

A Matrix Key to Families, Subfamilies, and Tribes of Lepidoptera of Canada

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Abstract. Despite being ecologically, economically, and scientifically important as well as a relatively well known group of insects, the order Lepidoptera can be difficult for non-experts to identify reliably. The matrix-based key presented here provides an easy and reliable way to identify the more difficult groups of adult Lepidoptera using a standard dissecting microscope. The key allows identification to the level of subfamily or tribe for most Canadian Lepidoptera, includes 222 taxa, and uses 73 characters with 266 character states. Taxon pages covering the diversity, diagnosis, and taxonomic references of each taxon accompany the identification key.

Introduction

Lepidoptera, consisting of moths and butterflies, is one of the most diverse insect orders, with over 4700 species known in Canada, and their actual number probably over 6000 (Danks 1988). Although the majority are phytophagous as larvae, a few species feed on fungi, lichens, detritus, animal products, or other insects. Because of their abundance and generally phytophagous habits, Lepidoptera can have very important ecological roles and include many important agricultural and forestry pests. In addition, their showiness and variable life histories have resulted in the more charismatic species being used in biodiversity and ecological studies.

Obtaining accurate identifications is a vital step in any study. Most butterflies and many macrolepidoptera are readily identified by ‘picture-booking’ using various internet resources (e.g. Troubridge & Lafontaine 2004a; 2004b; 2004c; 2004d; Patterson 2010; Gilligan 2010), field guides (e.g. Powell & Opler 2009; Handfield 1999; Covell 1984; Brock & Kaufman 2006; Layberry *et al.* 1998), or visually skimming insect collections; however, this method is not practical for some macrolepidoptera and most microlepidoptera. Field guides are most useful for butterflies, but are less comprehensive for moths due to their much larger diversity. Even with these resources, picture-booking can be error prone, especially for beginners, and offers no obvious starting point. Alternatively, while traditional dichotomous keys can be helpful in giving a place to start, it is difficult to see many characters due to the covering of scales. The reliable identification of specimens often requires careful examination of genitalia or wing venation. There are a few user-friendly dichotomous keys (eg. Scudder & Cannings 2007; Fauske 2007); however, they do not have a comprehensive coverage of lepidopteran subfamilies and tribes. Consequently, relying on expert opinion has remained the best means for identifying microlepidoptera and difficult macrolepidoptera. However,

such taxonomists are already overworked and experts are often lacking for key taxa.

This matrix-based key is an attempt to give the novice a place to start for lepidopteran identifications. It uses characters that are non-destructive to specimens and that can be observed under a dissecting microscope. The key works well for most microlepidoptera, while for many macrolepidoptera it may only narrow identifications down to several taxon groups. The key covers all Lepidoptera of Canada, and includes 222 taxon groups and is based on 73 characters with 266 character states.

Methods

A total of 1656 specimens of 1388 species in 1151 genera were examined, covering roughly 85% of the Lepidoptera genera in Canada (Appendix 5-1). I attempted to cover the range of variation by examining a minimum of five specimens for each taxon group. Specimens were obtained from the University of Alberta Strickland Museum, the Canadian National Collection, the Northern Forestry Centre, and the personal collections of Greg Pohl and of the author. All specimens were examined under a dissecting microscope at no more than 50X magnification, and depending upon the size of the feature being measured, either an ocular micrometer, digital callipers, or a ruler was used. In addition to examining specimens in hand, images of every species from Troubridge & Lafontaine (2004a; 2004b; 2004c; 2004d) and Layberry *et al.* (1998) were examined and the extent of variation in wing pattern and colour was recorded for each taxon group. Data were recorded in a spreadsheet, and a summary for each taxon group was entered into XID (Old 2011).

The taxonomy employed here generally follows Kristensen (1999), except that Scoble (1999) and Ferguson (2008) were used for the Geometridae and Lafontaine and Schmidt (2010) for the Noctuoidea. Butterfly names follow Pelham (2008). Taxon diagnoses are based on all

examined specimens, and references represent a selection of what were considered to be the most comprehensive and useful sources. For a more thorough list of taxonomic references, refer to Pohl (2006).

General anatomy and characters

For a thorough coverage of lepidopteran anatomy, Scoble (1992) or Kristensen (2003) should be consulted. The terminology used in this key follows Covell (1984).

The head of Lepidoptera is typically dominated by a pair of large compound eyes composed of many ommatidia. Immediately dorsal to the compound eyes may be ocelli, although these are frequently lost. Ocelli are typically small, but can be noticeably larger in a few microlepidopteran families. The dorsal region between the compound eyes is the vertex, which is bordered anteroventrally by the frons. Scale vestiture can differ between these two regions and can be useful for identification. Chaetosemata are patches of regularly arranged, slender scales located dorsal to the compound eyes and posterior to the ocelli, and are found in many different families. Each antenna is composed of a basal and usually broad scape that is followed by the second segment termed the pedicel, and a followed by a slender, multi-segmented flagellum. It is often scaled dorsally, and these scales may be arranged in rows on the flagellum, the number of which may be important in identification. Most Lepidoptera have well-developed, three segmented labial palps. Maxillary palps are five segmented, but are usually reduced in size and number of segments in all but some of the most basal lineages. The most basal lineages may also have functional mandibles, although these are difficult to see. Most Lepidoptera have a coiled proboscis (sometimes termed a haustellum), although this can be secondarily reduced or lost entirely. In some lineages the proboscis is covered by overlapping scales, at least basally, and this is one of the most useful characters in identifying microlepidoptera.

The thorax is divided into a prothorax, mesothorax, and metathorax, of which each has a pair of legs and the last two have a pair of wings each. When the wings are spread open, triangular, scaled projections, termed tegulae jut slightly outwards from the forewing base. The scale covering of the wings usually conceals their transparency and venation. The most basal lineages have homoneurous wings, which have a forewing and hindwing that are similarly veined and shaped and may be coupled together by a jugal lobe on the posterior edge of the forewing. However, the vast majority of the Lepidoptera have heteroneurous wings in which shape and venation differ between forewings and hindwings. In many of these families, the wings are coupled together by a frenulum, which is a curved bristle or series of bristles originating on the leading edge of the base of the hindwing that latches into a retinaculum on the underside of the forewing. Each leg is composed of a

coxa which rests next to the thorax, a tiny trochanter, an elongate and usually thick femur, a long slender tibia, and the tarsus (usually composed of five tarsomeres) ending in a pair of claws. The tibiae on the prothorax usually have an elongate scaled projection, termed an epiphysis. The tibiae located on the meso- and metathoracic segments often have movable spurs, with the mid-legs typically having two, and the hind-legs typically having four.

The abdomen is usually rather soft and consists of eight segments and terminal genitalia. The dorsal plates of the abdomen are termed tergites and the ventral plates sternites. Females will often have hairy ovipositor lobes at the end of the abdomen, though these may be modified into a sclerotized piercing structure in some taxa. Males have a pair of claspers associated with the genitalia, and these may be visible without dissection, especially if the scales are brushed off at the tip of the abdomen.

How to use this key

The key uses XID software developed by Richard Old that runs on a Windows platform. This software was chosen over other software titles due to its ease of use, excellent technical support, and its lack of glitches related to Java platform incompatibility that some other programs have. Run XIDRO.exe and open the file “Key to the Lepidoptera of Canada.xid”. Upon launching the program you will see a hierarchical list of characters (Appendix 5-2) in the upper left frame and these can be expanded by clicking on the “+” to reveal characters nested within. Once you reach a set of attributes, you will see a dotted box where you can enter your character state and a number that states how many taxon groups will remain if you mark that character state. If you click on the characters or attributes, a photo and a description may appear in the frame on the right. If a character is ambiguous, you can mark more than one box with “or”.

In the frame on the bottom left is a list of the taxon groups. The number at the top will show how many of the taxa have not been eliminated out of the 222 groups. Once a taxon group has been eliminated, the checkmark in front of it will change to an “X”, the font will turn red, and it will be moved down the list. Clicking on any of the taxon groups will show a picture and a taxon description followed by a selection of taxonomic references.

Several of the buttons in the top menu bar are useful when identifying a specimen. Hover over the button with the mouse cursor to see the name of each button. The most useful button to start with and to use after every character state selection, is the “analyze” button, which will list the most useful characters to initially look at.



Clicking on the “item/species list” button will show pictures and descriptions for the remaining taxa for easy comparison.



The “gallery” button will show thumbnail pictures of the remaining taxa for quick comparison. You can adjust the number of images shown by selecting “Gallery” in the “Options” menu.



Marking “marked & eliminated” button will give a list of characters marked.



Clicking on the “analyze” button will list the most useful characters to narrow down the search, and is the most useful button to quickly key out a specimen.



The “clear all marks” button is a quick way to restart the key.



The “show/hide references” button will reveal a full list of references used in the taxon descriptions.

When selecting specimens for keying, try to choose ones with the least amount of damage. Using a specimen where many of scales are rubbed off may underrepresent the pattern and the increase the chance of an incorrect identification. For measurements of some of the smaller specimens, care must be taken to get a fairly accurate measurement, especially when dealing with ratios. For small measurements, an ocular micrometer on a stereo microscope should be used when available. This key was built using species found within Canada and trying to use it to identify specimens collected elsewhere may also result in incorrect identifications. If errors are discovered in the key, the author would greatly appreciate the details to help improve future updates. A link will be provided to unreviewed updates of this key.

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References for Introduction

Brock J. P., and K. Kaufman. 2006. Kaufman Field Guide to Butterflies of North America. Houghton Mifflin Harcourt, Boston.

Covell C. V. 1984. A Field Guide to the Moths of Eastern North America. Houghton Mifflin, Boston.

Danks H. V. 1988. Insects of Canada. Biological Survey of Canada Document series no. 1.

Fauske G. M. 2007. A key to the superfamilies of the Lepidoptera with special reference to North and South Dakota. <http://www.ndsu.edu/pubweb/~gefauiske/ndmoths/Family%20key/keysSPF1.htm> Accessed: 26 iv 2011.

Ferguson D. C. 2008. The Moths of America North of Mexico, Fascicle 17.2, Geometroidea, Geometridae, Ennominae (part: Abraxini, Cassymini, Macariini). The Wedge Entomological Research Foundation, Washington.

Gilligan T. M. 2010. Tortricid.net. <http://www.tortricidae.com/> Accessed: 30 v 2010.

Handfield L. 1999. Le Guide des Papillons du Québec. Version populaire. Broquet, Boucherville, QC.

Kristensen N. P. 1999. Handbook of Zoology, Vol. IV Arthropoda: Insecta Part 35, Lepidoptera, Moths and Butterflies Vol. 1: Evolution, Systematics, Biogeography. Walter de Gruyter, Berlin.

Kristensen N. P. 2003. Handbook of Zoology, Vol. IV. Arthropoda: Insecta. Part 36, Lepidoptera, Moths and Butterflies, Vol. 2: Morphology, Physiology, and Development. Walter de Gruyter, Berlin.

Lafontaine J. D., and B. C. Schmidt. 2010. Annotated check list of the Noctuoidea (Insecta, Lepidoptera) of North America north of Mexico. *ZooKeys* 40:1-239.

Layberry R. A., P. W. Hall, and J. D. Lafontaine. 1998. The Butterflies of Canada. University of Toronto Press Inc., Toronto.

Old, R. 2011. XID Services. <http://xidservices.com/> Accessed: 08 v 2011.

Patterson B. 2010. The Moth Photographers Group. <http://mothphotographersgroup.msstate.edu/MainMenu.shtml> Accessed: 30 v 2010.

Powell J. A., and P. A. Opler. 2009. Moths of Western North America. University of California Press, Berkeley,

California.

Scoble M. J. 1992. *The Lepidoptera: Form, Function and Diversity*. Oxford University Press, New York.

Scoble M. J. 1999. *Geometrid moths of the world: a catalogue (Lepidoptera: Geometridae)*. Natural History Museum, London.

Scudder G. G. E., and R. A. Cannings. 2007. *Lepidoptera and associated orders of British Columbia*. <http://www.zoology.ubc.ca/bclepetal/> Accessed: 26 iv 2011.

Troubridge J. T., and J. D. Lafontaine. 2004. *The Moths of Canada*. Accessed: 30 v 2010. http://www.cbif.gc.ca/spp_pages/misc_moths/phps/mothindex_e.php

Characters

Head

Vertex - The vertex is the top part of the head between the compound eyes. (Fig. 1)

Rough scaled - Scales on the dorsal part of the head are rough or erect. (Fig. 2)

Smooth scaled - Scales on the dorsal part of the head are flattened or smooth looking. (Fig. 3)

Frons - The frons is the front part of the head between the compound eyes. (Fig. 4)

Rough scaled - Scales on the front part of the head are rough or erect. (Fig. 2)

Smooth scaled - Scales on the front part of the head are flattened or smooth looking. (Fig. 3)

Compound eye - The compound eyes are the large eyes visible and are made of many tiny lenses called ommatidia. (Fig. 5)

Hairy - Fine hairs are present between the individual facets of the compound eye and are noticeably long, at least ten times the width of an individual ommatidia. (Fig. 6)

Hairless - Fine hairs are absent between the individual facets of the compound eye or are not noticeably long or are not easily visible. (Fig. 5)

Ocelli - Ocelli are two very small, single lensed eyes that are situated just dorsal to the compound eyes when present. When in doubt, check the other side of the head since debris

can occasionally take on the appearance of ocelli and they can be obscured by scales. (Fig. 7)

Present - Ocelli are present.

Absent - No ocelli are present. When the ocelli are completely concealed by long scales, they count as absent.

Antennae

Eye cap - A broadening of the antennal base that can partially or fully cover the compound eye. (Fig. 8)

Present - A broadening of the antennal base that can partially or fully cover the compound eye is present. This character is only present in some tiny microlepidoptera.

Absent - A broadening of the antennal base that can partially or fully cover the compound eye is absent. This character is only present in some tiny microlepidoptera.

Number of scale rows per antennal segment - The antenna often has scales on each segment that may be arranged in rows. These are often only on the dorsal part of the antenna. Always check the middle of the antenna since the very base and very tip can be different than the remainder of the antenna. In cases where the segments are not apparent, try looking in lateral or ventral view for unscaled areas, or look for repeated patterns (eg. scale colours, distinct distal sensillae).

0 - There are no scales on the antenna, or they are present only at the very base or apex. When in doubt scan the entire antenna. (Fig. 9)

1 - There is one row of scales per antennal segment. In cases where the segments are not apparent, try looking in lateral or ventral view for unscaled areas, or look for repeated patterns (eg. scale colours, distinct distal sensillae). (Fig. 10)

2 - There are two rows of scales per antennal segment. In cases where the segments are not apparent, try looking in lateral or ventral view for unscaled areas, or look for repeated patterns (eg. scale colours, distinct distal sensillae). (Fig. 11)

3+ or not in rows - There are three or more rows of scales per antennal segment or the scales are not in apparent rows. In cases where the segments are not apparent, try looking in lateral or ventral view for unscaled areas, or look for repeated patterns (eg. scale colours, distinct distal sensillae). (Fig. 12)

Antennal length - The approximate length of the antennae

compared to the FW length.

