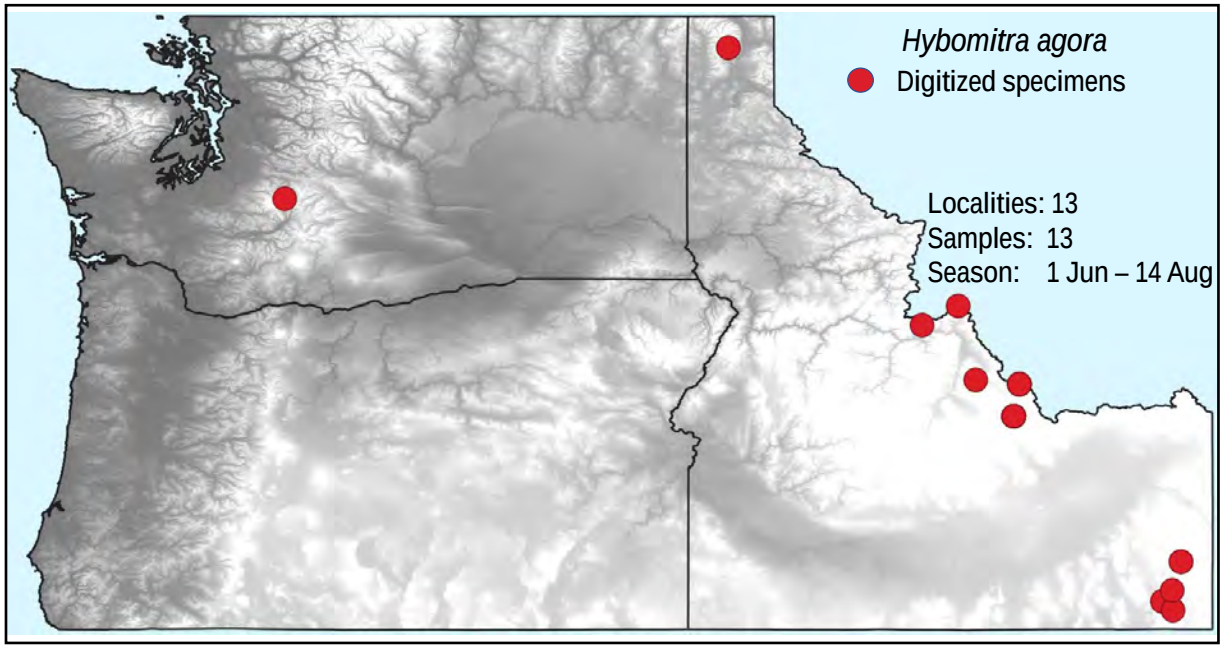
Hybomitra lasiophthalma (Macquart)

Hy 4



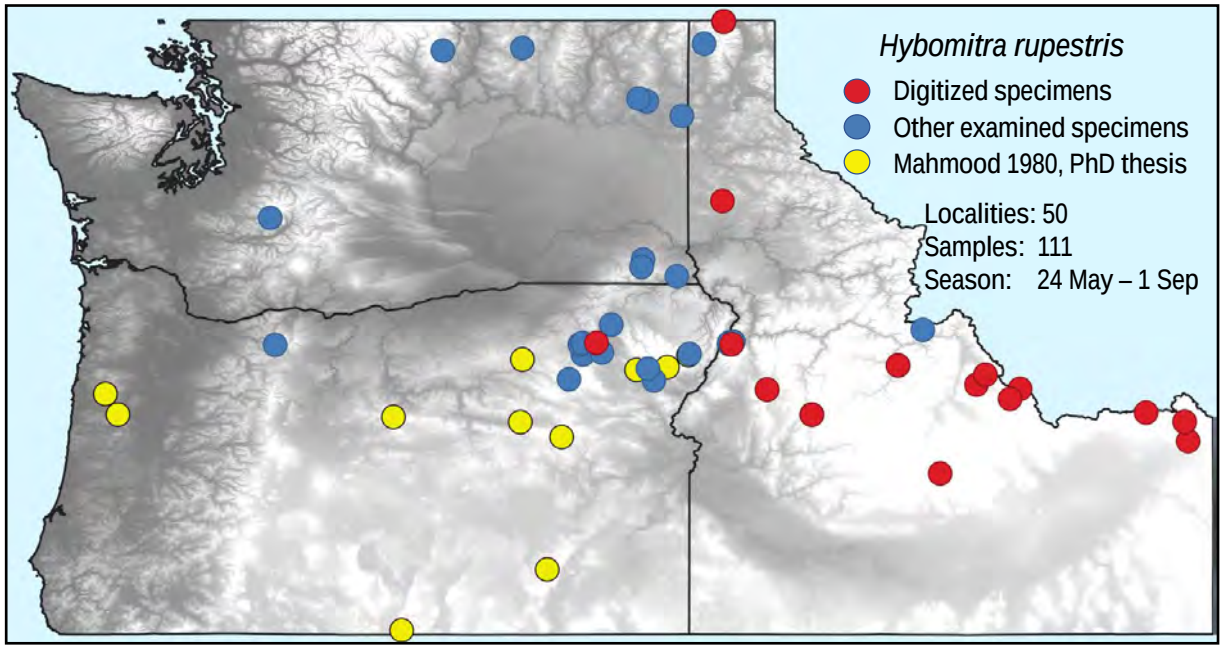
Diagnosis: Length 12-16 mm. Heavily spotted wings, denuded subcallus and bright eye color (in life) makes identification easy. **Distribution:** Northwest Territories to Nova Scotia, south to Colorado, Texas and Georgia.

key **_Hybomitra agora_** Teskey Hy 5



Diagnosis: Length 15-18 mm. Individuals vary from orange-brown laterally to a very dull brown with an almost purplish tinge. Black notopleural lobe and partially denuded subcallus are useful identification characters. **Distribution:** Alberta to South Dakota, south to northeastern Utah and northern New Mexico.

key **Hybomitra rupestris** (McDunnough) Hy 6

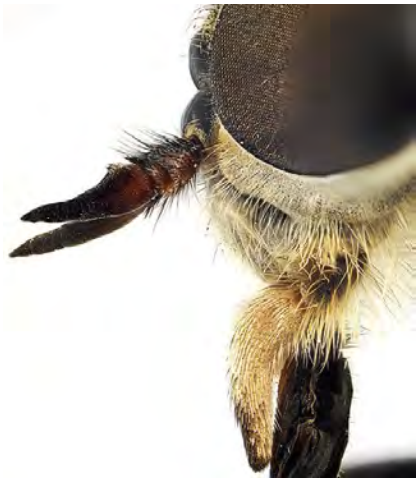


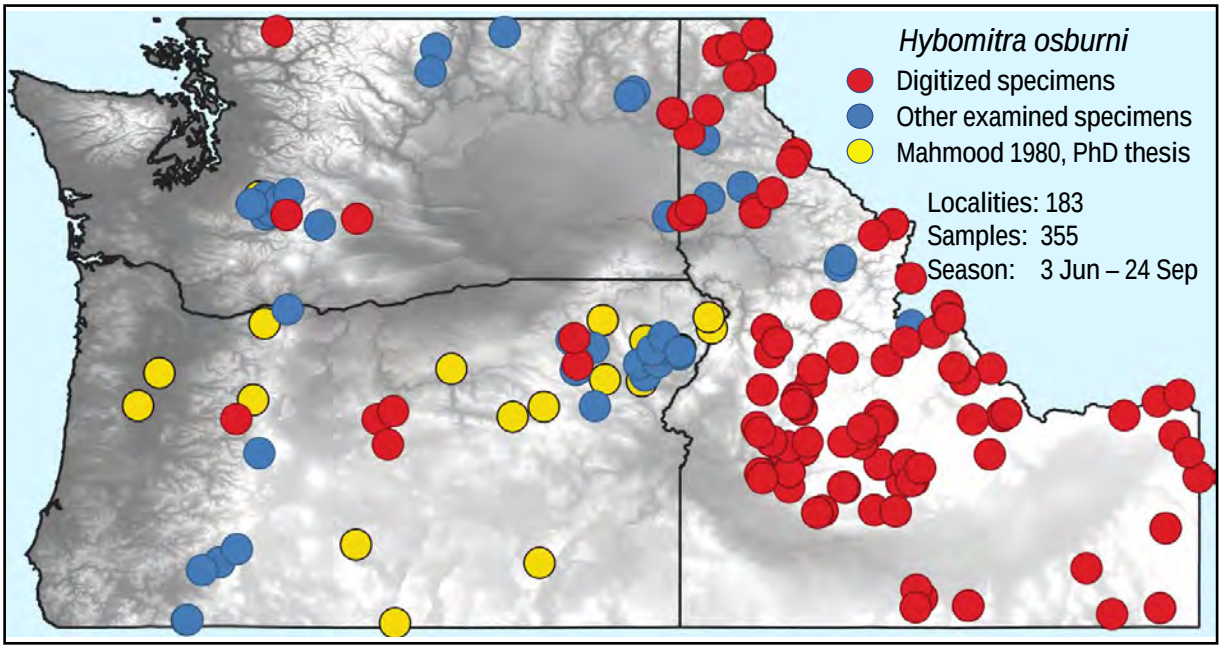
Diagnosis: Length 13-16 mm. The broad parallel-sided midline stripe on the tergites separates it from those 'red-sided' species with a narrower stripe constricted on tergite 3. Very similar to *H. agora* but separated from it by the presence of long hairs on the lateral area of the denuded subcallus.
Distribution: BC to Oregon and South Dakota.

key

Hybomitra osburni (Hine)

Hy 7



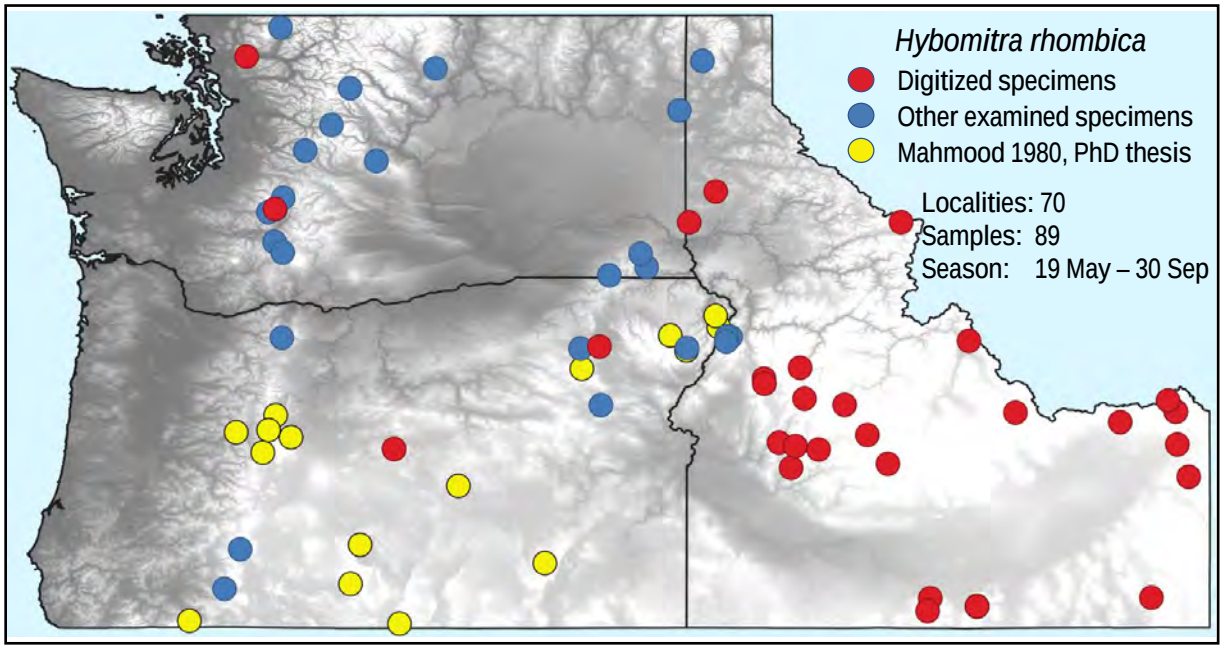


Diagnosis: Length 12-15mm. A shiny black species with a fully or partially denuded subcallus. Costal cell infuscated. **Distribution:** Alaska south to Colorado and Minnesota.

key

Hybomitra rhombica (Osten Sacken)

Hy 8



Diagnosis: Length 13-16 mm. Background color black but with extensive areas of gray hairs as stripes on thorax, as large mid line triangles on tergites and as large lateral patches on tergites 2 and 3.
Distribution: BC to North Dakota, south to California and New Mexico.

key

Hybomitra liorhina (Philip)

Hy 9

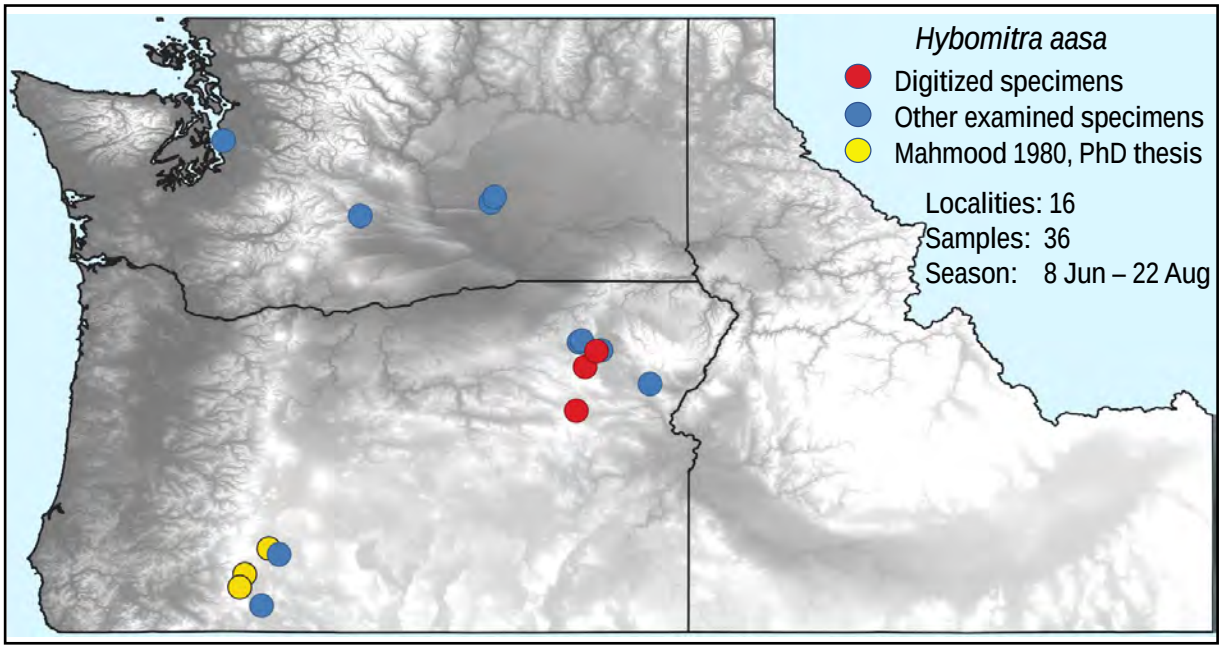
Diagnosis: Length 11-15 mm. Brownish legs, pale notopleural lobe, denuded subcallus, antenna lacking a dorsal excavation and swollen-base palpus help to identify this species. **Distribution:** Alaska to Labrador, south to Wyoming and Michigan.

A transcontinental species including southern BC, southern Alberta, and Wyoming, possibly present in the PNW.

key

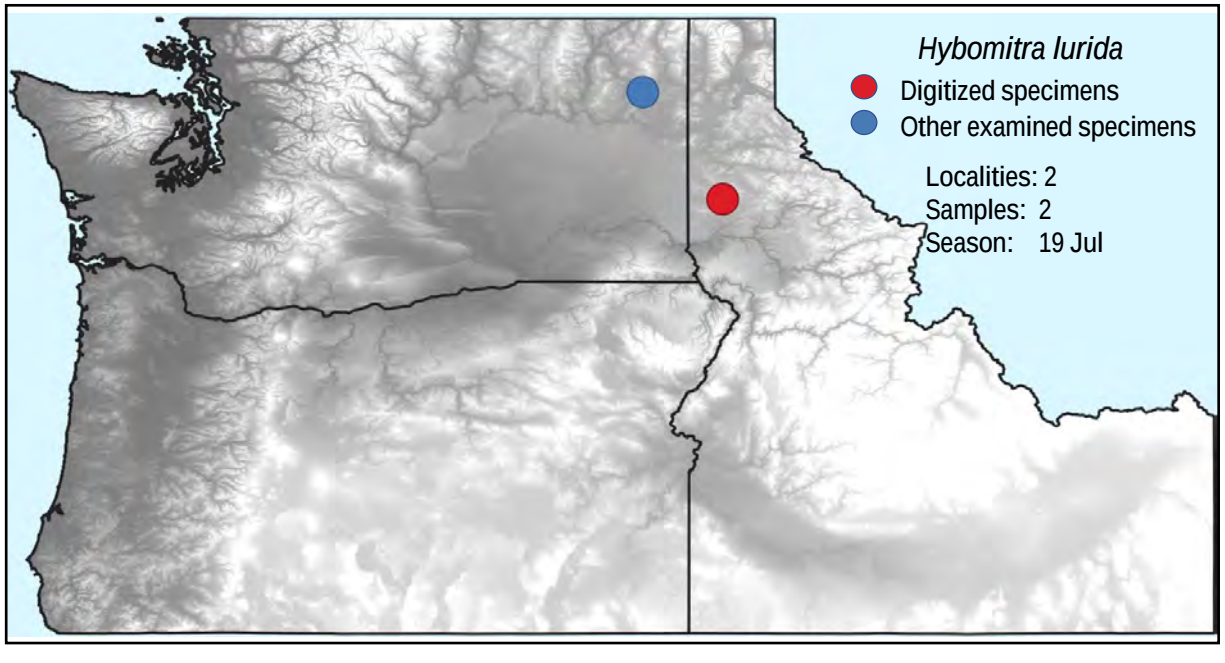
***Hybomitra aasa* Philip**

Hy 10



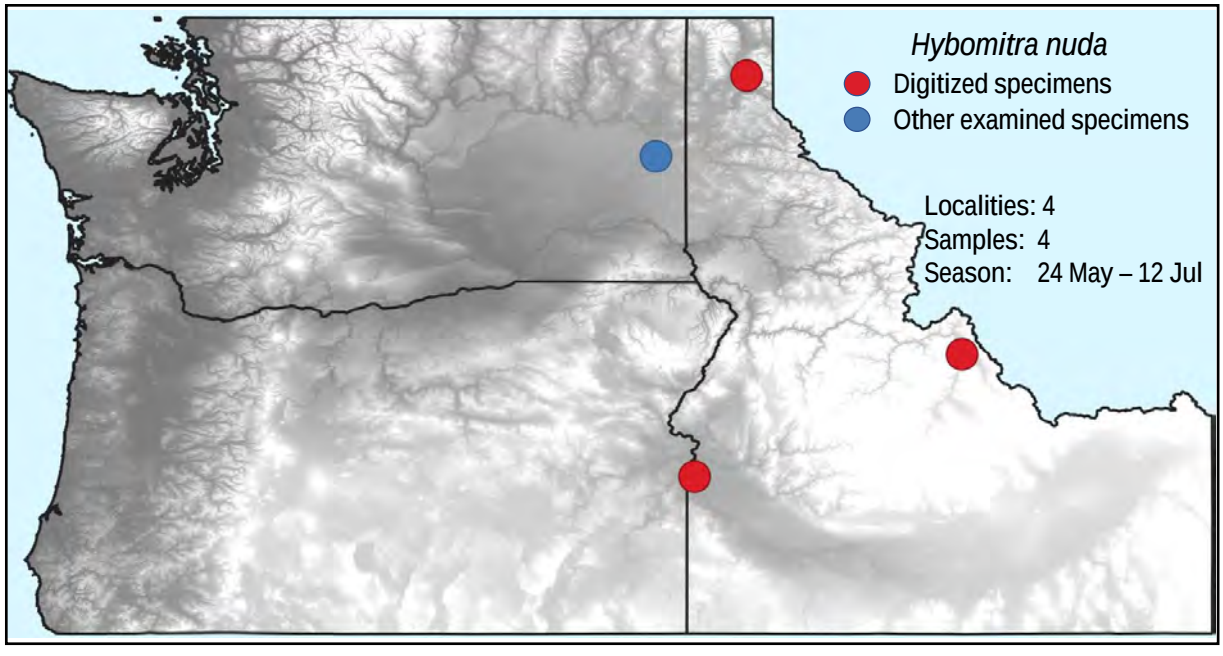
Diagnosis: Length 14-15 mm. A 'red-sided' species with a denuded subcallus. Wing with lightly infuscated costal cell and a weak spot at the fork. Legs predominantly pale brownish, hind tibial fringe black. **Distribution:** BC to California.