<1/2 forewing length - The antenna is less than 1/2 the length of the forewing measured from the wing base along the costa to the apex. If the antenna is roughly 1/2 the length, mark both <1/2 and >1/2 as 'OR'. (Fig. 13)

>1/2 forewing length - The antenna is greater than 1/2 the length of the forewing measured from the wing base along the costa to the apex, but less than the forewing length. If the antenna is roughly 1/2 the length, mark both <1/2 and >1/2 as 'OR'. (Fig. 14)

> 1 forewing length - The antenna is greater than the length of the forewing measured from the wing base along the costa to the apex, but less than twice its length. If the antenna is roughly the length of the forewing, mark both >1/2 and >1 as 'OR'. (Fig. 15)

> 2 forewing lengths - The antenna is greater than twice the length of the forewing measured from the wing base along the costa to the apex. Only Adelidae should have this character state which normally have iridescent forewings. If your specimen is dull-looking, check the wing. If it is covered in hairs and not scales, you have a caddisfly (Order Trichoptera). (Fig. 16)

Antennal sensillae length - These are fine hairs that are present ventrally on the antenna. For the purposes of this key, all hair-like structures that are visible are considered sensillae. (Fig. 17)

> half shaft width - Fine hairs are present on the ventral surface of the antenna and they are longer than 1/2 the width of the antennal shaft. These hairs may be sparse (including a single one at the distal end of each antennal segment) or dense. They need to be throughout the antenna, not just at the base or tip.

< half shaft width or absent - Fine hairs are absent from the ventral surface of the antenna or they are shorter than 1/2 the width of the antennal shaft. These hairs may be sparse (including a single one at the distal end of each antennal segment) or dense. They need to be throughout the antenna, not just at the base or tip.

Antennal type - The type of antenna the specimen has.

Filiform - A simple thread-like antenna or weakly pectinate with the pectinations less than twice the antennal shaft width. (Fig. 18)

Pectinate - The antennal segments have projections (pectinations) diverging off of them that are longer than twice the shaft width. Not all segments need to have pectinations, they are often absent from some of the antennal segments, especially apically. (Fig. 19)

Elongate club - Roughly the distal quarter or more of the antenna is thicker than the basal part. Most commonly seen in some diurnal moths. (Fig. 20)

Hooked - The antennal tip is hooked. This is often in combination with an abrupt club, in these cases mark both. The hooked antenna is most common in skippers, but can

be found in some moths. (Fig. 21)

Abrupt club - The very tip of the antenna is thickened or it is thickened just before, and the apex is hooked. When it is also hooked, mark both. The abrupt club is characteristic of most butterflies, but a few moths have it as well. (Fig. 22)

Labial palps - The labial palps are normally the most prominent palps. In some microleps the maxillary palps can be long as well, but in these cases the maxillary palps are very slender and have more than 3 visible segments while the labial palps have only 3 visible segments and may or may not be slender.

Orientation of labial palps - The orientation of the labial palps.

Ascending - Ascending palps point upwards, often following the contour of the head, and when really long can project backwards as well. (Fig. 23)

Porrect - Porrect palps point forwards, though they may have an upward inflection near their base. (Fig. 24)

Descending - Descending palps curl downwards or less commonly point downwards, and are normally parallel. Sometimes during the preparation of specimens, ascending palps can be artificially bent downwards, though these usually appear to be spread apart. (Fig. 25)

Labial palp length - The length of the labial palps relative to the compound eye.

> 2X length of compound eye - The length of the labial palp (measured from the base to tip and following any contour) is greater than twice the greatest length of the compound eye. (Fig. 23)

< 2X length of compound eye - The length of the labial palp (measured from the base to tip and following any contour) is less than twice the greatest length of the compound eye. (Fig. 5)

Labial palp vestiture - The presence or absence of erect scales or scale tufts on the labial palps.

Palps tufted - Erect scales are present throughout or in tufts on the labial palp giving it a roughened appearance. (Fig. 5)

Palps smooth - The scales on the labial palp are closely appressed to it. The palp may be expanded, especially on the second segment, but even here the scales will be appressed. (Fig. 26)

Maxillary palps - The maxillary palps tend to be slender and with more than three segments when visible. Only

some microleps have maxillary palps longer than half the length of the labial palps (measured from the base to tip and following any contour). A few macroleps that have very short labial palps will fall under this, but the maxillary palps in most leps are very short or not visible.

>1/2 length labial palps - The maxillary palps are greater than half the length of the labial palps. (Fig. 27)

<1/2 length labial palps - The maxillary palps are less than half the length of the labial palps. (Fig. 28)

Proboscis - The proboscis is located on the lower front part of the head when present and is often coiled. When coiled, the proboscis may be hidden between the labial palps, but can still be seen from a ventral view with good lighting. It can be absent or reduced.

Naked - The proboscis is completely shiny and naked, lacking appressed scales. Sometimes loose scales can adhere to the proboscis, but they are always arranged haphazardly and not overlapping each other. (Fig. 29)

Scaled - The proboscis has appressed scales on it at least near the base, but they can continue for more than half the length. (Fig. 30)

Absent - The proboscis is either absent or not visible. When coiled, the proboscis can be hidden between the labial palps, but can still be seen from a ventral view with good lighting. When it is very short and not visible at all due to dense erect scales, it is marked as absent. (Fig. 31)

Thorax

Dorsal thoracic scale tuft - A tuft of erect scales is raised dorsally above the rest of the thoracic scales. This is typically mid-dorsal, though there may be smaller paired tufts. Tegulae which are triangular tufts of scales that spread out laterally from the thorax around the base of the forewing do not count as scale tufts. (Fig. 32)

Present - A dorsal thoracic scale tuft is present.

Absent - All scales on the dorsal surface of the thorax are uniform in height.

Wings

Wings reduced - The wings are reduced or absent. Reduced wings are not functional and do not extend to the middle part of the abdomen. This is found only in the females of a few groups.

Reduced - The wings are reduced or absent. Reduced wings are not functional and do not extend to the middle part of the abdomen. This is found only in the females of a few groups. (Fig. 33)

Normal size - Wings are present and normally fully functional. They extend beyond the middle of the abdomen. (Fig. 34)

Forewing

Raised scales on forewing (Fig. 35)

Present - Tufts of scales are present on the forewing that are raised above the surface. The tufts are often composed of modified scent scales that look different than the other wing scales. Damaged specimens can have the appearance of raised scales, but these are usually in a line and composed of scales similar to those of the rest of the wing.

Absent - All scales on the forewing are appressed to the surface.

Costal fold in male - The basal portion of the costa is folded back over itself. This is present in males of certain groups and they usually have modified scales tucked in underneath the fold. (Fig. 36)

Present - The costal fold is present in males.

Absent - The costal fold is absent in males.

Forewing notch - There are one or more deep notches in the outer margin. (Fig. 37)

Present - A forewing notch or notches are present.

Absent - A forewing notch or notches are absent.

Forewing pattern - The pattern refers to those on the dorsal surface of the wing only.

Number of forewing colours

Single colour - The forewing is one solid colour with no pattern or variation in colour. (Fig. 38)

At least 2 colours - The forewing has at least a faint pattern or is speckled or graded in other colours. (Fig. 39)

Forewing spots

Forewing reniform spot - The true reniform spot is found just beyond the middle of the forewing towards the costa,

and just inside the postmedial line when present. This is typical of noctuids and other macroleps. When a spot is indicated in a similar location in microleps, it is marked as present. (Fig. 40)

Present - The reniform spot is present.

Absent - The reniform spot is absent.

Forewing orbicular spot - The true orbicular spot is found just before the middle of the forewing towards the costa, and just beyond the antemedial line when present. This is typical of noctuids and other macroleps. When a spot is indicated in a similar location in microleps, it is marked as present. (Fig. 41)

Present - The orbicular spot is present.

Absent - The orbicular spot is absent.

Forewing claviform spot - The true claviform spot is found just before the middle of the forewing towards the inner margin, just below the orbicular spot when present. This is typical of noctuids and other macroleps. When a spot is indicated in a similar location in microleps, it is marked as present. (Fig. 42)

Present - The claviform spot is present.

Absent - The claviform spot is absent.

Forewing discal spot / dot - The discal spot is usually small and located close to the center of the medial area of the forewing. It is rarely present when the reniform, orbicular, or claviform spots are present. (Fig. 43)

Present - A discal spot or dot is present.

Absent - A discal spot or dot is absent.

Forewing lines - These characters refer to the dorsal surface of the wing only

Forewing antemedial line - The antemedial line is located roughly one third of the way from the forewing base and before the orbicular spot when present. This line may be incomplete and even a strong indication of this line at only the costa or inner margin or a series of dots should be marked as present. It is also marked as present when it forms the edge of a basal patch or medial band. (Fig. 44)

Present - The antemedial line is present.

Absent - The antemedial line is absent.

Forewing medial line - The medial line is located roughly at the center of the forewing and between the orbicular and reniform spots when present. This line may be incomplete and even a strong indication of this line at only the costa or inner margin or a series of dots should be marked as present. It is also marked as present when it forms the edge of a patch or band. (Fig. 45)

Present - The medial line is present.

Absent - The medial line is absent.

Forewing postmedial line - The postmedial line is located roughly two thirds of the way from the forewing base and after the reniform spot when present. This line may be incomplete and even a strong indication of this line at only the costa or inner margin or a series of dots should be marked as present. It is also marked as present when it forms the edge of a medial or terminal band. (Fig. 46)

Present - The postmedial line is present.

Absent - The postmedial line is absent.

Forewing subterminal line - The subterminal line is located just before the outer margin of the forewing and after the postmedial line when present. This line may be incomplete and even a strong indication of this line at only the costa or inner margin or a series of dots should be marked as present. It is also marked as present when it forms the edge of a medial or terminal band. (Fig. 47)

Present - The subterminal line is present.

Absent - The subterminal line is absent.

Forewing dashes or streaks - Obvious dashes or streaks run through the forewing. They can be single or multiple. Sometimes the wing veins will be traced with paler scales, when these form a broad streak mark them as present, otherwise mark them as absent. (Fig. 48)

Present - Dashes or streaks are present.

Absent - Dashes or streaks are absent.

Forewing colour - The colour refers strictly to the upper surface of the wing.

Forewing iridescent / shiny - At least some of the scales on the forewing appear reflective or change colour when the viewing angle of the wing is changed. Typically these are iridescent or extremely shiny. This is slightly subjective since all scales have some shininess to them.

Present - There are at least some iridescent or metallic scales, or overall looks very shiny.

Absent - There are no iridescent or metallic scales and overall does not look very shiny.

Forewing transparent - There are at least small patches on the forewing that are transparent and lacking scales. Very translucent wings like those found in Cossidae can be marked either way. Excessive wear of specimens can cause extensive denuding of the wing scales, leaving it transparent. These should not be considered transparent.

Present - There are transparent patches on the wing.

Absent - The wing is fully scaled.

Forewing black - At least some of the scales on the dorsal surface of the forewing are black. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some black scales are present on the forewing.

Absent - There are no black scales on the forewing.

Forewing grey - At least some of the scales on the dorsal surface of the forewing are grey. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some grey scales are present on the forewing.

Absent - There are no grey scales on the forewing.

Forewing brown - At least some of the scales on the dorsal surface of the forewing are brown. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some brown scales are present on the forewing.

Absent - There are no brown scales on the forewing.

Forewing yellow - At least some of the scales on the dorsal surface of the forewing are yellow. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some yellow scales are present on the forewing.

Absent - There are no yellow scales on the forewing.

Forewing white - At least some of the scales on the dorsal

surface of the forewing are white. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some white scales are present on the forewing.

Absent - There are no white scales on the forewing.

Forewing orange - At least some of the scales on the dorsal surface of the forewing are orange. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some orange scales are present on the forewing.

Absent - There are no orange scales on the forewing.

Forewing red - At least some of the scales on the dorsal surface of the forewing are red. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some red scales are present on the forewing.

Absent - There are no red scales on the forewing.

Forewing purple - At least some of the scales on the dorsal surface of the forewing are purple. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some purple scales are present on the forewing.

Absent - There are no purple scales on the forewing.

Forewing green - At least some of the scales on the dorsal surface of the forewing are green. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some green scales are present on the forewing.

Absent - There are no green scales on the forewing.

Forewing blue - At least some of the scales on the dorsal surface of the forewing are blue. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some blue scales are present on the forewing.

Absent - There are no blue scales on the forewing.

Forewing pink - At least some of the scales on the dorsal

surface of the forewing are pink. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some pink scales are present on the forewing.

Absent - There are no pink scales on the forewing.

Hindwing - All of these characters refer to the dorsal surface of the wing.

Hindwing fringe length - The fringe is the elongated scales that border the outer margin of the hindwing.

> **Hindwing width** - The length of the fringe is longer than the hindwing width (measured perpendicularly from the inner margin of the hindwing for the greatest distance to near the anal angle). This is present in small microleps. (Fig. 49)

< **Hindwing width** - The length of the fringe is shorter than the hindwing width (measured perpendicularly from the inner margin of the hindwing for the greatest distance to near the anal angle). This is the state in larger microleps and macroleps. (Fig. 50)

Hindwing tail - The hindwings are projected into tails. These can be subtle points. (Fig. 51)

Present - Tails are present.

Absent - Tails are absent.

Hindwing notch - There are one or more deep notches in the outer margin. (Fig. 37)

Present - A hindwing notch or notches are present.

Absent - A hindwing notch or notches are absent.

Hindwing pattern - All of these characters refer to the dorsal surface of the wing.

Hindwing boldly patterned - The hindwing has a bold pattern of contrasting colours. This can be as simple as the outer part of the wing being distinctly darker than the inner part.

Boldly patterned - The hindwing is boldly patterned. (Fig. 52)

Not boldly patterned - The hindwing is not boldly patterned. It can grade subtly from one shade to another, but never distinctly so. (Fig. 53)

Hindwing similar to forewing in pattern - The hindwing pattern is a continuation of the forewing pattern. This is most common in leps that rest with their wings open and hindwings exposed.

Forewing and hindwing pattern similar - The forewing and hindwing are similar in pattern. (Fig. 52)

Forewing and hindwing pattern different - The forewing and hindwing are not similar in pattern. (Fig. 53)

Hindwing discal spot / lunule - A spot is often present in the middle of the hindwing which can sometimes be crescent-shaped (lunule). (Fig. 54)

Present - A discal spot or lunule is present.

Absent - A discal spot or lunule is absent.

Hindwing colour

Hindwing iridescent / shiny - At least some of the scales on the hindwing appear reflective or change colour when the viewing angle of the wing is changed. Typically these are iridescent or extremely shiny. This is slightly subjective since all scales have some shininess to them.

Present - There are at least some iridescent or metallic scales, or overall looks very shiny.

Absent - There are no iridescent or metallic scales and overall does not look very shiny.

Hindwing black - At least some of the scales on the dorsal surface of the hindwing are black. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some black scales are present on the hindwing.

Absent - There are no black scales on the hindwing.

Hindwing grey - At least some of the scales on the dorsal surface of the hindwing are grey. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some grey scales are present on the hindwing.

Absent - There are no grey scales on the hindwing.

Hindwing brown - At least some of the scales on the dorsal surface of the hindwing are brown. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some brown scales are present on the hindwing.

Absent - There are no brown scales on the hindwing.

Hindwing yellow - At least some of the scales on the dorsal surface of the hindwing are yellow. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some yellow scales are present on the hindwing.

Absent - There are no yellow scales on the hindwing.

Hindwing white - At least some of the scales on the dorsal surface of the hindwing are white. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some white scales are present on the hindwing.

Absent - There are no white scales on the hindwing.