key **_Hybomitra lurida_** (Fallen) Hy 11



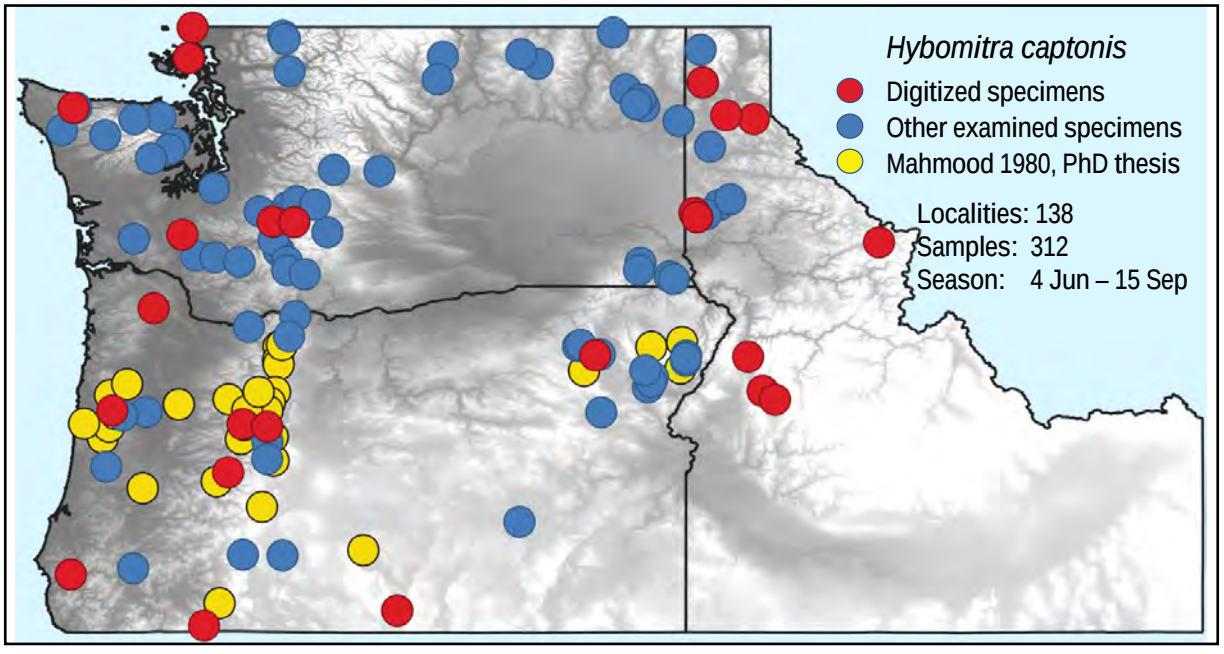
Diagnosis: Length 12-15 mm. A dark species with a denuded subcallus, dark costal cell, a dark spot at fork and crossveins darkened. Sublateral oblique dashes show some variation in size. **Distribution:** Alaska to Labrador, south to Colorado and New York.

key **_Hybomitra nuda_** (McDunnough) Hy 12



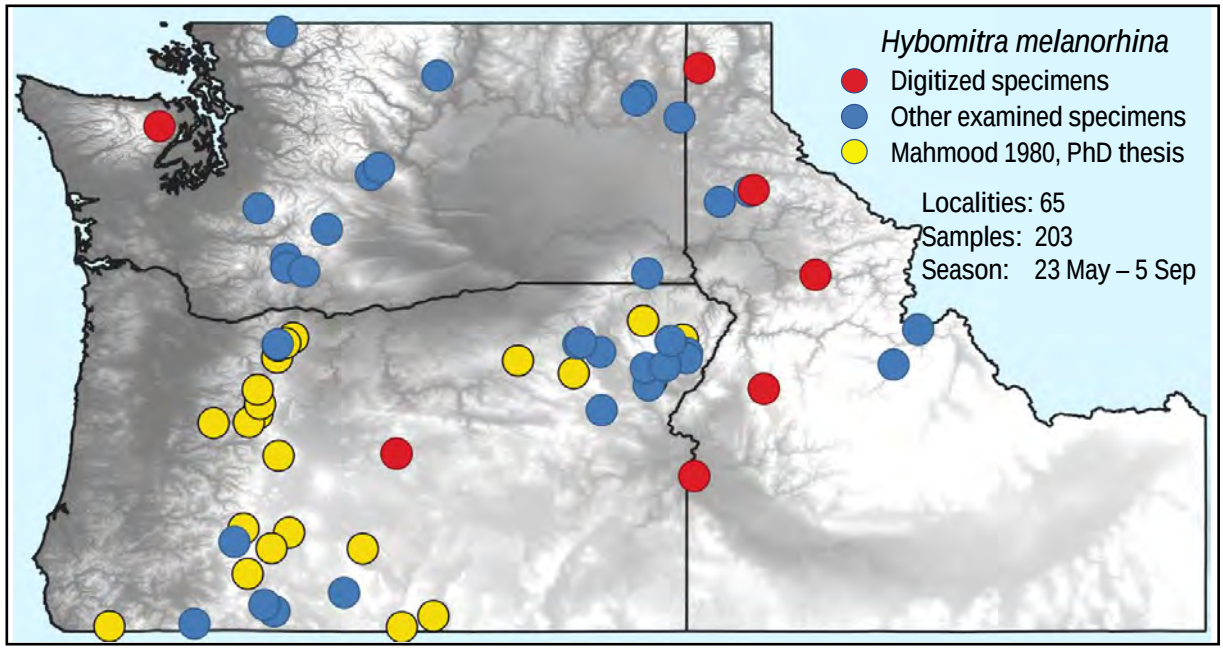
Diagnosis: Length 14-17 mm. A 'red-sided' species with a denuded subcallus. Palpus creamy white and swollen basally. One of the first species to emerge in the spring. **Distribution:** Alaska to Nova Scotia, south to Wyoming and New Jersey.

key **_Hybomitra captonis_** (Marten) Hy 13



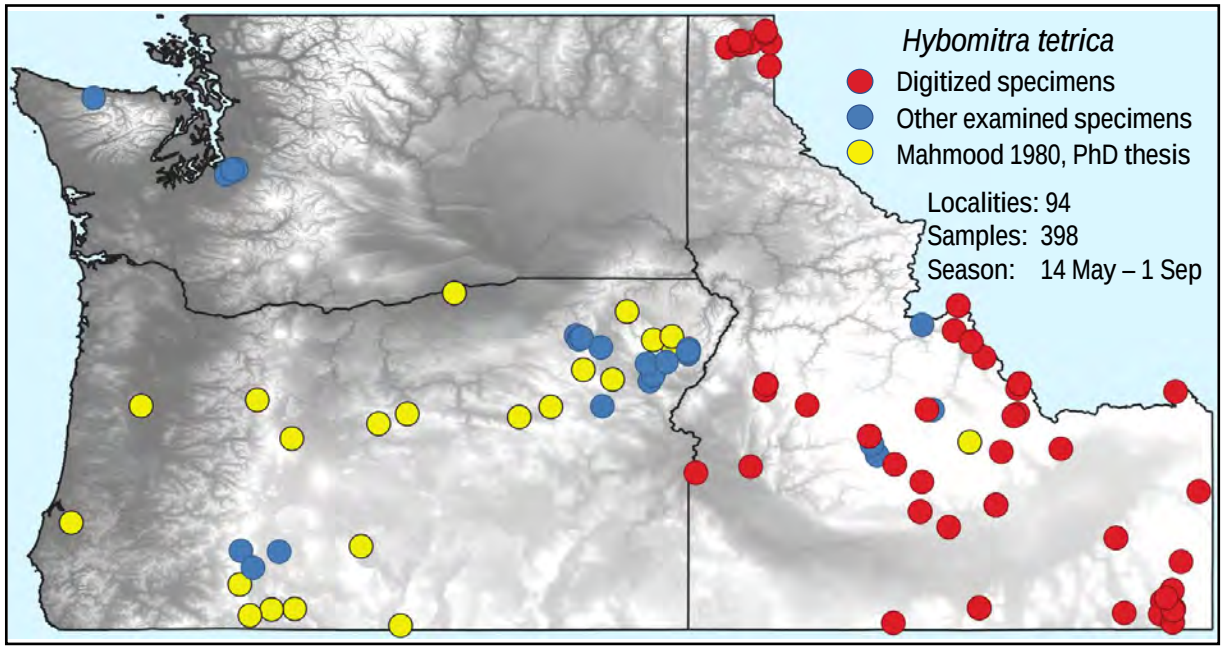
Diagnosis: Length 14-18mm. The partially denuded subcallus separates this species from similar 'red-sided' species. **Distribution:** Yukon south to California and Colorado.

key **Hybomitra melanorhina** (Bigot) Hy 14



Diagnosis: Length 13-15 mm. Denuded subcallus, red notopleural lobe, abdominal tergites with a wide dark median band, pale midline triangles and pale sublateral oblique patches on an orange background help to identify this species. **Distribution:** BC to Alberta, south to California and Colorado.

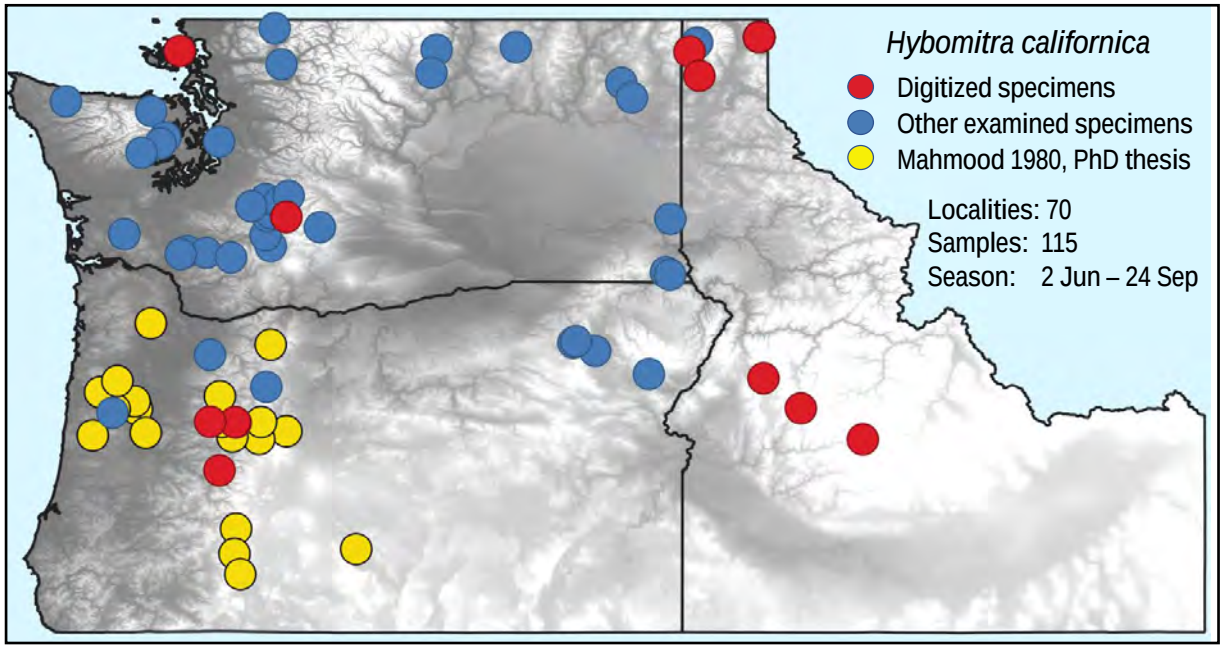
key **Hybomitra tetrica** (Marten) page 1 Hy 15



key ***Hybomitra tetrica*** (Marten) page 2 Hy 15

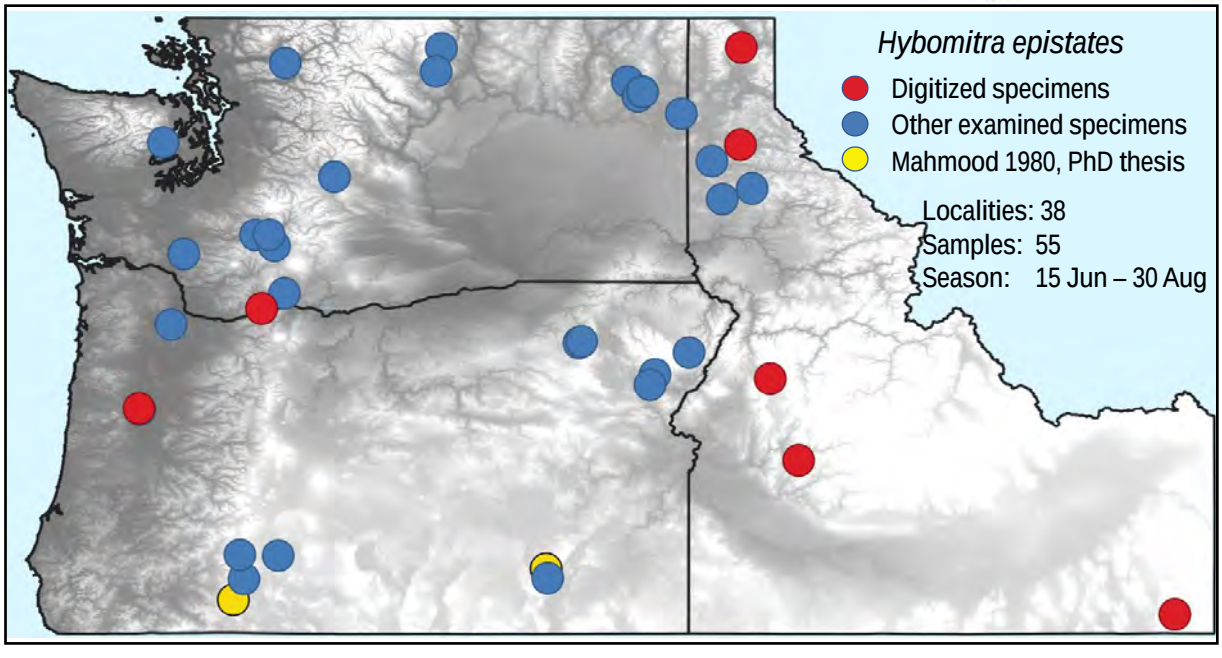
Diagnosis: Length 13-16 mm. A variable species ranging from reddish to black-gray. Unusual in that the subcallus can vary from totally denuded and shiny (typical form) to fully pruinose (variety *hirtula*); some individuals have a partly denuded subcallus. *H. tetrica* is most similar to *H. frontalis* and *H. opaca* differing from both by the presence of a long spur at the fork (of the wing). Also, compared to *H. frontalis*, *H. tetrica* has a more divergent frons and more swollen palpus. **Distribution:** BC to western Ontario, south to California and New Mexico.

key **_Hybomitra californica_** (Marten) Hy 16



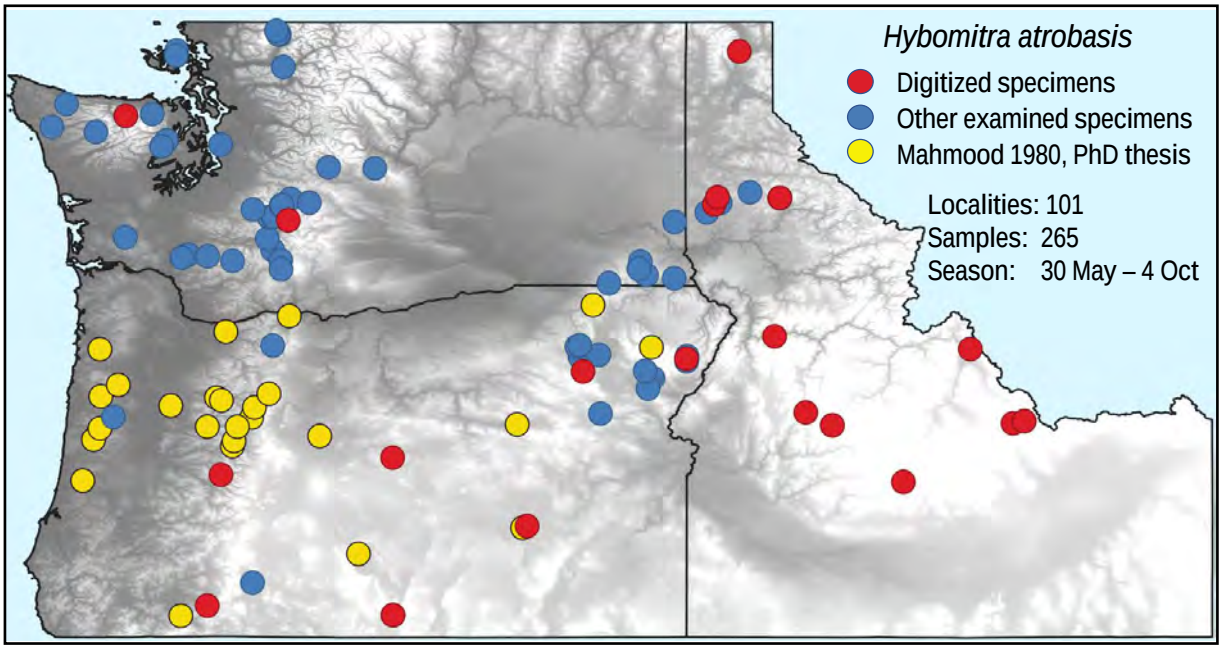
Diagnosis: Length 16-20 mm. The largest-sized PNW tabanid. A member of the 'red-sided' group. Tibial fringe on hind legs pale yellowish (see image in key), rarely black. **Distribution:** BC to California, Idaho.

key **_Hybomitra epistates_** (Osten Sacken) Hy 17



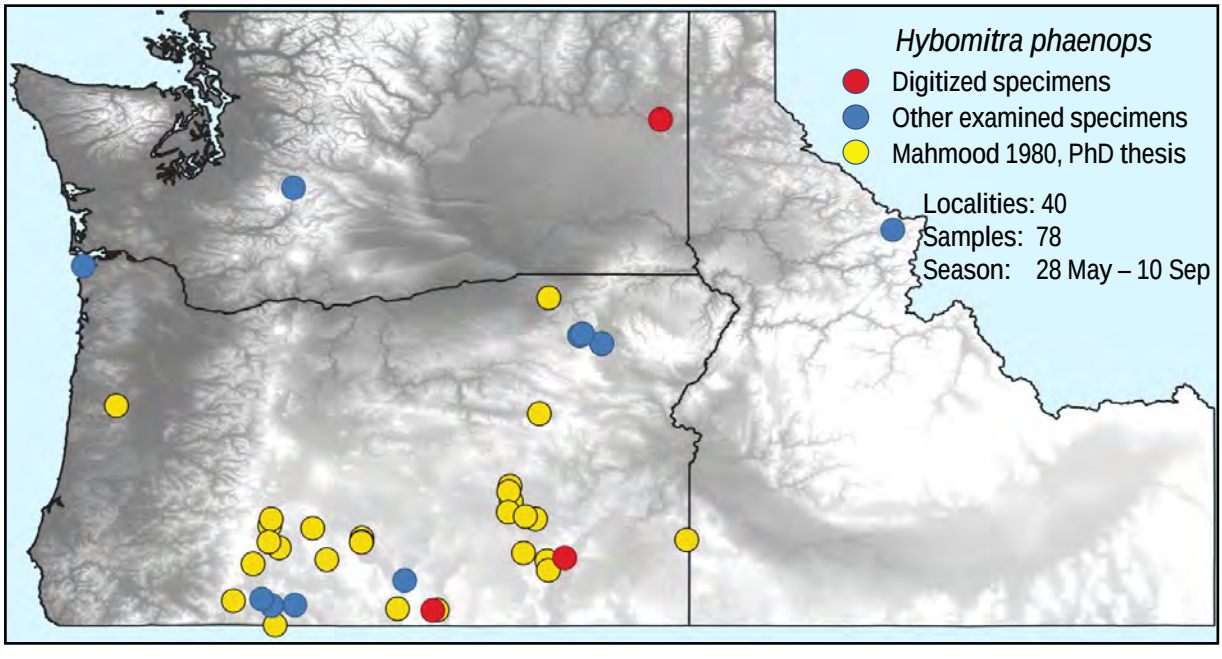
Diagnosis: Length 12-16mm. A 'red-sided' species. Frons strongly narrowed ventrally. **Distribution:** Alaska to Newfoundland, south to Oregon and New York.

key **_Hybomitra atrobasis_** (McDunnough) Hy 18



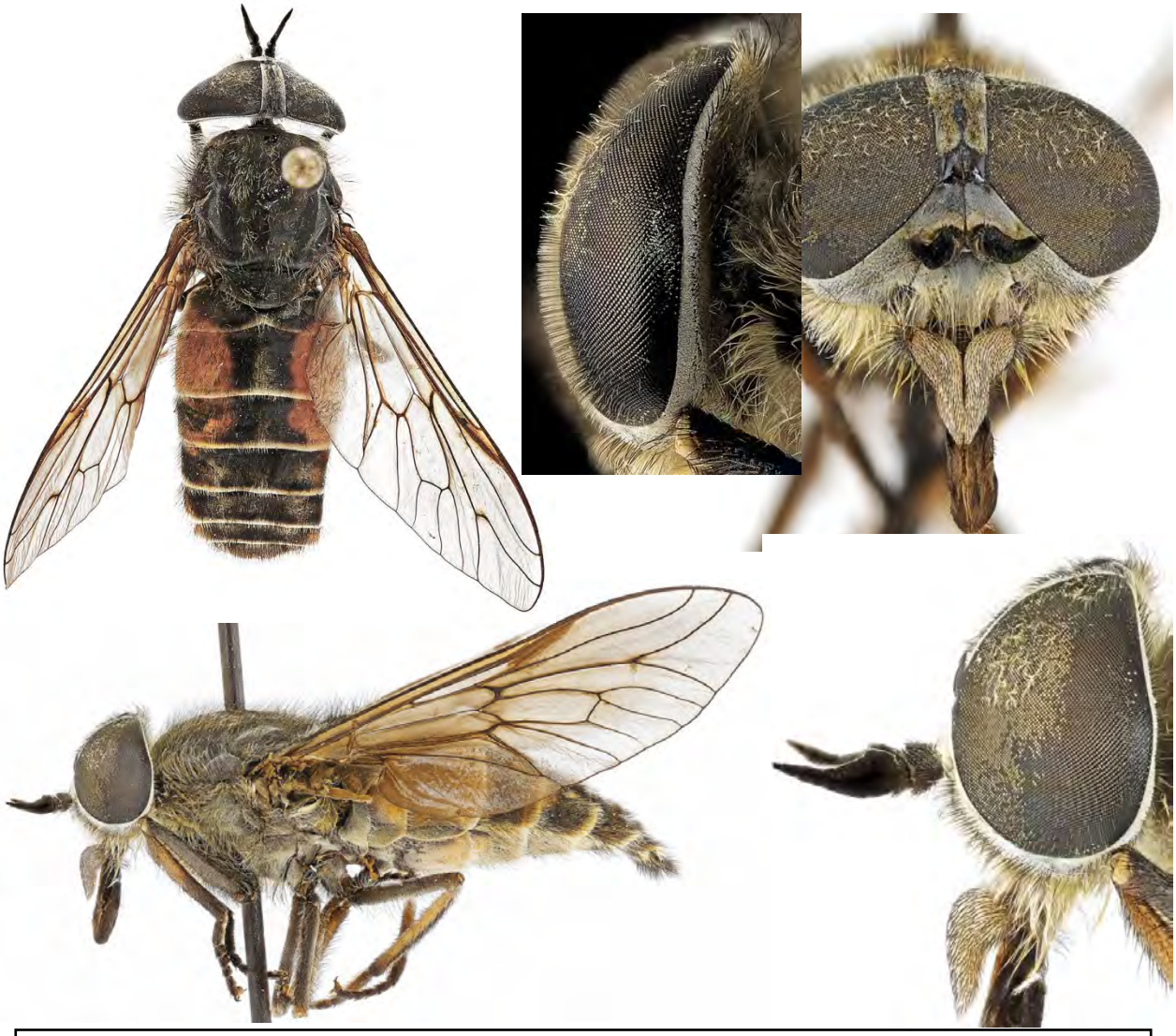
Diagnosis: Length 14-17 mm. A member of the 'red-sided' group with a black notopleural lobe. Antenna lacking a dorsal excavation and tergite 1 all black (lacking red laterally). Eye with long dense hairs. **Distribution:** BC to Oregon and Wyoming, south to northern California.