Hindwing orange - At least some of the scales on the dorsal surface of the hindwing are orange. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some orange scales are present on the hindwing.

Absent - There are no orange scales on the hindwing.

Hindwing red - At least some of the scales on the dorsal surface of the hindwing are red. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some red scales are present on the hindwing.

Absent - There are no red scales on the hindwing.

Hindwing green - At least some of the scales on the dorsal surface of the hindwing are green. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some green scales are present on the hindwing.

Absent - There are no green scales on the hindwing.

Hindwing blue - At least some of the scales on the dorsal surface of the hindwing are blue. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some blue scales are present on the hindwing.

Absent - There are no blue scales on the hindwing.

Hindwing pink - At least some of the scales on the dorsal surface of the hindwing are pink. When it grades into another colour or if in doubt, mark more than one colour.

Present - At least some pink scales are present on the hindwing.

Absent - There are no pink scales on the hindwing.

Legs

Hind tibial spur length - The hind tibia usually has two sets of movable spurs, one set near the apex, and one near the middle. Spurs when they are visible usually are situated in closely set pairs that spread outwards in a 'V'. The spurs are often covered in scales and are usually prominent except when the tibiae are excessively hairy. (Fig. 55)

> 1/2 length of 1st tarsomere - At least one of the apical pair of tibial spurs is longer than half of the length of the first tarsomere.

< 1/2 length of 1st tarsomere - The apical pair of tibial spurs are both shorter than half of the length of the first tarsomere.

Hind tibial spines - Spiniform setae are present that protrude from the scaly covering. These spiniform setae are usually much darker than the surrounding scales so they are apparent; however, in some small microleps they can be concolourous, but they are excessively long. In specimens where the scales of the tibia are excessively long and dense, these spiniform setae will be very difficult to see. In these cases mark the spines as absent. (Fig. 56)

Present - Hind tibial spiniform setae are visible.

Absent - Hind tibial spiniform setae are not visible.

Hind tarsal spines - Darkly pigmented spiniform setae are present on the ventral surface of the tarsomeres. These do not include paired spiniform setae at the apical end of each tarsomere since these are present in most Lepidoptera. Only count spines that are not apical in position.

Present - Spiniform setae are present on the tarsomeres in addition to apical paired spiniform setae. (Fig. 57)

Absent - There are no spiniform setae on the tarsomeres in addition to apical paired spiniform setae. (Fig. 58)

Measurements & ratios

Thorax width - The thorax width is measured as the distance between the base of both forewings at the costa. Do not include the tegulae (triangular scaled projections extending from the thorax at the wing bases) in measurements. (Fig. 59)

Forewing length - The forewing length is measured from the base at the costa in a straight line to the apex. Ignore this if the wings are reduced or absent. (Fig. 60)

Forewing width - The forewing width is measured in a straight line from the apex to the anal angle. In smaller microlepis with lanceolate wings, measure the broadest part of the wing, usually around the middle of the forewing. Ignore this if the wings are reduced or absent. (Fig. 61)

Hindwing width - The hindwing width is measured as the greatest distance measured from the costa perpendicularly to the anal angle. Ignore this if the wings are reduced or absent. (Fig. 62)

Ratio forewing length : thorax width - Forewing length (measured from the base at the costa in a straight line to the apex) divided by thorax width (measured as the distance between the base of both forewings at the costa). Ignore this if the wings are reduced or absent. (Fig. 63)

Ratio forewing length : forewing width - Forewing length (measured from the base at the costa in a straight line to the apex) divided by forewing width (measured in a straight line from the apex to the anal angle). Ignore this if the wings are reduced or absent. (Fig. 64)

Ratio forewing width : hindwing width - Forewing width (measured in a straight line from the apex to the anal angle) divided by hindwing width (measured as the greatest distance measured from the costa perpendicularly to the anal angle). Ignore this if the wings are reduced or absent. (Fig. 65)

Abdomen

Ovipositor - The abdominal tip of most female Lepidoptera is fleshy; however, in some taxa there is a sclerotized and elongated ovipositor. If a sclerotized-looking ovipositor extends beyond the abdominal scales, mark the ovipositor as sclerotized.

Sclerotized - A sclerotized and elongate ovipositor is present. (Fig. 66)

Non-sclerotized - A sclerotized and elongate ovipositor is absent.

Abdominal dorsal scale tuft - A tuft of erect scales is raised dorsally above the rest of the abdominal scales. Do not include anal scale tufts at the tip of the abdomen. (Fig. 67)

Present - A dorsal abdominal scale tuft is present.

Absent - A dorsal abdominal scale tuft is absent.

Abdominal pattern - The abdomen has a contrasting pattern on it.

Boldly patterned - The abdomen is boldly patterned. (Fig. 68)

Not boldly patterned - The abdomen is not boldly patterned. (Fig. 69)

Geography

Nunavut - The Lepidoptera fauna is relatively well known here.

Northwest Territories - The Lepidoptera fauna is not very well known here so marking this may eliminate taxa that are present.

Yukon Territory - The Lepidoptera fauna is not very well known here so marking this may eliminate taxa that are present.

British Columbia - The Lepidoptera fauna is relatively well known here.

Alberta - The Lepidoptera fauna is relatively well known here.

Saskatchewan - The Lepidoptera fauna is not very well known here so marking this may eliminate taxa that are present.

Manitoba - The Lepidoptera fauna is relatively well known here.

Ontario - The Lepidoptera fauna is relatively well known here.

Quebec - The Lepidoptera fauna is relatively well known here.

New Brunswick - The Lepidoptera fauna is not very well known here so marking this may eliminate taxa that are present.

Prince Edward Island - The Lepidoptera fauna is not

very well known here so marking this may eliminate taxa that are present.

Nova Scotia - The Lepidoptera fauna is relatively well known here.

Newfoundland and Labrador - The Lepidoptera fauna is not very well known here so marking this may eliminate taxa that are present.

TAXON DIAGNOSES

Micropterigidae (Fig. 70)

Superfamily: Micropterigoidea

Number of Canadian species: 1 mostly eastern sp. (*Epimartyria auricrinella*) + 1 undescribed sp. in BC

Genera: *Epimartyria*

Abundance: Very localized to wet areas where the larval host liverwort occurs, diurnal and rarely collected unless specifically targeted.

Quick recognition: The combination of the metallic wings, forewing and hindwing similar in shape and proboscis being absent will separate this from other similar-looking families. The two species are easily separated by wing pattern.

Diagnosis: HEAD: ocelli prominent; compound eyes small; chaetosemata present; head scales sparse and rough; functional mandibles present though difficult to see; proboscis absent; labial palps slender and relatively short; maxillary palps prominent; antenna filiform, with one scale row per segment, though often completely worn off, greater than half the length of the forewing, with prominent sensillae surrounding each flagellomere. THORAX: wings homoneurous, with a jugum; forewing dark metallic with a purplish sheen, unicolourous in *Epimartyria auricrinella*, with a broad yellow postmedial blotch in the undescribed species; hindwing lighter though still with a metallic sheen; legs with tibial spur formula of 0-0-4, hind tibial spurs short, hind tarsal spines present though not always obvious. ABDOMEN: entirely smooth, dark.

Similar taxa: Eriocraniidae (forewing patterned, small proboscis present)

Taxonomic references: Covell 1984

Eriocraniidae (Fig. 71)

Superfamily: Eriocranioidea

Number of Canadian species: 2 spp. (*Dyseriocrania griseocapitella* in the east and *Eriocrania semipurpurella* across the boreal zone)

Genera: *Dyseriocrania*, *Eriocrania*

Abundance: Rarely collected, but can be locally common, comes to light.

Quick recognition: The metallic sheen to the wings with fine strigulated pattern, forewing and hindwing similar in

shape, small proboscis, and bulging vertex of the head will separate this from other similar-looking families. The two species can be separated by wing pattern.

Diagnosis: HEAD: ocelli prominent; compound eyes small; chaetosemata present; head scales sparse and rough; mandibles present though difficult to see; very small proboscis present; labial palps slender and relatively short; maxillary palps prominent; antenna filiform, with one scale row per segment, about half the length of the forewing. THORAX: wings homoneurous, with a jugum; forewing somewhat translucent with a metallic sheen, often with fine lines or spots; hindwing slightly translucent grey; legs with tibial spur formula of 0-1-4, hind tibial spurs of normal length, hind tarsal spines present though not usually obvious. ABDOMEN: entirely smooth; female with a prominent ovipositor.

Similar taxa: Micropterigidae (forewing unpatterned, no proboscis)

Taxonomic references: Davis 1978

Acanthopteroctetidae (Fig. 72)

Superfamily: Acanthopteroctetoidea

Number of Canadian species: 1 sp. *Acanthopteroctetes bimaculata* in Canada only known from Manitoba to Alberta in boreal and mountain habitats; another species will likely be found in southern Alberta.

Genera: *Acanthopteroctetes*

Abundance: Very rarely collected probably due to its diurnal or crepuscular habits.

Quick recognition: The homoneurous wings, lack of iridescence on the wings and lack of ocelli are characteristic. Diagnosis: HEAD: ocelli absent; compound eyes relatively larger than other related families; head scales rough; mandibles present though difficult to see; small proboscis present but often difficult to see; labial palps minute and descending; maxillary palps prominent, longer than proboscis; antenna filiform, with one or two scale rows per segment, greater than half the length of the forewing. THORAX: wings homoneurous, with a small jugum; forewing dull greyish, often with the indication of two darker spots along the inner margin; hindwing greyish; legs with tibial spur formula of 0-1-4, hind tibial spurs just less than half length of first tarsomere, hind tibial and tarsal spines obvious. ABDOMEN: entirely smooth.

Similar taxa: Most similar to Eriocraniidae and Micropterigidae, but both of these have prominent ocelli.

Taxonomic references: Davis 1978

Hepialidae (Fig. 73)

Superfamily: Hepialoidea

Number of Canadian species: 12 spp. found throughout Canada south of the tundra.

Genera: *Gazorycta*, *Korscheltellus*, *Paraphymatopus*, *Sthenopsis*

Abundance: Uncommon to locally common, some species frequent lights, many are most frequently found in mating swarms in the evening.

Quick recognition: Large to huge thick-bodied micromoths with relatively small heads, short antennae, and homoneurous wings. Most species are easy to recognize by wing pattern, though there is no modern literature on *Paraphymatopus*.

Diagnosis: HEAD: tiny relative to thorax; ocelli absent; head scales rough; proboscis absent; both labial and maxillary palps tiny; antenna filiform, scale-less, very short. THORAX: wings homoneurous, with a jugum; forewing usually marked with broad bands or blotches, sometimes metallic; hindwing usually mostly unpatterned; legs with without tibial spurs, hind tibial and tarsal spines not obvious except in *Gazorycta*. ABDOMEN: entirely smooth, and relatively long.

Similar taxa: No other family of homoneurous moths approaches the size of a hepialid.

Taxonomic references: Barnes & Benjamin 1925 (*Gazorycta* spp.); Powell & Opler 2009 (*Paraphymatopus* spp. and some others); Handfield 1999 (eastern spp.)

Nepticulidae (Fig. 74)

Superfamily: Nepticuloidea

Number of Canadian species: 37 spp. found across Canada

Genera: *Stigmella*, *Ectoedemia*, *Etainia*, *Glaucolepis*

Abundance: uncommon, some species come to lights

Quick recognition: The minute size (forewing length 3 mm or less) combined with the large eye-caps and darkly patterned forewings make it easily recognizable. Most species need to be dissected for positive identification.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough, rarely smooth on the frons; proboscis very short and can be difficult to see; labial palps small and descending; maxillary palps prominent; antenna filiform, with one scale row per segment, half length of the forewing or shorter, with a very large rounded eye-cap at the base. THORAX: wings heteroneurous and lanceolate, with a frenulum, jugum sometimes present; forewing dark and usually metallic, often with a pale band; hindwing usually pale grey; legs with tibial spur formula of 0-2-4, hind tibial spurs prominent, very large hind tibial spines present though sometimes obscured. ABDOMEN: entirely smooth, dark.

Similar taxa: Opostegidae (forewing mostly white)

Taxonomic references: Wilkinson & Scoble 1979 (most spp.); Wilkinson 1981; Wilkinson & Newton 1981 (*Ectoedemia*); Puplesis & Diskus 2003 (generic revision)

Opostegidae (Fig. 75)

Superfamily: Nepticuloidea

Number of Canadian species: at least 4 spp. found across Canada

Genera: *Opostegoides*, *Pseudopostega*

Abundance: rare, some species come to lights

Quick recognition: The minute size (forewing length 5 mm or less) combined with the large eye-caps and mostly white forewings make it easily recognizable. Most species need to be dissected for positive identification.

Diagnosis: HEAD: ocelli absent; head scales smooth or rough; proboscis very short and difficult to see; labial palps small and descending; maxillary palps often prominent; antenna filiform, with one scale row per segment, half length of the forewing or more, with a very large eye-cap at the base. THORAX: wings heteroneurous and lanceolate, without a frenulum though with a row of curved scales that serves the same function; forewing always predominantly white, often with some darker markings; hindwing usually pale brownish grey; legs with tibial spur formula of 0-2-4, hind tibial spurs variably prominent, very large hind tibial spines present, tibial spines often present. ABDOMEN: entirely smooth.

Similar taxa: Nepticulidae (forewing mostly darkly patterned)

Taxonomic references: Davis & Stonis 2007

Heliozelidae (Fig. 76)

Superfamily: Incurvarioidea

Number of Canadian species: at least 13 spp. sporadic across Canada, most spp. in the East.

Genera: *Antispila*, *Coptodisca*

Abundance: Rare, typically collected diurnally.

Quick recognition: Very small, metallic forewing, scaled proboscis, descending labial palps, ocelli absent, sclerotized ovipositor. Difficult to identify due to lack of literature.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth; proboscis present and scaled at base, scaling can be difficult to see; labial palps descending; maxillary palps visible; antenna filiform, with two scale rows per segment, that rarely appears as one scale row per segment, half the length of the forewing or less. THORAX: wings heteroneurous and lanceolate, with a frenulum; forewing metallic usually with broad antemedial or postmedial bands; hindwing grey; legs with tibial spur formula of 0-2-4, hind tibial spurs large. ABDOMEN: entirely smooth, with a sclerotized ovipositor.

Similar taxa: Elachistidae, Elachistinae are similar, but the forewing pattern is never as bold and metallic and the ovipositor is not sclerotized.

Taxonomic references: Lafontaine 1973 (some *Antispila*), Forbes 1923 (a few)

Adelidae (Fig. 77)

Superfamily: Incurvarioidea

Number of Canadian species: 13 spp. across Canada but most diverse in the West, some undescribed.

Genera: *Adela*, *Cauchas*, *Nemophora*

Abundance: Common, most species encountered diurnally, especially in mating swarms or at flowers.

Quick recognition: Usually metallic, often with antennae much longer than the forewing length, with two scale rows per antennal segment, rough scaling on the head, with a scaled proboscis and lacking ocelli. Generally easy to identify though there are a few undescribed species in the West.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough, occasionally smooth on the frons; proboscis present and scaled at base, scaling can be difficult to see; labial palps descending or porrect; maxillary palps small; antenna filiform, sometimes thickened on shaft or at base, with two scale rows per segment, greater than half the length of the forewing in *Cauchas*, much longer than the forewing in other genera. THORAX: wings heteroneurous and rounded, with a frenulum; forewing often metallic and often with prominent lines; hindwing usually grey; legs with tibial spur formula of 0-2-4, hind tibial spurs variable; tarsal spines prominent. ABDOMEN: entirely smooth, with a sclerotized ovipositor.

Similar taxa: Prodoxidae are similar but can be separated by the typically less metallic wing markings, longer maxillary palps, and most genera do not have two distinct scale rows per antennal segment; if with two scale rows, they lack a scaled proboscis. Incurvariidae can be separated since they have one scale row per antennal segment. Tineidae are less commonly metallic and lack a scaled proboscis. Taxonomic references: Powell 1969 (mostly western spp.); Handfield 1999 (some eastern spp.)

Prodoxidae, Lamproniinae (Fig. 78)

Superfamily: Incurvarioidea

Number of Canadian species: at least 7 spp. across Canada but most diverse in the West.

Genera: *Lampronia*, *Tetragma*

Abundance: Uncommon to locally common, encountered diurnally or nocturnally.

Quick recognition: Most *Lampronia* have a bold blotchy pattern or are metallic on the forewing, *Tetragma* is uniformly creamy. The combination of sclerotized ovipositor, lack of ocelli, scaled proboscis, long maxillary palps, and forewing pattern will help separate it from most similar taxa. Some species are easy to identify, though there is a lack of comprehensive literature.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales usually rough; proboscis usually short and usually scaled at base; labial palps ascending or porrect; maxillary palps quite long; antenna filiform, with one scale row per segment or unscaled, about half the length of the forewing or less. THORAX: wings heteroneurous and rounded, with a frenulum; forewing with a bold blotchy pattern, metallic, or uniformly grey; hindwing usually whitish brown, can be metallic; legs with tibial spur formula of 0-2-4, hind tibial

spurs prominent; tarsal spines usually absent. ABDOMEN: entirely smooth, with a sclerotized ovipositor.

Similar taxa: Adelidae usually have much longer antennae, are usually metallic, and always have two rows of scales per antennal segment. Prodoxinae typically have more distinctive tarsal spines, often lack bold blotchy markings on the forewing, and never have a scaled proboscis. Incurvariidae can be separated by forewing pattern. Tineidae lack a scaled proboscis.

Taxonomic references: Dietz 1905 (some *Lampronia*); Davis *et al.* 1992 (*Tetragma*)

Prodoxidae, Prodoxinae (Fig. 79)

Superfamily: Incurvarioidea

Number of Canadian species: at least 12 spp. in western Canada and in extreme southern Ontario (where they are likely introduced).

Genera: *Greya*, *Prodoxus*, *Tegeticula*

Abundance: Rare to locally uncommon, *Prodoxus* and *Tegeticula* are found in close association with yucca flowers.

Quick recognition: *Greya* is either uniformly greyish or has a blotchy forewing pattern; The other genera are closely associated with yucca and are white, sometimes with black markings on the forewing. The very long labial palps are characteristic in most species. Fairly easy to identify to species.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough; proboscis present and unscaled; labial palps ascending or porrect; maxillary palps normally quite long and sometimes form flexible tentacles; antenna filiform, with variable scaling, usually less than half the length of the forewing. THORAX: wings heteroneurous and rounded, with a frenulum; forewing with a bold blotchy pattern, uniformly greyish, or white, sometimes with black spots; hindwing usually white, sometimes greyish; legs with tibial spur formula of 0-2-4, hind tibial spurs variable, tarsal spines usually present. ABDOMEN: entirely smooth, with a sclerotized ovipositor.

Similar taxa: Adelidae usually have much longer antennae and are usually metallic, and always have two rows of scales per antennal segment. Lamproniinae typically have less distinctive tarsal spines, usually have a scaled proboscis, and have a different forewing pattern. Incurvariidae can be separated by forewing pattern. Tineidae usually have shorter maxillary palps.

Taxonomic references: Davis *et al.* 1992 (*Greya*); Powell & Opler 2009 (*Prodoxus*); Pellmyr 1999 (*Tegeticula*)

Incurvariidae (Fig. 80)

Superfamily: Incurvarioidea

Number of Canadian species: at least 2 spp. across southern Canada.

Genera: *Paraclemensia*, *Phylloporia*

Abundance: Rare to locally abundant, *Paraclemensia acerifoliella* can outbreak in Sugar Maple forests, regularly taken at lights.

Quick recognition: *Paraclemensia acerifoliella* is easily recognized by the metallic blue forewings and orange head. *Phylloporia bistrigella* is brownish with pale white antemedial and postmedial lines like many other small microleps, but the large maxillary palps, scaled proboscis, and rough orange head scales will distinguish it.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough and orange on the vertex, sometimes partially appressed on the frons; proboscis short and scaled; labial palps variable in orientation; maxillary palps long; antenna filiform, with variable scaling, usually around half the length of the forewing. THORAX: wings heteroneurous and rounded to nearly lanceolate, with a frenulum; forewing metallic blue or brown with white lines; hindwing greyish and translucent; legs with tibial spur formula of 0-2-4, hind tibial spurs long, tarsal spines sometimes present. ABDOMEN: entirely smooth, with a sclerotized ovipositor. Similar taxa: The two species can be separated from other similar microleps as outlined above.

Taxonomic references: Covell 1984 (*Paraclemensia*); Dietz 1905 (*Phylloporia*)

Tischeriidae (Fig. 81)

Superfamily: Tischerioidea

Number of Canadian species: at least 9 spp. across Canada, most diverse in the Southeast.

Genera: *Coptotriche*

Abundance: Rarely collected, rarely comes to light.

Quick recognition: Very small often pale coloured microleps, head tapering towards the proboscis which is scaled, prominent rough 'mushroom' of scales on the vertex with smoothly scaled frons, and very long antennal sensillae. Specimens must be dissected for specific identification.

Diagnosis: HEAD: ocelli absent; head scales prominent and forming a mushroom-like appearance on the vertex, scales appressed on the frons; proboscis scaled; labial palps short and descending; maxillary palps small; antenna filiform, with a broadened scape, normally with two scale rows per segment, with prominent long sensillae on the underside, usually longer than half the length of the forewing. THORAX: wings heteroneurous and lanceolate, with a frenulum; forewing usually drab and unicolourous, sometimes metallic; hindwing pale; legs with tibial spur formula of 0-2-4, hind tibial spurs long. ABDOMEN: entirely smooth.

Similar taxa: The characters of the head are diagnostic.

Taxonomic references: Braun 1972

Tineidae (Fig. 82)

Superfamily: Tineoidea

Number of Canadian species: well over 40 spp. across Canada.

Genera: *Dryadaula*, *Eccritothrix*, *Elatobia*, *Haplotinea*, *Homosetia*, *Isocorypha*, *Monopis*, *Morphogoides*, *Nemapogon*, *Niditinea*, *Scardia*, *Scardiella*, *Tinea*, *Tineola*, *Trichophaga*, *Xylesthia*, and others.

Abundance: Common, most species come to light.

Quick recognition: Difficult to characterize; usually small microleps, sometimes moderate sized, head scales rough and usually most prominent on the vertex, ocelli absent, proboscis reduced or lost, distinct bristles are usually present on the second segment of the labial palps, most species drab in colour. Many are difficult to identify to species due to an abundance of undescribed species and outdated literature.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough and usually prominent on vertex; proboscis reduced or absent, naked; labial palps usually long and tufted, typically with prominent bristles on the second segment; maxillary palps variable; antenna filiform, with one scale row per segment that often appears as two rows, usually longer than half the length of the forewing. THORAX: wings heteroneurous and often lanceolate, with a frenulum; forewing usually drab, sometimes boldly patterned; hindwing also drab; legs with tibial spur formula of 0-2-4, hind tibial spurs usually long. ABDOMEN: entirely smooth.

Similar taxa: The distinct bristles on the labial palps are normally present and will separate tineids from all other microleps except Acrolophidae and Psychidae. Both of the latter families have few Canadian species and are best separated by wing pattern.

Taxonomic references: Dietz 1905 (many species); Powell & Opler 2009 (many western species); Robinson 1986 (Scardiinae)

Acrolophidae (Fig. 83)

Superfamily: Tineoidea

Number of Canadian species: 4 spp. across Canada including 1 undescribed sp.

Genera: *Acrolophus*, *Amydria*

Abundance: Rare to uncommon, can be found at light.

Quick recognition: *Acrolophus* is rather large and has very long and sparse scales on the head and thorax. *Amydria* looks like a typical tineid and is best identified by the forewing pattern. They are relatively easy to identify to species.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough and often sparse and hair-like; proboscis absent; labial palps ascending, variable in length and always tufted, with prominent spines laterally; maxillary palps small; antenna filiform, with one or two scale rows per segment, longer than half the length of the forewing in *Amydria*, much shorter in *Acrolophus*. THORAX: wings

heteroneurous and rounded, with a frenulum; forewing usually drab and brownish, with fine darker markings; hindwing paler; legs with tibial spur formula of 0-2-4, hind tibial spurs variable. ABDOMEN: entirely smooth. Similar taxa: The distinct bristles on the labial palps are normally present and will separate acrolophids from all other microleps except Tineidae and Psychidae. The last two families are best separated by wing pattern. Taxonomic references: Dietz 1905 (*Amydria*); Hasbrouck 1964 (*Acrolophus*)

Psychidae (Fig. 84)

Superfamily: Tineoidea

Number of Canadian species: 9 spp. across Canada

Genera: *Apterona*, *Astala*, *Dahlica*, *Hyaloscotes*, *Kearfottia*, *Psyche*, *Taleporia*

Abundance: Uncommon to locally common, most commonly seen as larval cases, some species come to light. Quick recognition: Easiest to recognize when associated with larval cases. Otherwise adults are quite variable in appearance. Females are larviform and typically stay close to the larval case. The most widespread species appear similar to a typical tineid with relatively slender wings, while some of the rarer species have very broad wings, or sharply pointed ones that are translucent. Most are easy to identify to species, especially when associated with a larval case, but a few require dissection.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales usually rough, occasionally smooth; proboscis absent; labial palps variable in orientation, short, and usually tufted; maxillary palps small; antenna filiform or pectinate, with variable scaling, usually less than half the length of the forewing. THORAX: wings heteroneurous and rounded, sometimes pointed, usually fairly slender though very broad in a few species, absent to greatly reduced in the females of most species, with a frenulum; forewing variable in pattern from drab and brownish, with fine darker markings, to translucent, to unicolourous, to having a broad white band; hindwing paler or similar to the forewing; legs with tibial spur formula of 0-2-4, hind tibial spurs variable. ABDOMEN: smooth to hairy.

Similar taxa: Most flightless females of other families will have at least small wing pads present, while in Psychidae they are usually not visible. The smaller species look just like tineids and are best separated by wing pattern.

Taxonomic references: Davis 1964 (all but *Dahlica* and *Kearfottia*); Handfield 1999 (most eastern spp.)

Douglasiidae (Fig. 85)

Superfamily: Gracillarioidea

Number of Canadian species: 4 described spp. and at least one undescribed spp.; in western Canada with only one of these found in the East.

Genera: *Tinagma*

Abundance: Rare to locally common, diurnal on their host plants or at light.

Quick recognition: The brown and white dusted forewing with two brown bands coupled with the distinctly narrower hindwing is distinctive.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales smooth; proboscis present; labial palps usually descending, moderately long, tufted, maxillary palps small; antenna filiform, with one scale row per segment, about half the length of the forewing. THORAX: wings heteroneurous and lanceolate, with a frenulum; forewing consistent in pattern, brown and white dusted with two broad brown bands; hindwing much narrower than the forewing, evenly brown; legs with tibial spur formula of 0-2-4, hind tibial spurs usually long. ABDOMEN: smooth.

Similar taxa: The wing pattern and difference in size between the fore and hindwings are diagnostic.

Taxonomic references: Gaedike 1990

Bucculatricidae (Fig. 86)

Superfamily: Gracillarioidea

Number of Canadian species: At least 32 spp. across Canada.

Genera: *Bucculatrix*

Abundance: uncommon to locally abundant, diurnal or at light.

Quick recognition: The elongate pointed face, naked proboscis, rough-scaled vertex and smooth scaled frons, small eye-cap, and in the male a notched basal segment of the antenna is distinctive. Reared specimens are easily recognized by the characteristic ribbed cocoon of this family. Many specimens need dissection for specific identification.

Diagnosis: HEAD: ocelli absent; head with a distinct tuft of scales on the vertex, scales smooth on the elongate pointed frons; proboscis small; all palps tiny; antenna filiform, with two scale rows per segment, longer than half the length of the forewing. THORAX: wings heteroneurous and lanceolate, with a frenulum; forewing often boldly patterned, usually with oblique bands, spots, or streaks, sometimes with metallic markings; hindwing evenly grey or brown; legs with tibial spur formula of 0-2-4, hind tibial spurs usually long, hind tibiae with long hair-like scales. ABDOMEN: smooth.

Similar taxa: The head characters described above are diagnostic.

Taxonomic references: Braun 1963 (nearly all species)

Gracillariidae, Gracillariinae (Fig. 87)

Superfamily: Gracillarioidea

Number of Canadian species: At least 65 spp. across Canada.

Genera: *Acrocercops*, *Callisto*, *Caloptilia*, *Gracillaria*, *Leucanthiza*, *Marmara*, *Micrurapteryx*, *Parectopa*,

Parornix

Abundance: common to locally abundant, most come to light, some commonly hibernating under bark.

Quick recognition: Slender microleps that typically rest in a 'push-up' position with the front of the body elevated; antennae with a single scale row and quite long; proboscis naked. Most species difficult to identify due to a lack of literature.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth, sometimes rough on the vertex; proboscis present, but sometimes difficult to see; labial palps usually ascending, usually long, usually slender; antenna filiform, with one scale row per segment, about the length of the forewing. THORAX: wings heteroneurous and lanceolate, with a frenulum; forewing pattern variable, often boldly patterned, sometimes metallic; hindwing evenly grey or brown; legs with tibial spur formula of 0-2-4, hind tibial spurs usually short, rarely with hind tibial spines. ABDOMEN: smooth.

Similar taxa: The most similar taxa are the other subfamilies of Gracillariidae. Both Phyllocnistinae and Lithocolletinae are usually smaller (forewing length 1.5-3.9 mm), while in Gracillariinae the forewing length is 2.5-5.0 mm. The easiest way to separate the subfamilies is to key specimens out.

Taxonomic references: Forbes 1923 (key to genera & some spp.); Powell & Opler 2009 (some western spp.)

Gracillariidae, Lithocolletinae (Fig. 88)

Superfamily: Gracillarioidea

Number of Canadian species: At least 65 spp. across Canada.

Genera: *Cameraria*, *Chrysaster*, *Cremastobombycia*, *Phyllonorycter*, *Porphyrosela*, *Prolithocolletis*

Abundance: uncommon to common, most come to light.

Quick recognition: Tiny microleps, typically with boldly patterned forewings, with a single scale row per antennal segment and a naked proboscis. Most need dissection for specific identification.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales usually rough on the vertex, smooth on the frons; proboscis present; labial palps descending, variable in length, slender; antenna filiform, with one scale row per segment, about the length of the forewing. THORAX: wings heteroneurous and lanceolate, with a frenulum; forewing usually boldly patterned with oblique lines or triangles, sometimes metallic; hindwing usually evenly grey; legs with tibial spur formula of 0-2-4, hind tibial spurs variable in length. ABDOMEN: smooth.