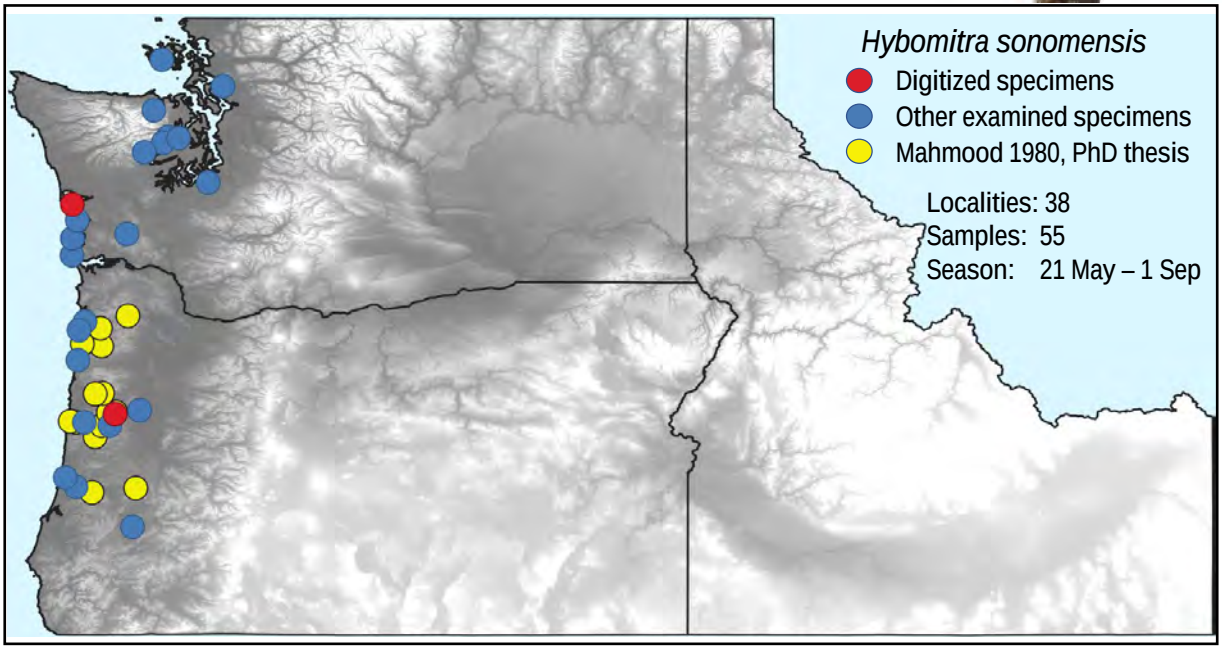
key **Hybomitra phaenops** (Osten Sacken) Hy 19



Diagnosis: Length 12-15 mm. Identical to *H. enigmatica* in general appearance, differing only in the pattern of eye banding. In *H. phaenop*s the dark transverse bands are narrower (*cf. enigmatica*) and do not extend to the eye margin. Stone (1948) considered *H. phaenops* as a variety of *H. sonomensis*, but that was before *H. enigmatica* was separated from *H. sonomensis*, a salt-marsh species of the Pacific coast. **Distribution:** Oregon to Montana, south to California and New Mexico.

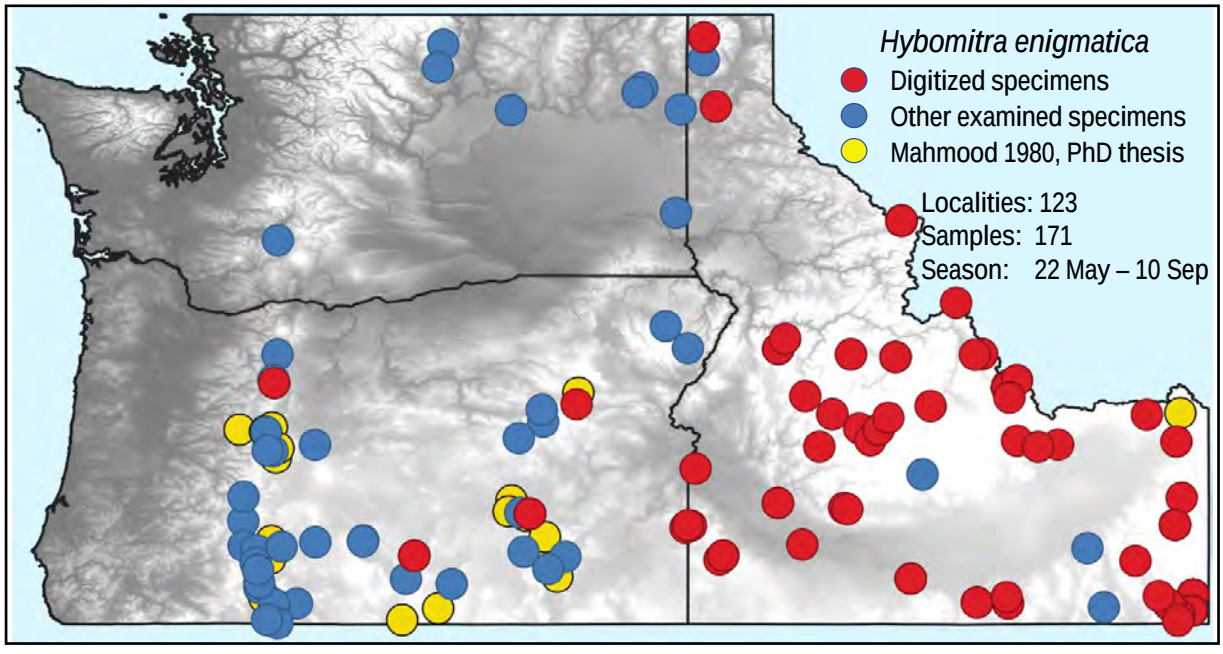
key **_Hybomitra sonomensis_** (Osten Sacken) Hy 20





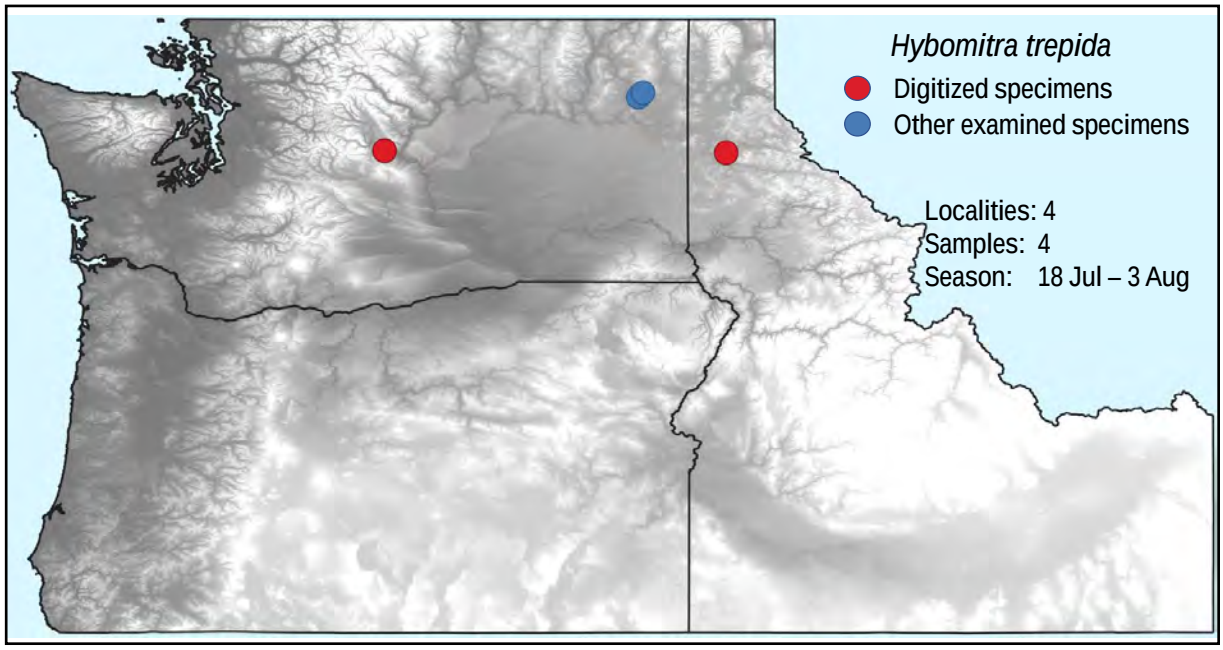
Diagnosis: Length 12-15 mm. Abdomen with orange laterally. Antenna black. Eyes densely pilose (hairy). Wing fork with an infuscated spot. **Distribution:** Alaska to California. Larvae found in coastal salt marshes.