Similar taxa: The most similar taxa are the other subfamilies of Gracillariidae. Gracillariinae are typically larger (forewing length 2.5-5.0 mm, in Lithocolletinae 1.8-3.9 mm) and have usually ascending labial palps and a smoothly scaled vertex. Phyllocnistinae usually have

prominent hind tibial and tarsal spines and have the bold markings on the forewing mostly near the apex. Other tiny microleps of similar pattern typically have a scaled proboscis. The easiest way to separate the subfamilies is to key specimens out.

Taxonomic references: Braun 1908 (most spp.); Forbes 1923 (key to most genera & some spp.); Powell & Opler 2009 (some western spp.)

Gracillariidae, Phyllocnistinae (Fig. 89)

Superfamily: Gracillarioidea

Number of Canadian species: At least 3 spp. across Canada.

Genera: *Phyllocnistis*

Abundance: uncommon to common, at light or hibernating under bark.

Quick recognition: Tiny microleps, the forewing is white with a complex pattern on the outer two-fifths of the wing, with a single scale row per segment on the antenna and a naked proboscis. They are most easily identified to species when associated with a larval leafmine.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth; proboscis present, though can be difficult to see; labial palps descending, fairly long, slender; antenna filiform, with one scale row per segment, shorter than the length of the forewing. THORAX: wings heteroneurous and lanceolate, with a frenulum; forewing white with a complex pattern on the outer two-fifths, occasionally with a dark blotch along the inner margin near the base; hindwing very slender, evenly grey; legs with tibial spur formula of 0-2-4, hind tibial spurs usually fairly long, hind tibial and tarsal spines present. ABDOMEN: smooth.

Similar taxa: The forewing pattern, spined hind tibiae and tarsi, and tiny size (forewing length 1.5-2.8 mm) will separate it from other Gracillariidae. Other tiny microleps of similar pattern typically have a scaled proboscis or lack spines on the hind tibiae and tarsi.

Taxonomic references: Forbes 1923; Powell & Opler 2009 (some spp.)

Yponomeutidae, Attevininae (Fig. 90)

Superfamily: Yponomeutoidea

Number of Canadian species: 1 species (*Atteva aurea*) in southern ON and QC.

Genera: *Atteva*

Abundance: uncommon at lights.

Quick recognition: The forewing pattern, with clusters of pale spots, is unmistakable.

Diagnosis: HEAD: ocelli absent; head scales smooth, slightly roughened on the vertex; proboscis naked; labial palps ascending, two times as long as the compound eye, slender; antenna filiform, with one scale row per segment, shorter than the length of the forewing. THORAX: wings heteroneurous and broad, with a frenulum; forewing orange with clusters of yellow spots surrounded by metallic blue;

hindwing grey and very translucent towards the center; legs with tibial spur formula of 0-2-4, hind tibial spurs short. ABDOMEN: smooth.

Similar taxa: None

Taxonomic references: Wilson *et al.* 2010

Yponomeutidae, Yponomeutinae (Fig. 91)

Superfamily: Yponomeutoidea

Number of Canadian species: 15 species across Canada.

Genera: *Eucalantica*, *Euhyponomeutoides*, *Kessleria*, *Ocnerostoma*, *Paraswammerdamia*, *Swammerdamia*, *Yponomeuta*, *Zelleria*

Abundance: uncommon, most come to light.

Quick recognition: Quite variable on the generic level and difficult to characterize overall. Some species easily recognized by the broad white forewing with fine black spots. Others tend to be much more slender. Species identification can be challenging.

Diagnosis: HEAD: ocelli absent; head scales rough, often smooth on the frons; proboscis present; labial palps porrect or descending, usually fairly long, slender, rarely tufted; antenna filiform, with two scale rows per segment, usually longer than half the length of the forewing. THORAX: wings heteroneurous and either broad or lanceolate, sometimes very slender, with a frenulum; forewing pattern variable, sometimes white with black spots, often streaky, sometimes unpatterned; hindwing usually grey or brown; legs with tibial spur formula 0-2-4, hind tibial spurs variable, hind tarsal spines sometimes present. ABDOMEN: smooth.

Similar taxa: Argyresthiinae are closely related and similar, most species have bold patterns that will immediately distinguish them and they never have tarsal spines. Plutellidae can be separated by the distinctive forward projecting triangular scale tuft on the labial palps. Bedelliidae can be separated by forewing pattern. Bucculatricidae typically have a very boldly patterned wing and have a characteristic elongate and smooth scaled frons combined with a distinct scale tuft on the vertex. Urodidae can be separated by the pattern and distinct raised scales of the forewing. Tineidae typically have a less prominent proboscis and much rougher looking scales on the vertex. Copromorphidae can be separated on wing pattern.

Taxonomic references: Freeman 1960 (*Ocnerostoma*, *Zelleria*); Powell & Opler 2009 (*Eucalantica*, *Zelleria*); Duckworth 1965 (most *Swammerdamia*); Sperling *et al.* 1995 (*Yponomeuta*); Braun 1940 (*Kessleria*)

Yponomeutidae, Argyresthiinae (Fig. 92)

Superfamily: Yponomeutoidea

Number of Canadian species: at least 22 species across Canada.

Genera: *Argyresthia*

Abundance: common at light.

Quick recognition: Live specimens are easily recognized by the characteristic head-standing pose. Slender lanceolate wings, forewing often with distinctive golden blotches or pure gold, coupled with no ocelli, naked proboscis, and rough vertex with smooth frons will help distinguish this from most other taxa. Species identification is easy for most boldly-patterned species, but more challenging for others. Diagnosis: HEAD: ocelli absent; head scales rough on the vertex and smooth on the frons; proboscis naked; labial palps variable in orientation, fairly long, slender; antenna filiform, with one or two scale rows per segment, longer than half the length of the forewing. THORAX: wings heteroneurous and lanceolate; forewing pattern often with a complex pattern of blotches or strigulae, sometimes unicolourous, shiny to metallic; hindwing usually grey or brown; legs with tibial spur formula 0-2-4, hind tibial spurs long; ABDOMEN: smooth.

Similar taxa: Some Yponomeutinae are similar, but they typically have tarsal spines, otherwise they are difficult to separate. Bedelliidae can be separated by forewing pattern. Tineidae typically have a less prominent proboscis. Gracillariidae can be similar, but always have 1 scale row per antennal segment and often have shorter hind tibial spurs.

Taxonomic references: Busck 1907; Freeman 1972 (some species)

Ypsolophidae, Ypsolophinae (Fig. 93)

Superfamily: Yponomeutoidea

Number of Canadian species: at least 13 species across Canada, most diverse in the west.

Genera: *Euceratia*, *Ypsolopha*

Abundance: rare to uncommon at light.

Quick recognition: Most species have a prominent curved tip to the forewing, if not then they usually have a bulge at both the apex and anal angle of the forewing. Most species also have very long porrect labial palps. Species identifications are challenging in the west due to the lack of literature.

Diagnosis: HEAD: ocelli usually absent; head scales rough; proboscis present; labial palps variable in orientation but usually porrect, long, usually tufted; antenna filiform, with two scale rows per segment, usually longer than half the length of the forewing, usually with fairly prominent sensillae. THORAX: wings heteroneurous and broadly lanceolate, forewing often with a prominent hook at the apex, otherwise usually with prominent bulges at the apex and anal angle; forewing pattern variable, most often yellow and brown; hindwing usually grey or brown; legs with tibial spur formula 0-2-4, hind tibial spurs variable, hind tarsal spines present; ABDOMEN: smooth, sometimes with a prominent ovipositor.

Similar taxa: A few ypsolophines lack the peculiar shaped forewings and are similar to Yponomeutinae, which never

have the massive porrect labial palps.

Taxonomic references: Aurelian 2008 (most species east of BC); Powell & Opler 2009 (some western species)

Ypsolophidae, Ochsenheimeriinae (Fig. 94)

Superfamily: Yponomeutoidea

Number of Canadian species: A single species *Ochsenheimeria vaculella* has been introduced from Europe and can be found in ON and QC.

Genera: *Ochsenheimeria*

Abundance: rare at light.

Quick recognition: The vertex and antennal base with long scales, smoothly scaled frons, tibial spines, and yellow band on the abdomen will identify this species.

Diagnosis: HEAD: ocelli present; head scales rough and long on the vertex, smooth on the frons; proboscis present; labial palps ascending, long, tufted; antenna filiform, with long dense scales at base, with two scale rows per segment, less than half the length of the forewing. THORAX: wings heteroneurous and broadly lanceolate; forewing usually dull, brown; hindwing greyish brown, very pale at base; legs with tibial spur formula 0-2-4, hind tibial spurs long, hind tibial and tarsal spines present; ABDOMEN: smooth and brown with a yellow band distally.

Similar taxa: The quick recognition characters will separate it from other taxa.

Taxonomic references: Covell 1984

Plutellidae (Fig. 95)

Superfamily: Yponomeutoidea

Number of Canadian species: At least 6 spp. nearly everywhere in Canada, most diverse in the West.

Genera: *Plutella*, *Pseudoplutella*, *Rhigognostis*

Abundance: common at light.

Quick recognition: The forward-pointing scale tuft on the second segment of the labial palps is distinctive. Species are generally easy to identify, but the literature is lacking for most.

Diagnosis: HEAD: ocelli present; head scales rough, rarely smooth on the frons; proboscis present; labial palps ascending, usually long, with a prominent triangular scale tuft on the second segment; antenna filiform, with two scale rows per segment, greater than half the length of the forewing. THORAX: wings heteroneurous and broadly lanceolate; forewing usually with markings elongate; hindwing greyish; legs with tibial spur formula 0-2-4, hind tibial spurs usually short, hind tarsal spines usually present; ABDOMEN: smooth.

Similar taxa: None, the triangular scale tufts on the labial palps are distinctive.

Taxonomic references: Covell 1984 (*Plutella xylostella*); Forbes 1923 (eastern *Plutella*); Kyrki 1989 (*Rhigognostis*); Powell & Opler 2009; Baraniak 2007 (some western spp.)

Acrolepiidae (Fig. 96)

Superfamily: Yponomeutoidea

Number of Canadian species: 3 spp., 1 probably widespread in the west and 2 in southern ON & QC.

Genera: *Acrolepiopsis*

Abundance: rare, though one is an introduced pest on leeks in ON & QC.

Quick recognition: Labial palps ascending and un-tufted, proboscis naked, ocelli present. Identification to species may require dissection.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough on vertex, smooth on frons; proboscis present; labial palps ascending, long, slender without tufts; antenna filiform, with two scale rows per segment, greater than half the length of the forewing. THORAX: wings heteroneurous and broadly lanceolate; forewing brown to grey with the most prominent marking a white triangular spot on the inner margin in the antemedial area, other markings variably present; hindwing greyish; legs with tibial spur formula 0-2-4, hind tibial spurs long, hind tarsal spines sometimes present; ABDOMEN: smooth.

Similar taxa: Plutellidae have a prominent triangular tuft of scales on the labial palps.

Taxonomic references: Landry 2007

Glyphipterigidae (Fig. 97)

Superfamily: Yponomeutoidea

Number of Canadian species: 9 spp. across Canada.

Genera: *Diploschizia*, *Glyphipterix*

Abundance: rare to uncommon, diurnal.

Quick recognition: The prominent curved metallic wing markings, naked proboscis, and large ocelli are characteristic. Identification to species is usually not too difficult.

Diagnosis: HEAD: ocelli large; chaetosemata absent; head scales smooth; proboscis present; labial palps usually ascending, long, usually slender; antenna filiform, often with prominent sensillae, with two scale rows per segment, about half the length of the forewing or less. THORAX: wings heteroneurous and fairly broad, hindwing sometimes lanceolate; forewing variable in pattern, markings typically curved and metallic; hindwing brown; legs with tibial spur formula 0-2-4, hind tibial spurs long; ABDOMEN: smooth, sometimes boldly patterned.

Similar taxa: Choreutidae have a scaled proboscis.

Taxonomic references: Heppner 1985

Heliodinidae (Fig. 98)

Superfamily: Yponomeutoidea

Number of Canadian species: 1 sp., *Neoheliodines nyctaginella* in southern MB.

Genera: *Neoheliodines*

Abundance: very rare, diurnal.

Quick recognition: The distinctive forewing markings

coupled with smoothly-scaled head, naked proboscis, and drooping labial palps will identify it.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales smooth; proboscis present; labial palps descending, short, slender; antenna filiform, with two scale rows per segment, longer than half the length of the forewing. THORAX: wings heteroneurous and lanceolate; forewing metallic, orange with black borders and metallic spots; hindwing greyish brown; legs with tibial spur formula 0-2-4, hind tibial spurs long; ABDOMEN: smooth. Similar taxa: Several other microleps have a similar forewing pattern but these all have a scaled proboscis. Taxonomic references: Covell 1984

Bedelliidae (Fig. 99)

Superfamily: Yponomeutoidea

Number of Canadian species: 1 sp., *Bedellia somnulentella* across southern Canada.

Genera: *Bedellia*

Abundance: rare to uncommon at light.

Quick recognition: The naked proboscis, roughly scaled vertex, lack of ocelli, expanded antennal base, and drooping labial palps will help identify it.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough on the vertex, smooth on the frons; proboscis present; labial palps descending, usually short, slender; antenna filiform, with two scale rows per segment, usually longer than the length of the forewing. THORAX: wings heteroneurous and lanceolate; forewing drab greyish to brownish and finely speckled, sometimes with more distinctive cream markings along inner margin; hindwing greyish brown; legs with tibial spur formula 0-2-4, hind tibial spurs long; ABDOMEN: smooth.

Similar taxa: Both Lyonetiidae and Argyresthiinae are similar. The easiest way to separate Bedelliidae from these taxa is by the forewing pattern. Superficially they are similar to Coleophoridae, but can be separated by the naked proboscis, drooping labial palps, and lack of spine patches on top of the abdomen.

Taxonomic references: Powell & Opler 2009

Lyonetiidae (Fig. 100)

Superfamily: Yponomeutoidea

Number of Canadian species: 6 spp., across Canada.

Genera: *Leucoptera*, *Lyonetia*, *Paraleucoptera*, *Proleucoptera*

Abundance: rare to locally uncommon, most come to light.

Quick recognition: The naked proboscis, roughly scaled vertex, lack of ocelli, expanded antennal base, and drooping labial palps will help identify the family.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales usually rough on the vertex, smooth on the frons; proboscis present; labial palps descending, usually short, slender; antenna filiform, with two scale rows per

segment, usually longer than the length of the forewing. THORAX: wings heteroneurous and lanceolate; forewing variable in pattern and colour; hindwing usually greyish brown; legs with tibial spur formula 0-2-4, hind tibial spurs variable in length; ABDOMEN: smooth.

Similar taxa: Both Bedelliidae and Argyresthiinae are similar. Bedelliidae are best separated by forewing pattern. Argyresthiinae usually have a slightly broader forewing and often have a more blotchy pattern compared to the finer markings typical of Lyonetiidae.

Taxonomic references: Forbes 1923 (*Paraleucoptera*, *Proleucoptera*, some *Lyonetia*)

Elachistidae, Stenomatininae (Fig. 101)

Superfamily: Gelechioidea

Number of Canadian species: 5 spp., in eastern Canada and 1 sp. in southern BC.

Genera: *Antaeotricha*, *Gonioterma*, *Menesta*

Abundance: rare to common at light.

Quick recognition: Scaled proboscis, elongate squared forewings, broader hindwings, usually large in size. Most are easy to identify to species, dissection is often necessary for *Antaeotricha*.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales often rough on the vertex, usually smooth on the frons; proboscis scaled; labial palps ascending, long, slender; antenna filiform, with two scale rows per segment, with prominent sensillae, usually longer than half the length of the forewing. THORAX: sometimes tufted; wings heteroneurous, forewing elongate and squared, hindwing broader; forewing usually mottled in colour, sometimes with raised scales, sometimes iridescent, hindwing grey, brown, or white; legs with tibial spur formula 0-2-4, hind tibial spurs usually long, hind tibial spines rarely present; ABDOMEN: smooth.

Similar taxa: Ethmiinae, Oecophoridae, and Gelechiinae are most easily separated by forewing pattern. Phycitinae can be separated by forewing pattern as well, and typically have the antennae tucked straight backwards, whereas in Stenomatininae the antennae usually point forwards or out to the sides.

Taxonomic references: Duckworth 1964 (*Antaeotricha*, *Gonioterma*)

Elachistidae, Ethmiinae (Fig. 102)

Superfamily: Gelechioidea

Number of Canadian species: 7 spp., across southern Canada.

Genera: *Ethmia*, *Pyramidobela*

Abundance: uncommon to common at light.

Quick recognition: Scaled proboscis, elongate squared forewings, broader hindwings, large size, in *Ethmia* the forewing is boldly patterned with black and grey or white, and has a brightly coloured (often with yellow) abdomen;

in *Pyramidobela* the forewing pattern is mostly brown with prominent raised scales. They are easy to identify to species.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales at least partially smooth on the vertex, smooth on the frons; proboscis scaled; labial palps usually ascending, long, usually slender; antenna filiform, with one or two scale rows per segment, rarely with prominent sensillae, variable in length but usually around half the forewing length. THORAX: wings heteroneurous, forewing elongate and squared to rounded, hindwing broader; forewing usually boldly patterned with black and white or grey, the black spots often as a broad streak along the inner margin and often as elongate spots, sometimes mostly brownish with raised scales, hindwing usually grey; legs with tibial spur formula 0-2-4, hind tibial spurs variable in length, hind tarsal spines present, though may be difficult to see; ABDOMEN: smooth, boldly patterned or brightly coloured in most species.

Similar taxa: The combination of size, forewing pattern, boldly coloured abdomen, and scaled proboscis will separate *Ethmia* from all others. The combination of size, forewing pattern, raised scales on the forewing, and scaled proboscis will separate *Pyramidobela* from all others.

Taxonomic references: Powell 1973

Elachistidae, Depressariinae (Fig. 103)

Superfamily: Gelechioidea

Number of Canadian species: 49 spp., throughout Canada.

Genera: *Agonopterix*, *Bibarrambla*, *Depressaria*, *Depressariodes*, *Nites*, *Semioscopis*

Abundance: common at light or hibernating under bark

Quick recognition: Scaled proboscis, usually squared forewings, overall flattened body, most species common from fall to spring. Some are easy to identify to species by forewing pattern, others require dissection, especially in the west.

Diagnosis: HEAD: ocelli present or absent; chaetosemata absent; head scales rough on vertex, smooth on frons; proboscis scaled; labial palps curved up and back over the head, long, usually slender, sometimes tufted; antenna filiform, with two scale rows per segment, usually around half the forewing length. THORAX: wings heteroneurous, forewing squared, sometimes acutely pointed, hindwing broad; forewing variable in pattern, usually brown or grey, hindwing usually grey; legs with tibial spur formula 0-2-4, hind tibial spurs variable in length, hind tarsal spines often present; ABDOMEN: smooth.

Similar taxa: Superficially depressariines are similar to some tortricids in the tribe Tortricini, but can be easily separated by the scaled proboscis and recurved labial palps. Amphibatidae are also flattened but can be separated by forewing pattern. Oecophoridae and Ethmiinae usually have a narrower forewing, otherwise they can be separated

by forewing pattern. Phycitinae tends to have much narrower forewings relative to the broad hindwings and the antennae typically rest tightly backwards. Crambidae usually have a more triangular forewing and a very different forewing pattern.

Taxonomic references: Hodges 1974; Clarke 1941

Elachistidae, Elachistinae (Fig. 104)

Superfamily: Gelechioidea

Number of Canadian species: At least 53 spp., throughout Canada, more probably undescribed.

Genera: *Elachista*, *Perittia*

Abundance: uncommon to common, many come to light.

Quick recognition: Scaled proboscis, curved labial palps, smooth head scaling, small size, relatively stubby lanceolate wings. Most require dissection for specific identification. Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth; proboscis scaled; labial palps usually ascending, long, slender; antenna filiform, with two scale rows per segment, longer than half the forewing length. THORAX: wings heteroneurous, lanceolate; forewing variable in pattern and colour, hindwing usually grey; legs with tibial spur formula 0-2-4, hind tibial spurs long. ABDOMEN: smooth.

Similar taxa: Many other Gelechioidea like Oecophoridae, Batrachedridae, Coleophoridae, Cosmopterigidae, and Gelechiinae can look very similar. They can be tricky to separate externally, but Elachistinae tend to have stouter looking wings.

Taxonomic references: Kaila 1995b; 1996; 1997; 1999

Elachistidae, Agonoxeninae (Fig. 105)

Superfamily: Gelechioidea

Number of Canadian species: At least 3 spp., across southern Canada.

Genera: *Blastodacna*, *Chrysoclista*

Abundance: rare to locally common, diurnal or at light.

Quick recognition: Scaled proboscis, long labial palps, smooth head scaling, raised scales on forewing. Fairly easy to identify to species in the east using a reference collection, in the west there may be undescribed species.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth, rarely roughened on vertex; proboscis scaled; labial palps ascending or porrect, long, slender; antenna filiform, with two scale rows per segment, longer than half the forewing length. THORAX: wings heteroneurous, lanceolate; forewing with tufts of raised scales, either greyish or black with a large orange blotch and silvery spots, hindwing usually grey; legs with

tibial spur formula 0-2-4, hind tibial spurs usually long. ABDOMEN: smooth.

Similar taxa: A few other Gelechioidea like Momphinae, Cosmopterigidae, and Gelechiinae can look similar. These are best separated by forewing pattern.

Taxonomic references: *Blastodacna curvilineella* is in Forbes 1923, *Chrysoclista lineella* is in Covell 1984

Xyloryctidae, Scythridinae (Fig. 106)

Superfamily: Gelechioidea

Number of Canadian species: At least 13 spp., throughout Canada, many undescribed.

Genera: *Landryia*, *Rhamphura*, *Scythris*

Abundance: rare to uncommon, usually diurnal.

Quick recognition: Scaled proboscis, long labial palps, usually drably patterned, teardrop-shaped with antennae pointed in a V at rest. Many require dissection for specific identification, though many species are undescribed.

Diagnosis: HEAD: ocelli present or absent; chaetosemata absent; head scales smooth, sometimes roughened; proboscis scaled; labial palps ascending or porrect, long, slender; antenna filiform, with two scale rows per segment, usually longer than half the forewing length. THORAX: wings heteroneurous, lanceolate; forewing variably patterned though usually subdued, hindwing usually greyish; legs with tibial spur formula 0-2-4, hind tibial spurs short. ABDOMEN: smooth.

Similar taxa: A few other Gelechioidea like Gelechiinae and Oecophoridae can look similar and can usually be separated by having a broader hindwing.

Taxonomic references: Landry 1991

Chimabachidae (Fig. 107, 108)

Superfamily: Gelechioidea

Number of Canadian species: A single introduced species *Dasystema salicella* has been found in southern BC.

Genera: *Dasystema*

Abundance: rarely collected due to its limited distribution and early spring adult emergence.

Quick recognition: Scaled proboscis, broad greyish brown forewing with two indistinct bands in the male, wingless female.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales somewhat rough, smooth on the frons in males; proboscis scaled; labial palps porrect, slightly ascending in females, long, tufted; antenna filiform, with two scale rows per segment, longer than half the forewing length and with prominent sensillae in males. THORAX: wings heteroneurous, broad, forewing somewhat pointed, females brachypterous; forewing greyish brown with two dark partial bands, hindwing greyish brown; legs with tibial spur formula 0-2-4, hind tibial spurs long in males, short

in females; hind tarsal spines present. ABDOMEN: with some rough scales.

Similar taxa: Females can be separated from other apterous moths by the scaled proboscis. Males can be separated from all others by the combination of scaled proboscis, ocelli, and forewing pattern.

Taxonomic references: Hodges 1974

Glyphidoceridae (Fig. 109)

Superfamily: Gelechioidea

Number of Canadian species: 3 spp., across southern Canada.

Genera: *Glyphidocera*

Abundance: rare, comes to light

Quick recognition: Scaled proboscis, elongate squared forewings with broader hindwings, somewhat difficult to instantly separate from other similar looking Gelechioidea. Identification to species is fairly easy from a reference collection, but the near lack of literature makes it difficult. Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales somewhat rough or smooth on vertex, smooth on the frons; proboscis scaled; labial palps upcurved, long, slender; antenna filiform, with two scale rows per segment, usually longer than half the forewing length. THORAX: wings heteroneurous, forewing elongate and squared, hindwing broader; forewing typically brownish, sometimes with spots, hindwing brownish; legs with tibial spur formula 0-2-4, hind tibial spurs variable in length; hind tarsal spines rarely present. ABDOMEN: smooth.

Similar taxa: Similar to Blastobasinae, Depressariinae, and Oecophoridae from which it usually can be separated by forewing pattern. Gelechiidae usually have a narrower hindwing that often has a distinctly projected apex. Several Pyralidae will key out with it and they can be separated by the antennae tucking tightly back over the body and by the wing shape and pattern.

Taxonomic references: Adamski 2000 (western sp.)

Oecophoridae (Fig. 110)

Superfamily: Gelechioidea

Number of Canadian species: 18 species across Canada.

Genera: *Batia*, *Brymblia*, *Carcina*, *Carolana*, *Coelopoeta*, *Decantha*, *Denisia*, *Eido*, *Endrosis*, *Epicallima*, *Fabiola*, *Hofmannophila*, *Mathildana*, *Oecophora*, *Pleurota*, *Polix*, *Stathmopoda*

Abundance: uncommon to common, most come to light.

Quick recognition: Scaled proboscis, large recurved labial palps, no ocelli, often boldly patterned. Identification to species is usually easy.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth, sometimes rough on vertex; proboscis scaled; labial palps recurved, long, slender, rarely tufted; antenna filiform, with two scale rows per segment, usually longer than half the forewing length, sensillae often prominent. THORAX: wings heteroneurous, usually lanceolate, sometimes more rounded in larger species; forewing highly variable in pattern and colour, often with bold patterns and bright colours, hindwing usually grey, brown, or white; legs with tibial spur formula 0-2-4, hind tibial spurs usually long; hind tarsal spines rarely present. ABDOMEN: smooth.

Similar taxa: *Depressariinae*, *Xyloryctidae*, *Coleophoridae*, and *Gelechiidae* can be similar and are best separated by forewing pattern.

Taxonomic references: Hodges 1974 (all except *Coelopoeta*, *Oecophora*, *Stathmopoda*); Kaila 1995a (*Coelopoeta*)

Batrachedridae (Fig. 111)

Superfamily: Gelechioidea

Number of Canadian species: 3 species across Canada.

Genera: *Batrachedra*, *Duospina*

Abundance: rare to uncommon, at light.

Quick recognition: Scaled proboscis, large recurved labial palps, no ocelli, slender wings, hindwing more slender than forewing, very similar to several other gelechioids. Identification to species is fairly easy, but several require dissection.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth; proboscis scaled; labial palps recurved, long, slender; antenna filiform, with two scale rows per segment, longer than half the forewing length. THORAX: wings heteroneurous, slender lanceolate; forewing either greyish or yellowish, sometimes with distinctive ovate dark spots, hindwing usually greyish; legs with tibial spur formula 0-2-4, hind tibial spurs usually long. ABDOMEN: smooth.

Similar taxa: *Oecophoridae*, *Coleophoridae*, *Cosmopterigidae*, and *Gelechiidae* can be similar and are best separated by forewing pattern.

Taxonomic references: Hodges 1966a

Coleophoridae, Coleophorinae (Fig. 112)

Superfamily: Gelechioidea

Number of Canadian species: well over 75 species throughout Canada, many undescribed.

Genera: *Coleophora*

Abundance: common, at lights or diurnal.

Quick recognition: Scaled proboscis, large labial palps, no ocelli, smoothly scaled head, slender wings, paired elongate patches of spines dorsally on abdominal segments;

when alive, they typically hold their antennae forward and together. Identification to species is very difficult for most due to a large number of undescribed species and scarcity of literature.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth; proboscis scaled; labial palps usually ascending or porrect, long, slender, rarely tufted; antenna filiform, with two scale rows per segment, longer than half the forewing length. THORAX: wings heteroneurous, slender lanceolate; forewing variable in colour and pattern, often unicolourous, hindwing usually grey; legs with tibial spur formula 0-2-4, hind tibial spurs variable in length. ABDOMEN: smooth, segments 1 or 2-7 each with paired dorsal patches of spiniform scales that appear dark or golden and contrast markedly with surrounding pigmented scales.

Similar taxa: Various *Gelechioidea*, including other *Coleophoridae* and *Cosmopterigidae*, can be similar and can be separated by the dorsal abdominal patches of spines.

Taxonomic references: Landry & Wright 1993 (metallic green spp.); Landry 1998a (some spp.)

Coleophoridae, Momphinae (Fig. 113)

Superfamily: Gelechioidea

Number of Canadian species: well over 15 species throughout Canada, many undescribed.

Genera: *Mompha*

Abundance: rare to uncommon, only a few regularly come to light, others active in early morning.

Quick recognition: Scaled proboscis, large recurved labial palps, no ocelli, smoothly scaled head, wing may be boldly patterned, metallic, or tufted. Identification to species is very difficult for some due to a large number of undescribed species and scarcity of literature.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth; proboscis scaled; labial palps ascending, long, slender, sometimes tufted; antenna filiform, with one or two scale rows per segment, longer than half the forewing length. THORAX: wings heteroneurous, lanceolate; forewing variable in colour and pattern, often boldly patterned or metallic, often with raised scale tufts, hindwing usually grey or brown; legs with tibial spur formula 0-2-4, hind tibial spurs usually short. ABDOMEN: smooth, segments 1-6 with scattered, golden non-pigmented, spiniform scales.

Similar taxa: Various *Gelechioidea*, including other *Coleophoridae*, *Elachistinae*, *Agonoxeninae*, *Oecophoridae*, *Batrachedridae*, *Cosmopterigidae*, and *Gelechiinae* can be similar and are best separated by forewing pattern.

Taxonomic references: Forbes 1923 (a few spp.)

Coleophoridae, Blastobasinae (Fig. 114)

Superfamily: Gelechioidea

Number of Canadian species: over 10 species throughout

Canada, many undescribed.

Genera: *Asaphocrita*, *Blastobasis*, *Calosima*, *Holcocera*, *Hypatopa*, *Pigritia*

Abundance: uncommon, at light.