key **_Hybomitra enigmatica_** Teskey Hy 21



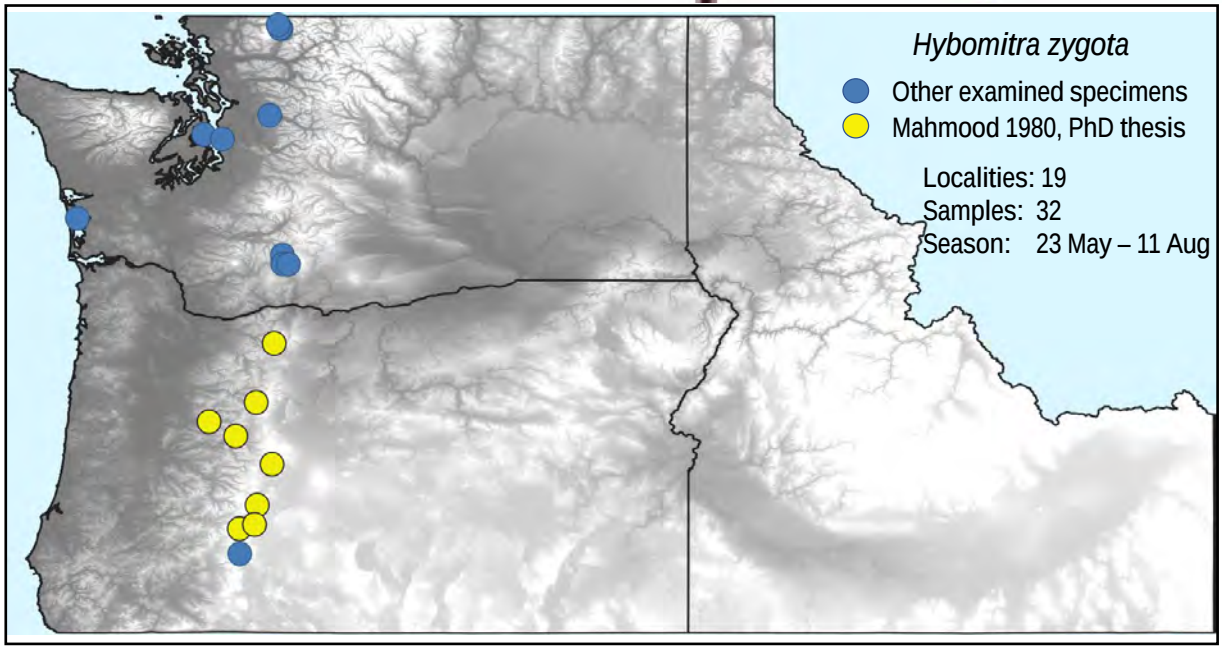
Diagnosis: Length 12-16 mm. A 'red-sided' species that is almost identical to *H. phaenops*. Best identified by eye color banding. Dark purple bands are wide in *H. enigmatica* and reach lateral margin of the eye; one such band is just visible in the lateral view of the head at the level of the basal callus. Bands narrower in *H. phaenops* and not reaching lateral margin. **Distribution:** BC to Montana, south to California and Colorado.

key **_Hybomitra trepida_** (McDunnough) Hy 22



Diagnosis: Length 12-16 mm. A 'red-sided' species with a median black stripe narrowly tapered on tergite 3. Orange oblique dashes on tergites. Slender palpus, pruinose subcallus, antenna with shallow excavation. **Distribution:** Alaska to Nova Scotia, south to Idaho, Ohio and Pennsylvania.

key **Hybomitra zygota** (Philip) Hy 23



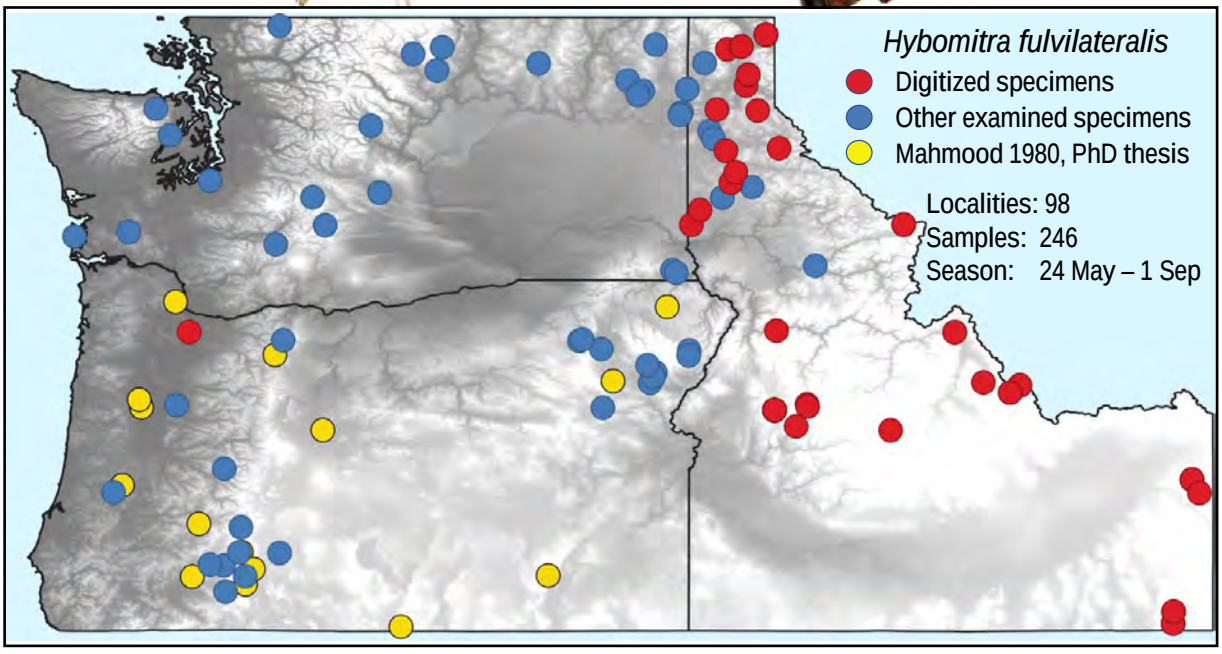
Diagnosis: Length 13-17 mm. A 'red-sided' species with a rather broad median stripe. Distinguishing features include: short wide frons only slightly widened above, basal flagellomere orange and black, light brown palpus with black hair. Notopleural lobe normally black, rarely with an orange-reddish tinge (as in the specimen imaged). **Distribution:** BC to Washington and Oregon.

key **_Hybomitra arpadi_** (Szilady) Hy 24

Diagnosis: Length 13-16 mm. A member of the red-sided group with a pruinose subcallus. Differs from others in having the median black stripe wide and weakly parallel-sided rather than narrow and constricted on tergite 3. Basal callus not smooth but with horizontal ridges, less shiny than similar 'red-sided' species. **Distribution:** Alaska to Labrador, south to BC, Minnesota and Maine.

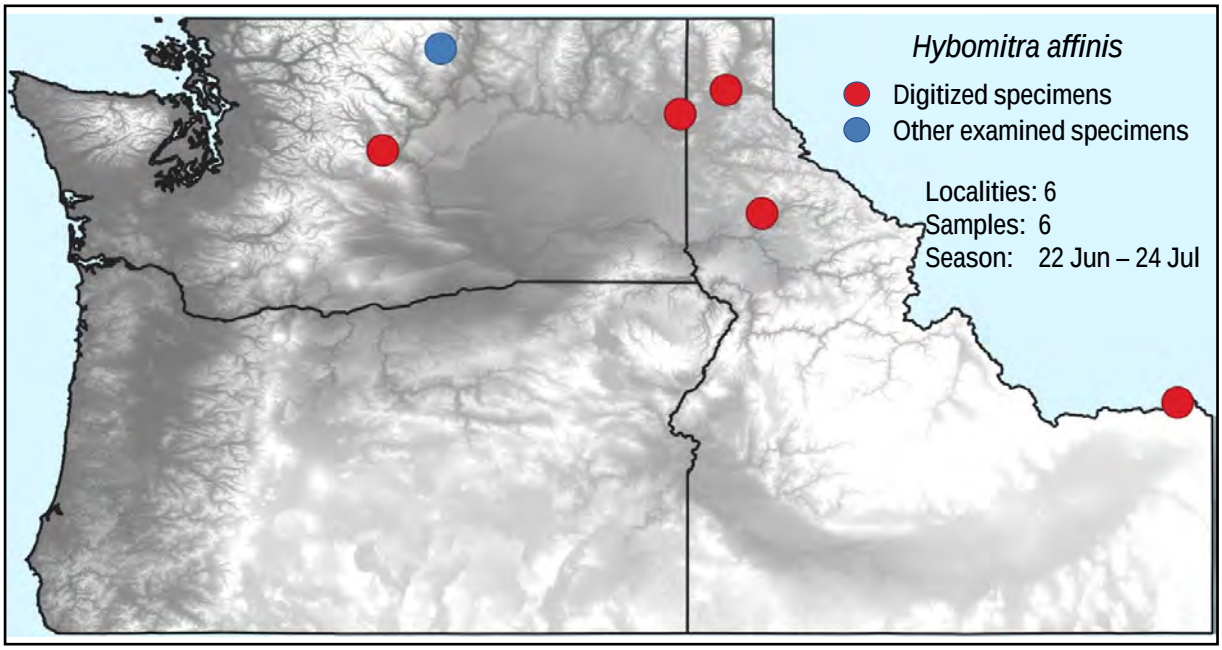
Teskey's (1990) Map 40 shows a location in extreme SW Alberta adjacent to the Montana border. This species is possible in extreme NE Idaho.

key **Hybomitra fulvilateralis** (Macquart) Hy 25



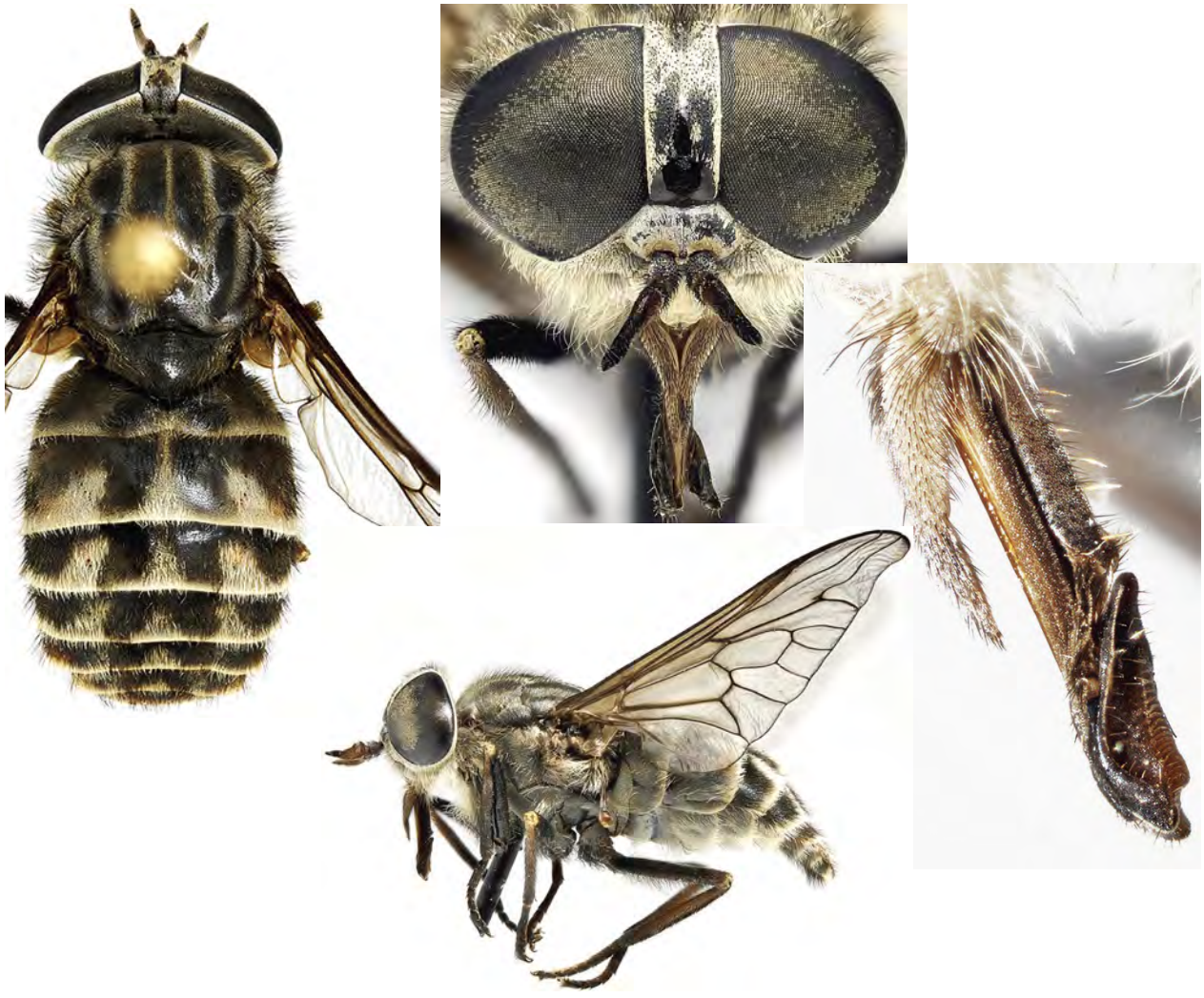
Diagnosis: Length 14-18 mm. A 'red-sided' species with a median black stripe narrowest on tergite 3. Similar to *H. affinis* but distinguished by the absence of black hairs on the sides of tergite 2.
Distribution: BC to Manitoba, south to California and New Mexico.

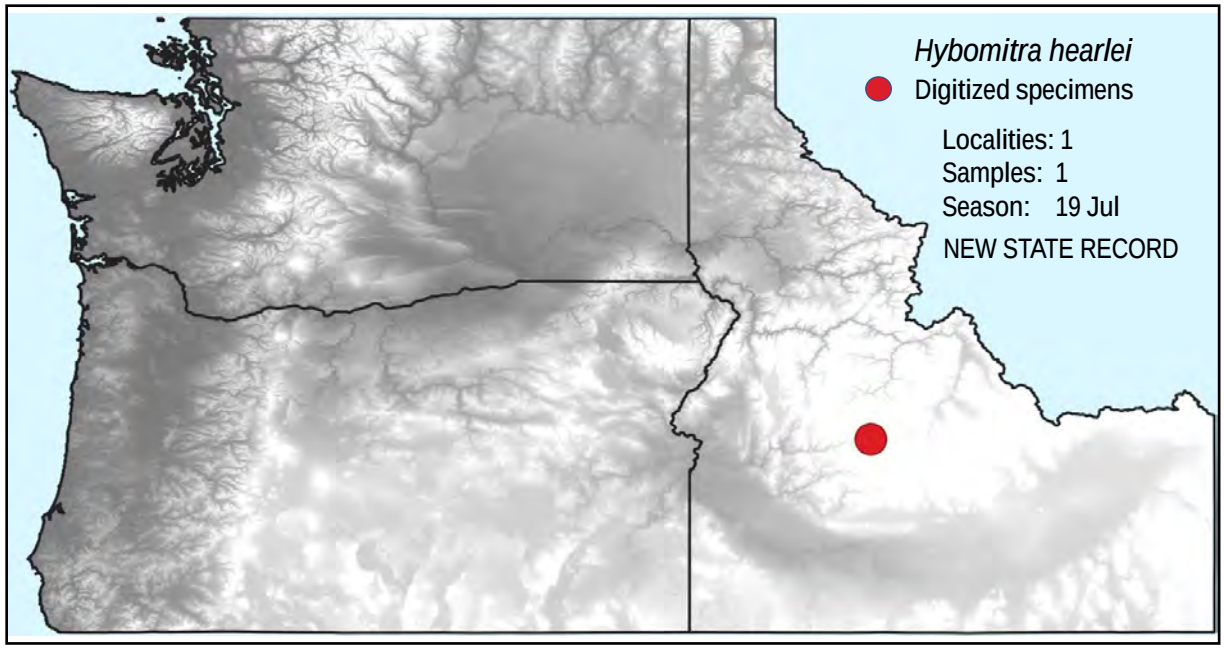
key **Hybomitra affinis** (Kirby) Hy 26



Diagnosis: Length 16-19 mm. Amongst the largest tabanids in the PNW. Very similar to *H. fulvilateralis* but *H. affinis* differs in the presence of black hairs on the sides of tergite 2 and the much darker groundcolor of tergites 3-5. **Distribution:** Alaska to Labrador, south to Colorado and New York.

key **Hybomitra hearlei** (Philip) Hy 27





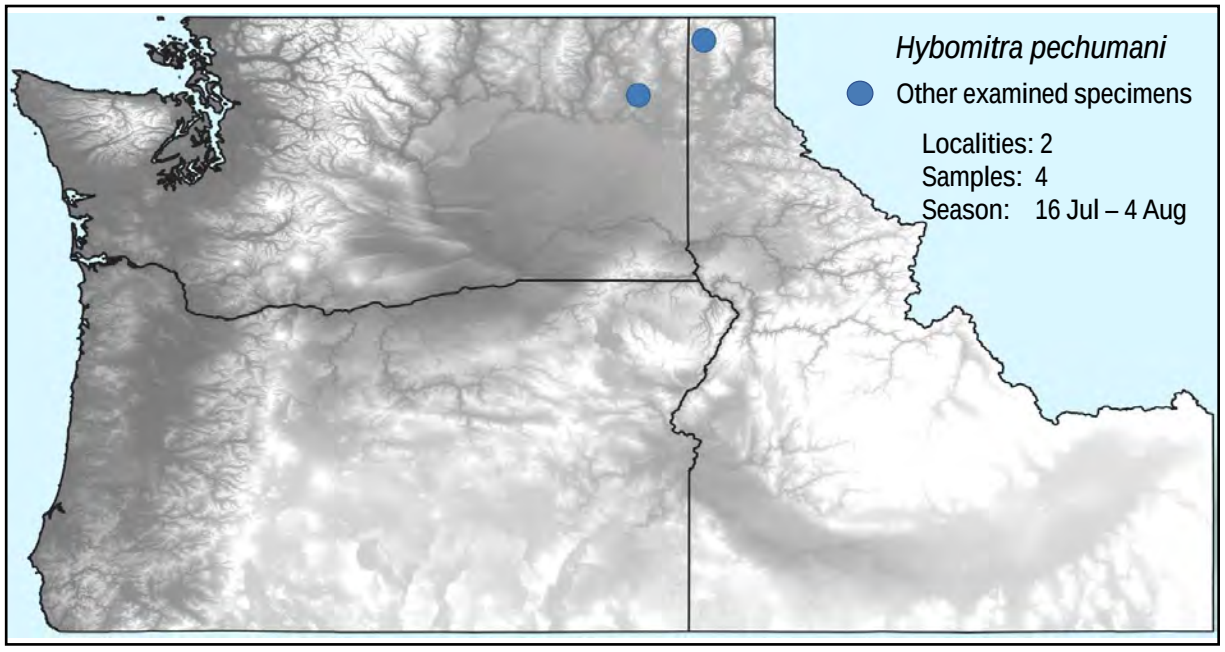
Diagnosis: Length 12-15 mm. Most similar to *H. pechumani* but distinguished by the black notopleural lobes, very slender palpus and very long proboscis. Note also, the contiguous median and basal calli.
Distribution: Alaska to Labrador, south to BC, Idaho, Manitoba, Ontario, Quebec.

key **_Hybomitra itasca_** (Philip) Hy 28

Diagnosis: Length 10-14 mm. Brown legs, pale notopleural lobe and mostly orange antenna along with the abdominal pattern make it unlikely to be confused with any other species. **Distribution:** Alaska to Labrador, south to BC, Minnesota and Wisconsin.

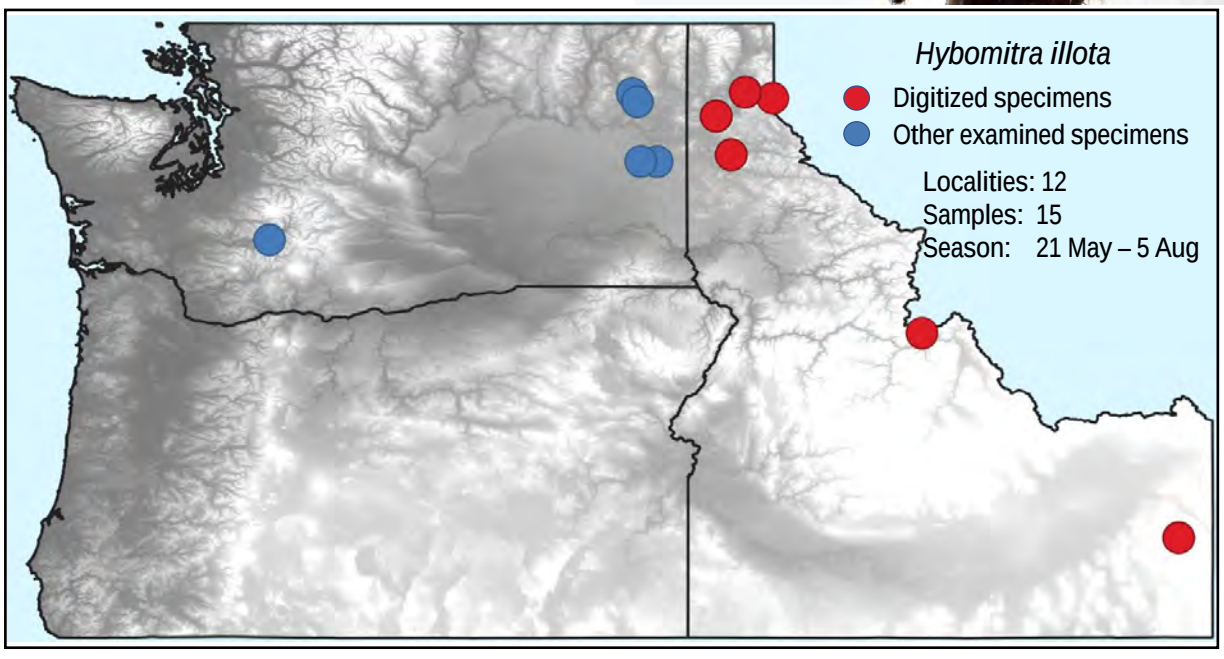
A transcontinental species that is rarely collected. Known from southern BC and southern Alberta; possibly present in northern PNW.