Quick recognition: Scaled proboscis, large ascending labial palps, no ocelli, smoothly scaled head, forewing usually greyish, spines usually present on the tarsi. In live specimens, they rest with the forewing apices separated forming a 'V'-shaped end to the abdomen. Identification to species is difficult for many, and usually require dissection. Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth; proboscis scaled; labial palps usually ascending, usually long, slender; antenna filiform, with two scale rows per segment, longer than half the forewing length. THORAX: wings heteroneurous, lanceolate to rounded; forewing usually grey with black and white markings, hindwing usually greyish or whitish; legs with tibial spur formula 0-2-4, hind tibial spurs usually long; hind tarsal spines usually present. ABDOMEN: segments 2-6 dorsally each with transverse band of unpigmented spiniform scales.

Similar taxa: Various Gelechioidea like Oecophoridae, Autostichidae, and Gelechiinae can be similar and are best separated by forewing pattern and lack of abdominal spines. Taxonomic references: Forbes 1923 (a few spp.)

Coleophoridae, Pterolonchinae (Fig. 115)

Superfamily: Gelechioidea

Number of Canadian species: 1 introduced species (*Pterolonche inspersa*) in BC.

Genera: *Pterolonche*

Abundance: rare

Quick recognition: Proboscis absent, descending labial palps, forewing white with brown streaks.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough, sometimes smooth on frons; proboscis absent; labial palps usually descending, long, usually tufted; antenna filiform, with two scale rows per segment, longer than half the forewing length. THORAX: wings heteroneurous, lanceolate; forewing white with brown streaks; legs with tibial spur formula 0-2-4, hind tibial spurs short. ABDOMEN: smooth.

Similar taxa: The quick recognition characters should separate it from all others.

Taxonomic references: none

Autostichidae (Fig. 116)

Superfamily: Gelechioidea

Number of Canadian species: 4 species across southern Canada

Genera: *Gerdana*, *Oegoconia*, *Taygete*

Abundance: rare to common, at light.

Quick recognition: Proboscis scaled, ascending labial palps, most genera with a fairly distinctive forewing pattern. The

genera are easy to separate by forewing pattern, but some may require dissection for positive identification.

Diagnosis: HEAD: ocelli absent, rarely present; chaetosemata absent; head scales smooth, sometimes rough on vertex; proboscis scaled; labial palps ascending, long, slender; antenna filiform, with two scale rows per segment, longer than half the forewing length. THORAX: wings heteroneurous, lanceolate; forewing light brown with dark brown in the basal, postmedial, and terminal areas and discal dot, or black with white blotches in the antemedial and postmedial areas, hindwing greyish to brownish; legs with tibial spur formula 0-2-4, hind tibial spurs long. ABDOMEN: smooth.

Similar taxa: Autostichids can be separated from several other gelechioids like Elachistidae, Scythridinae, Oecophoridae, Coleophoridae, and Gelechiidae by the forewing pattern.

Taxonomic references: Clarke 1941 (*Gerdana*); Lee & Brown 2010; Huemer 1998 (*Oegoconia*)

Amphisbatidae (Fig. 117)

Superfamily: Gelechioidea

Number of Canadian species: At least 7 spp. from SK to NS.

Genera: *Machimia*, *Psilocorsis*

Abundance: rare to uncommon, at light

Quick recognition: Proboscis scaled, ascending labial palps, fairly distinctive forewing pattern. Most species are difficult to identify.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales usually rough on vertex, smooth on frons; proboscis scaled; labial palps ascending, long, slender; antenna filiform, with two scale rows per segment, usually longer than half the forewing length. THORAX: wings heteroneurous, forewing broad and squared, usually brownish with fine dark strigulations throughout, or straw yellow with grey spots and lines, hindwing greyish; legs with tibial spur formula 0-2-4, hind tibial spurs long. ABDOMEN: smooth.

Similar taxa: Amphisbatids can be separated from several other gelechioids like Depressariinae, Oecophoridae, and Dichomeridinae by the forewing pattern. Similar looking Pyralidae can be separated by the forewing pattern and by the antennae typically being tucked tightly backwards along the body.

Taxonomic references: Hodges 1974

Cosmopterigidae (Fig. 118)

Superfamily: Gelechioidea

Number of Canadian species: 16 species across Canada.

Genera: *Chrysopeleia*, *Cosmopterix*, *Eteobalea*, *Euclimensia*, *Limnaecia*, *Perimede*, *Periploca*, *Sorhagenia*, *Stigmatophora*, *Stilbosis*, *Walshia*

Abundance: uncommon, most come to light.

Quick recognition: Proboscis scaled, ascending labial palps, smoothly scaled head, hind tarsal spines often present. Many can be recognized by forewing pattern, others are more difficult.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth; proboscis scaled; labial palps ascending, long, slender; antenna filiform, with two scale rows per segment, usually longer than half the forewing length. THORAX: wings heteroneurous, lanceolate, sometimes very slender, forewing variable in pattern and colour, sometimes boldly patterned, sometimes metallic, hindwing usually greyish; legs with tibial spur formula 0-2-4, hind tibial spurs usually long; hind tarsal spines often present. ABDOMEN: smooth.

Similar taxa: Many other Gelechioidea like Elachistidae, Xyloryctidae, Batrachedridae, Coleophoridae, and Gelechiinae are similar and can be difficult to separate.

Taxonomic references: Hodges 1978

Gelechiidae, Gelechiinae (Fig. 119)

Superfamily: Gelechioidea

Number of Canadian species: well over 200 species throughout Canada, many undescribed.

Genera: *Agnippe*, *Agonochaetia*, *Altenia*, *Anacamptis*, *Anarsia*, *Aroga*, *Bryotropha*, *Carpatolechia*, *Caryocolum*, *Chionodes*, *Chrysoesthia*, *Coleotechnites*, *Deltophora*, *Enchrysa*, *Exoteleia*, *Filatima*, *Gelechia*, *Gnorimoschema*, *Isophrictis*, *Metzneria*, *Monochroa*, *Neotelphusa*, *Phthorimaea*, *Prolita*, *Pseudotelphusa*, *Ptycerata*, *Rifseria*, *Scrobipalpa*, *Scrobipalpula*, *Scrobipalpulopsis*, *Sitotroga*, *Xenolechia*

Abundance: common, most come to light.

Quick recognition: Proboscis scaled, ascending labial palps, smoothly scaled head, hind tarsal spines usually present, hindwing often broad with an apical projection. Most are difficult to identify to species.

Diagnosis: HEAD: ocelli present or absent; chaetosemata absent; head scales smooth; proboscis scaled; labial palps ascending, long, slender, sometimes tufted; antenna filiform, with two scale rows per segment, longer than half the forewing length. THORAX: wings heteroneurous, forewing lanceolate to broad, hindwing often broad with an apical projection, forewing variable in pattern and colour, sometimes boldly patterned, rarely with raised scale tufts, hindwing usually greyish or brownish; legs with tibial spur formula 0-2-4, hind tibial spurs usually long; hind tarsal spines usually present. ABDOMEN: smooth.

Similar taxa: Most Gelechiinae have a distinct projection at the apex of the hindwing that is lacking in most other Gelechioidea. When they lack this projection they can look like many other gelechioids like Xyloryctidae, Oecophoridae, Coleophoridae, Glyphidoceridae, and Cosmopterigidae and can be difficult to separate. Dichomeridinae can be separated by forewing pattern.

Pyalidae can be separated by the often more triangular wings, antennae held tightly backwards, and by wing pattern.

Taxonomic references: Busck 1903 (some spp.); Powell & Opler 2009 (some western spp.); Forbes 1923 (some eastern spp.); Lee & Brown 2008 (key to Teleiodini); Rutten & Karsholt 2004 (*Bryotropha*); Huemer 1988 (*Caryocolum*); Hodges 1999 (*Chionodes*); Freeman 1960 (some *Coleotechnites*, some *Exoteleia*); Freeman 1965 (some *Coleotechnites*); Sattler 1979 (*Deltophora*); Povolny 1967 (some *Gnorimoschema*, *Ptycerata*, some *Scrobipalpa*, *Scrobipalpulopsis*); Miller 2000, Povolny 1998, 2003 (some *Gnorimoschema*); Englert 1974 (*Metzneria*); Hodges 1966b (*Prolita*, *Rifseria*)

Gelechiidae, Dichomeridinae (Fig. 120)

Superfamily: Gelechioidea

Number of Canadian species: 30 species across Canada.

Genera: *Dichomeris*, *Helcystogramma*

Abundance: uncommon, most come to light.

Quick recognition: Proboscis scaled, ascending labial palps, smoothly scaled head, ocelli usually present, hind tarsal spines often present, forewing often divided into longitudinal dark and light areas, hindwing often broad with an apical projection. Most are fairly easy to identify to species.

Diagnosis: HEAD: ocelli usually present; chaetosemata absent; head scales smooth; proboscis scaled; labial palps ascending, long, slender, second segment sometimes ventrally tufted contrasting with a thin third segment; antenna filiform, with two scale rows per segment, longer than half the forewing length. THORAX: wings heteroneurous, forewing elongate and usually squared, sometimes rounded, sometimes with the apex acute, hindwing broad and typically squarish, forewing variable in pattern and colour, sometimes boldly patterned, hindwing unicolourous and variable in colour; legs with tibial spur formula 0-2-4, hind tibial spurs usually long; hind tarsal spines often present. ABDOMEN: smooth.

Similar taxa: The squarish shape of the hindwing is fairly distinctive amongst the Gelechioidea. When the hindwing is more subtly squarish they can look like many other gelechioids like Elachistidae, Glyphidoceridae, Oecophoridae, and Gelechiinae and can be separated by forewing pattern. Pyalidae can be separated by the often more triangular forewing, antennae typically held tightly back over the body, and forewing pattern.

Taxonomic references: Hodges 1986

Limacodidae (Fig. 121)

Superfamily: Zygaenoidea

Number of Canadian species: 15 across southern Canada, most species confined to the southeast.

Genera: *Apoda*, *Euclea*, *Heterogenea*, *Lithacodes*,

Packardia, Parasa, Prolimacodes, Tortricidia

Abundance: common in south eastern Canada, rarer as you go north and west, at lights.

Quick recognition: Broad wings on a relatively stout, hairy body, easily recognized by wing pattern. Most are easy to identify to species.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough, sometimes smooth; proboscis small or absent; labial palps usually ascending, sometimes porrect, variable in length, usually slender, sometimes tufted; antenna filiform, rarely pectinate, with many scale rows per segment, usually less than half the forewing length. THORAX: wings heteroneurous, forewing broad and usually squared, sometimes rounded, sometimes with the apex acute, hindwing broad and usually rounded, forewing variable in pattern and colour, sometimes boldly patterned, sometimes unicolourous, sometimes with green patterns, hindwing unicolourous and usually brown; legs usually densely furry, with tibial spur formula of 0-2-2 or 0-2-4, hind tibial spurs often long. ABDOMEN: hairy, rarely with a dorsal scale tuft.

Similar taxa: The quick recognition characters will easily separate most limacodids from other Lepidoptera.

Taxonomic references: Handfield 1999

Zygaenidae (Fig. 122)

Superfamily: Zygaenoidea

Number of Canadian species: A single species, *Harrisina americana* can be found in southern MB and ON.

Genera: *Harrisina*

Abundance: Rare, uncommon in southernmost ON, diurnal or at lights.

Quick recognition: Unmistakeable by the jet black slender wings and reddish collar.

Diagnosis: HEAD: ocelli present; chaetosemata present; head scales smooth, though somewhat roughened on frons; proboscis prominent; labial palps descending, small, slender; antenna pectinate, with many scale rows per segment, about half the forewing length. THORAX: wings heteroneurous, slender with an acute apex, both jet black and unicolourous, hindwing slightly translucent; legs with no apparent tibial spurs. ABDOMEN: smooth.

Similar taxa: None.

Taxonomic references: Powell & Opler 2009

Sesiidae, Tinthiinae (Fig. 123)

Superfamily: Sesiioidea

Number of Canadian species: 3 spp. across Canada, 2 of which are found only in AB.

Genera: *Pennisetia, Zenodoxus*

Abundance: uncommon to rare, diurnal.

Quick recognition: Very wasp-like, often with partially translucent wings and with colourful wings and body. Easy to identify to species.

Diagnosis: HEAD: ocelli large; chaetosemata present; head scales smooth, sometimes roughened on vertex; proboscis prominent or reduced; labial palps ascending, variable in length, often tufted; antenna pectinate or filiform, sometimes with long sensillae, with variable scaling, roughly half the forewing length. THORAX: wings heteroneurous, slender and rounded, often transparent centrally, often boldly patterned if not transparent; legs with tibial spur formula of 0-2-4; often with prominent scale tufts, especially on hind tibiae, tibial spurs long, sometimes with hind tarsal spines. ABDOMEN: smooth, often boldly patterned, sometimes with a dorsal scale tuft. Similar taxa: Sesiinae have an elongate club on the antenna. Taxonomic references: Eichlin & Duckworth 1988

Sesiidae, Sesiinae (Fig. 124)

Superfamily: Sesiioidea

Number of Canadian species: 38 spp. across Canada.

Genera: *Albuna, Carmenta, Euhagena, Melitta, Paranthrene, Podosesia, Sesia, Synanthedon*

Abundance: uncommon to common, most diurnal, a few come to light.

Quick recognition: Very wasp-like, often with partially translucent wings and with colourful wings and body. Most are fairly easy to identify to species.

Diagnosis: HEAD: ocelli large; chaetosemata present; head scales smooth, sometimes roughened on vertex, rarely rough on frons; proboscis prominent; labial palps usually ascending, long, usually tufted; antenna with an elongate club, sometimes with a slightly hooked tip, sometimes with long sensillae, with many scale rows per antennal segment, roughly half the forewing length. THORAX: wings heteroneurous, slender and rounded or acute, usually transparent centrally, often boldly patterned if not transparent; legs with tibial spur formula of 0-2-4; often with prominent scale tufts, especially on hind tibiae, tibial spurs variable in length, hind tarsal spines present. ABDOMEN: smooth, usually boldly patterned.

Similar taxa: Tinthiinae have either pectinate or filiform antennae.

Taxonomic references: Eichlin & Duckworth 1988 (most spp.)

Cossidae (Fig. 125)

Superfamily: Cossoidea

Number of Canadian species: 6 spp. across Canada.

Genera: *Acossus, Givira, Prionoxystus, Zeuzera*

Abundance: uncommon to common, at light.

Quick recognition: Large, very stout, greasy-looking moths, often with translucent wings, forewing pattern usually consists of fine lines. Most are fairly easy to identify to species.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough; proboscis absent or very short; labial

palps ascending, short, usually tufted; antenna usually pectinate, sometimes filiform, with many scale rows per antennal segment, less than half the forewing length. THORAX: wings heteroneurous, broad and rounded or acute, usually at least slightly translucent, typically greyish with darker grey or black fine lines throughout the forewing, hindwings sometimes with fine darker lines, sometimes boldly patterned; legs densely furry, tibial spurs usually not visible, hind tarsal spines present. ABDOMEN: furry and large.

Similar taxa: There is a resemblance of some species to Sphingidae, though most sphingids lack a pectinate antenna, have a more prominent proboscis, and have different wing patterns.

Taxonomic references: Handfield 1999 (all but *Givira*)

Choreutidae (Fig. 126)

Superfamily: Choreutoidea

Number of Canadian species: 17 spp. across Canada, several undescribed.

Genera: *Anthophila*, *Caloreas*, *Choreutis*, *Prochoreutis*, *Tebenna*

Abundance: uncommon to rare, diurnal, a few come to light.