key **_Hybomitra pechumani_** Teskey & Thomas Hy 29



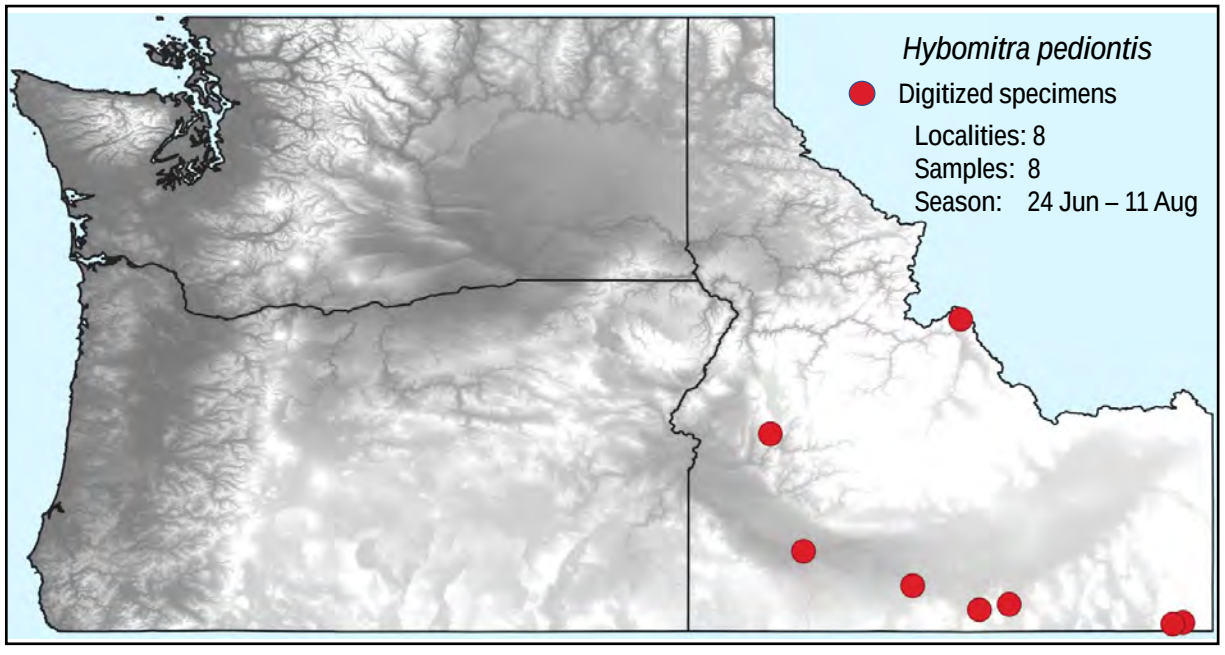
Diagnosis: Length 10-13 mm. A distinctive black and gray species with a pruinose subcallus, short wide frons, black basal callus, basal flagellomere with a dorsal excavation, and narrow apically-pointed palpus. **Distribution:** Northwest Territories to Labrador, south to Idaho and West Virginia.

key **_Hybomitra illota_** (Osten Sacken) Hy 30



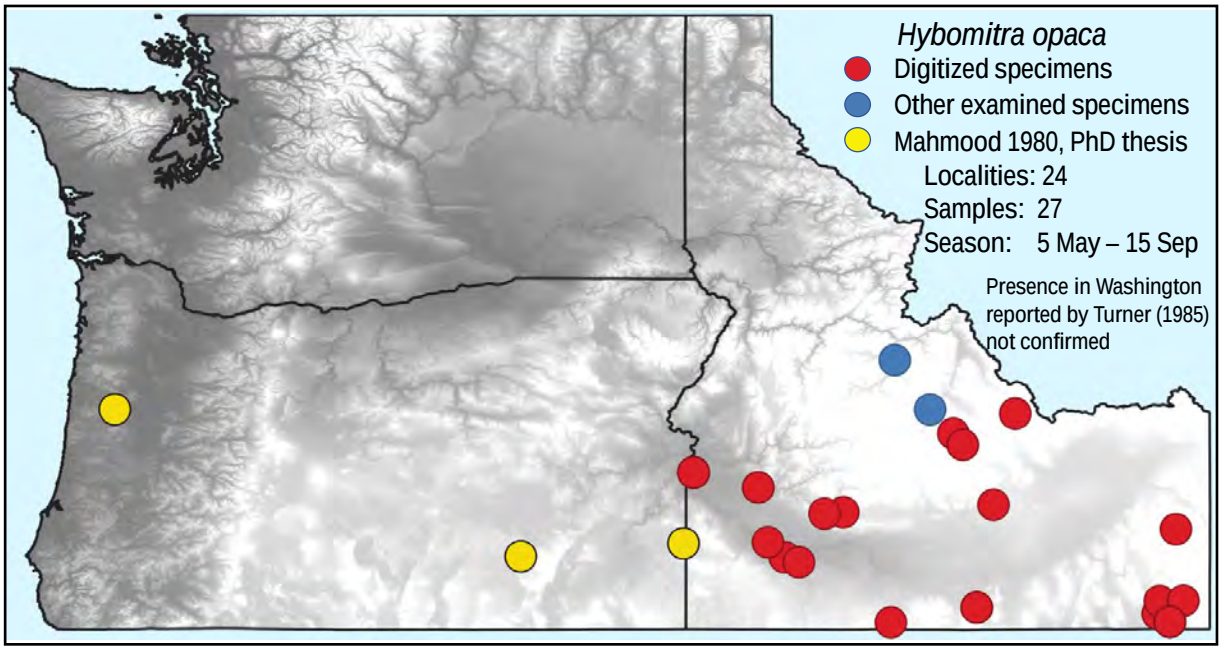
Diagnosis: Length 11-14 mm. Abdomen pattern and wing spotting (at fork and at all crossveins) are distinctive. **Distribution:** Alaska to PEI, south to Washington, Wyoming and Pennsylvania.

key **Hybomitra pediontis** (McAlpine) Hy 31



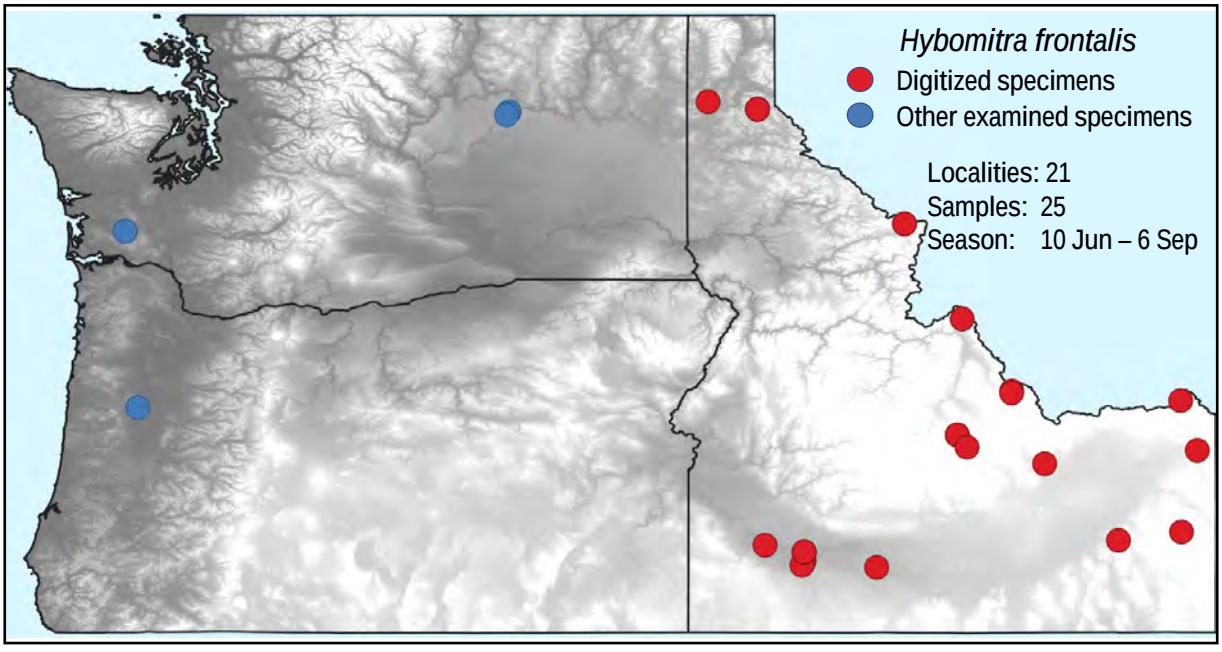
Diagnosis: Length 13-16 mm. Recognized by the midline triangles extending the full length of the tergites, the adjacent, almost parallel-sided, black bars and the salmon-pink sublateral bars extending at full width from the anterior to posterior end of each tergite. **Distribution:** Alberta to Manitoba, south to Utah and Nebraska.

key **_Hybomitra opaca_** (Coquillett) Hy 32



Diagnosis: Length 12-15 mm. The pruinose subcallus separates *opaca* from the similar *H. rupestris*, *H. melanorhina* and the typical form of *H. tetrica*. *H. opaca* differs from *frontalis* in having the convex basal callus touching the eyes and projecting as a small triangular area into the subcallus. **Distribution:** Alberta to Saskatchewan, south to California and Arizona.

key **Hybomitra frontalis** (Walker) Hy 33



Diagnosis: Length 10-16 mm. A species that is very difficult to characterize because of its variability in size and color. McAlpine (1961) described 8 morphs based on color variation, but only Morph number 1 (the most reddish morph) occurs in the PNW, where it is most similar to *H. opaca,* H. *pediontis*, and *H. tetrica*. **Distribution:** Alaska to Labrador, south to Colorado and Vermont.

Anthony Thomas studied blackflies and mosquitoes at McMaster University (Ontario) and tabanids at the University of Alberta (Edmonton). Subsequently he moved to New Brunswick and worked on Spruce Budworm. Since retirement he has concentrated on producing images of moth genitalia: several hundred on Tom Murray's PBase pages (Moths Identified with Genitalia Pictures (pbase.com)), several hundred on both BugGuide (bugguide.net) and the North American Moth Photographers Group (North American Lepidoptera Genitalia Library (msstate.edu)).

Luc Leblanc has many years of experience in the fields of insect taxonomy, specializing on Tephritidae, and managing insect collections. Originally from Canada, he resided many years abroad, implementing plant protection-related projects and research in Africa (1989-1994), the South Pacific Islands (1994-2002), and Hawaii (2003-2015). He is currently the curator and manager of the William F. Barr Entomological Museum, at the University of Idaho.

William J. Turner graduated from the University of California, Berkeley and immediately took a teaching and research faculty position at Washington State University (1971-2009), with specialization on biosystematics, biology and evolution of Diptera, especially lower Brachycera.