Quick recognition: Micros with stout, squared wings, often with metallic spots, scaled proboscis, large ocelli, live individuals hold the wings flared outwards, often with the apex drooping. Some are fairly easy to identify to species, but others are more difficult due to a lack of literature.

Diagnosis: HEAD: ocelli large; chaetosemata absent; head scales smooth; proboscis scaled; labial palps usually ascending, long, usually tufted; antenna filiform, usually with long sensillae, with two scale rows per antennal segment, roughly half the forewing length. THORAX: wings heteroneurous, broad, forewing squared, variable in colour and pattern, often with prominent lines, often with metallic spots near the anal angle; hindwing usually unpatterned, sometimes with bold markings; legs with tibial spur formula of 0-2-4, hind tibial spurs large. ABDOMEN: smooth, sometimes boldly patterned.

Similar taxa: The scaled proboscis will separate them from Tortricidae. Pyralidae and Crambidae can be separated by the much smaller ocelli, frequent presence of chaetosemata, tympanum present ventrally on the first abdominal segment, and by wing pattern.

Taxonomic references: Dombroskie 2003 (most eastern spp.)

Tortricidae, Tortricinae, Tortricini (Fig. 127)

Superfamily: Tortricoidea

Number of Canadian species: 57 spp. across Canada, several undescribed.

Genera: *Acleris*

Abundance: common, at lights, often active in winter.

Quick recognition: Naked proboscis, ascending palps with small terminal segment, forewing generally flattened, squared-off, strongly arched basally, most species found during the colder months of the year. Some species are extremely variable and can be difficult to identify.

Diagnosis: HEAD: ocelli present; chaetosemata present; head scales usually rough on vertex and at least partially smooth on frons; proboscis naked; labial palps typically ascending, usually long, usually tufted; antenna filiform, with two scale rows per antennal segment, usually less than half the forewing length. THORAX: wings heteroneurous, broad, forewing squared, variable in colour and pattern, lines typically slanted, often a V-shaped marking prominent at middle of costa, usually greyish; hindwing usually unpatterned, sometimes with fine strigulations; legs with tibial spur formula of 0-2-4, hind tibial spurs often large. ABDOMEN: smooth.

Similar taxa: Olethreutinae and Sparganothini can be separated by having only a single row of scales per antennal segment. Other Tortricinae are best separated by the wing pattern. Glyphipterigidae can be separated by the forewing pattern and larger ocelli. Some noctuoids are similar and can be separated by forewing pattern and by the presence of tympana laterally on the thorax.

Taxonomic references: Razowski 1966 (most spp.)

Tortricidae, Tortricinae, Cnephasiini (Fig. 128)

Superfamily: Tortricoidea

Number of Canadian species: 11 spp. across Canada, some undescribed.

Genera: *Cnephasia*, *Decodes*, *Eana*

Abundance: uncommon to rare, at lights.

Quick recognition: Naked proboscis, ascending palps with small terminal segment, generally with elongate wings that are fairly pointed at the apex. Some species can be difficult to identify and may require dissection.

Diagnosis: HEAD: ocelli present; chaetosemata present; head scales rough, sometimes partially smooth on frons; proboscis naked; labial palps typically ascending, sometimes descending, usually long, usually tufted; antenna filiform, with two scale rows per antennal segment, variable in length. THORAX: wings heteroneurous, fairly elongate, forewing with an acute apex, variable in colour and pattern, sometimes unicolourous, often with fine lines throughout, often greyish; hindwing usually unpatterned, often greyish or white; legs with tibial spur formula of 0-2-4, hind tibial spurs usually short, tarsal spines usually present. ABDOMEN: smooth.

Similar taxa: Olethreutinae and Sparganothini can be separated by having only a single row of scales per antennal segment. Other Tortricinae are best separated by the wing pattern. Some noctuoids, especially Arctiinae are similar and can be separated by forewing pattern and by the presence of tympana laterally on the thorax.

Taxonomic references: Mutuura 1982 (*Cnephasia*); Obraztsov 1962 (*Eana*); Powell 1980 (*Decodes*)

Tortricidae, Tortricinae, Cochylini (Fig. 129)

Superfamily: Tortricoidea

Number of Canadian species: At least 56 spp. across Canada, some undescribed.

Genera: *Aethes*, *Agapeta*, *Atroposia*, *Cochylidia*, *Cochylis*, *Gynidomorpha*, *Henricus*, *Phalonidia*, *Platphalonidia*, *Recavicula*, *Saphenista*, *Thyralia*, *Trachysmia*, and others

Abundance: uncommon to common, at lights.

Quick recognition: Naked proboscis, palps with small terminal segment, generally with stubby squared or pointed wings, often brightly coloured. Many species can be difficult to identify and many require dissection.

Diagnosis: HEAD: ocelli present; chaetosemata present; head scales rough, sometimes smooth on frons; proboscis naked; labial palps variable in direction, long, usually tufted; antenna filiform, with two scale rows per antennal segment, usually with long sensillae, usually less than half the forewing length. THORAX: wings heteroneurous, variable in shape, typically stubby, variable in colour and pattern, usually with bright colours and contrasting patterns, males sometimes with costal fold; hindwing usually unpatterned, often greyish; legs with tibial spur formula of 0-2-4, hind tibial spurs usually long. ABDOMEN: smooth. Similar taxa: Olethreutinae and Sparganothini can be separated by having only a single row of scales per antennal segment. Other Tortricinae are best separated by the wing pattern. Glyphipterigidae can be separated by the forewing pattern and larger ocelli. Some noctuids are similar and can be separated by forewing pattern and by the presence of tympana laterally on the thorax.

Taxonomic references: Sabourin *et al.* 2002 (some *Aethes*); Razowski 1997 (most spp.)

Tortricidae, Tortricinae, Euliini (Fig. 130)

Superfamily: Tortricoidea

Number of Canadian species: 4 spp. across Canada.

Genera: *Anopina*, *Apotomops*, *Eulia*

Abundance: uncommon, some spp. at lights.

Quick recognition: Naked proboscis, palps ascending with small terminal segment, generally with squared wings, greyish or brownish. Easy to identify to species.

Diagnosis: HEAD: ocelli present; chaetosemata present; head scales usually rough on vertex, somewhat smooth on frons; proboscis naked; labial palps typically ascending, variable in length, usually slender; antenna filiform, with two scale rows per antennal segment, usually with long sensillae, usually less than half the forewing length. THORAX: wings heteroneurous, typically squared, usually grey and white, sometimes brownish orange; hindwing greyish; legs with tibial spur formula of 0-2-4, hind tibial spurs variable in length. ABDOMEN: smooth.

Similar taxa: Olethreutinae and Sparganothini can be separated by having only a single row of scales per antennal segment. Other Tortricinae are best separated by the wing pattern. Glyphipterigidae can be separated by the forewing pattern and larger ocelli. Some noctuids are similar and can be separated by forewing pattern and by the presence of tympana laterally on the thorax.

Taxonomic references: Brown & Powell 2000 (*Anopina*); Powell 1986 (*Apotomops*); Razowski 2002 (*Eulia*)

Tortricidae, Tortricinae, Sparganothini (Fig. 131)

Superfamily: Tortricoidea

Number of Canadian species: 33 spp. across Canada, some undescribed.

Genera: *Amorbia*, *Coelostathma*, *Platynota*, *Sparganothis*

Abundance: common to uncommon, at lights.

Quick recognition: Naked proboscis, palps long and porrect, with squared wings, often yellow or brownish. Usually easy to identify to species.

Diagnosis: HEAD: ocelli usually present; chaetosemata present; head scales usually rough on vertex, sometimes smooth on frons; proboscis naked; labial palps usually porrect, long, sometimes tufted; antenna filiform, with one scale rows per antennal segment, rarely with two scale rows, with long sensillae, variable in length. THORAX: wings heteroneurous, forewing squared, often yellow or brown, usually with reticulate markings, males sometimes with costal fold; hindwing usually greyish or white; legs with tibial spur formula of 0-2-4, hind tibial spurs usually long. ABDOMEN: smooth.

Similar taxa: Other Tortricinae have two scale rows per antennal segment. Olethreutinae typically either lack porrect labial palps, or the palps are shorter. Glyphipterigidae can be separated by the forewing pattern and larger ocelli. Some noctuids are similar and can be separated by forewing pattern and by the presence of tympana laterally on the thorax.

Taxonomic references: Phillips-Rodriguez & Powell 2007 (*Amorbia*); Lambert 1950 (most spp.)

Tortricidae, Tortricinae, Archipini (Fig. 132)

Superfamily: Tortricoidea

Number of Canadian species: over 80 spp. across Canada.

Genera: *Adoxophyes*, *Aphelia*, *Arche pandemis*, *Archips*, *Argyrotaenia*, *Choristoneura*, *Clepsis*, *Dichelia*, *Diedra*, *Ditula*, *Lozotaenia*, *Pandemis*, *Syndemis*, *Xenotemna*

Abundance: common, at lights.

Quick recognition: Naked proboscis, palps ascending with small terminal segment, with squared wings, sometimes with a sinuous costa, often brown with darker brown oblique bands. Often easy to identify to species.

Diagnosis: HEAD: ocelli present; chaetosemata present; head scales usually rough on vertex, usually smooth on frons; proboscis naked; labial palps usually ascending,

variable in length, sometimes tufted; antenna filiform, with two scale rows per antennal segment, with long sensillae, less than half the forewing length. THORAX: wings heteroneurous, forewing squared, often brown with darker brown bands, males sometimes with a costal fold; hindwing usually greyish or white; legs with tibial spur formula of 0-2-4, hind tibial spurs variable in length, hind tarsal spines often present. ABDOMEN: smooth.

Similar taxa: Olethreutinae and Sparganothini can be separated by having only a single row of scales per antennal segment. Other Tortricinae are best separated by the wing pattern. Glyphipterigidae can be separated by the forewing pattern and larger ocelli. Some noctuoids are similar and can be separated by forewing pattern and by the presence of tympana laterally on the thorax.

Taxonomic references: Mutuura 1978 (*Archepandemis*); Razowski 1977 (*Archips*); Razowski 1979a, 1979b (most *Clepsis*); Mutuura 1980 (some *Pandemis*); Freeman 1958 (most spp.)

Tortricidae, Chlidanotinae (Fig. 133)

Superfamily: Tortricoidea

Number of Canadian species: a single species *Thaumato-grapha youngiella* is known from S. BC

Genera: *Thaumato-grapha*

Abundance: rare, at lights.

Quick recognition: Naked proboscis, with squared wings, distinct complex forewing pattern.

Diagnosis: HEAD: ocelli present; chaetosemata present; head scales smooth, rarely roughened on vertex; proboscis naked; labial palps ascending or porrect, long, slender; antenna filiform, with one scale row per antennal segment, with long sensillae, less than half the forewing length. THORAX: wings heteroneurous, forewing squared, brown with many fine white lines, prominent black spots at anal angle; hindwing brown; legs with tibial spur formula of 0-2-4, hind tibial spurs long. ABDOMEN: smooth.

Similar taxa: The forewing pattern is distinctive, only a few Olethreutinae and Glyphipterigidae have vaguely similar patterns.

Taxonomic references: None

Tortricidae, Olethreutinae, Endotheniini (Fig. 134)

Superfamily: Tortricoidea

Number of Canadian species: 10 spp. across Canada

Genera: *Endothenia*, *Hulda*, *Taniva*, *Tia*

Abundance: uncommon, at lights.

Quick recognition: Naked proboscis, squared wings, labial palps with tiny third segment. Species are generally easy to identify but may require dissection.

Diagnosis: HEAD: ocelli present; chaetosemata present; head scales usually rough on vertex, usually smooth on frons; proboscis naked; labial palps usually porrect, usually short, tufted; antenna filiform, with one scale row

per antennal segment, less than half the forewing length. THORAX: wings heteroneurous, forewing squared, usually with a complex pattern, grey brown and white; hindwing greyish; legs with tibial spur formula of 0-2-4, hind tibial spurs long, hind tarsal spines rarely present. ABDOMEN: smooth.

Similar taxa: The single row of scales per antennal segment will separate Endotheniini from similar looking Tortricinae. It is difficult to separate them from other Olethreutinae and best done by wing pattern or by dissection.

Taxonomic references: Gilligan *et al.* 2008 (most spp.)

Tortricidae, Olethreutinae, Bactrini (Fig. 135)

Superfamily: Tortricoidea

Number of Canadian species: 6 spp. across Canada

Genera: *Bactra*

Abundance: uncommon to rare, at lights.

Quick recognition: Naked proboscis, elongate wings, forewing apex somewhat acute, usually streaked, labial palps descending. Most species require dissection for positive identification.

Diagnosis: HEAD: ocelli present; chaetosemata present; head scales usually rough on vertex, often smooth on frons; proboscis naked, rarely reduced; labial palps usually descending, variable in length, tufted; antenna filiform, with one scale row per antennal segment, greater than half the forewing length. THORAX: wings heteroneurous, forewing elongate, apex somewhat acute, sometimes with a complex pattern, often streaked, usually brownish; hindwing greyish; legs with tibial spur formula of 0-2-4, hind tibial spurs long. ABDOMEN: smooth.

Similar taxa: The single row of scales per antennal segment will separate Bactrini from similar looking Tortricinae. It is difficult to separate them from other Olethreutinae and best done by wing pattern or by dissection.

Taxonomic references: Heinrich 1926; Gilligan *et al.* 2008 (some spp.)

Tortricidae, Olethreutinae, Olethreutini (Fig. 136)

Superfamily: Tortricoidea

Number of Canadian species: over 109 spp. across Canada, most diverse in the East, some undescribed

Genera: *Ahmosia*, *Apotomis*, *Argyroplote*, *Aterpia*, *Celypha*, *Episimus*, *Eumaroza*, *Evora*, *Hedya*, *Metendothenia*, *Olethreutes*, *Orthotaenia*, *Paralobesia*, *Phaecasiophora*, *Priesterognatha*, *Pseudosciaphila*, *Zomaria*

Abundance: common, at lights.

Quick recognition: Naked proboscis, stout squared wings, labial palps usually ascending with small terminal segment, forewing pattern usually banded grey and white or dark and light brown. Many species require dissection for positive identification, some genera are difficult.

Diagnosis: HEAD: ocelli present; chaetosemata present; head scales rough on vertex, often smooth on frons;

proboscis naked, rarely reduced; labial palps usually ascending, usually stout, usually tufted; antenna filiform, with one scale row per antennal segment, usually less than half the forewing length. THORAX: wings heteroneurous, forewing stout, squared, sometimes with a complex pattern, usually banded with grey and white or with dark and light grey; hindwing grey brown or white; legs with tibial spur formula of 0-2-4, hind tibial spurs long. ABDOMEN: smooth.

Similar taxa: The single row of scales per antennal segment will separate Olethreutini from similar looking Tortricinae. They can usually be separated from other Olethreutinae by wing pattern.

Taxonomic references: Adamski & Peters 1986 (*Apotomis*); Miller 1985, Jalava & Miller 1998 (some *Olethreutes*); Heinrich 1926 (most spp.); Gilligan *et al.* 2008, Miller 1987 (many spp.)

Tortricidae, Olethreutinae, Enarmoniini (Fig. 137)

Superfamily: Tortricoidea

Number of Canadian species: 39 spp. across Canada

Genera: *Ancylis*, *Enarmonia*, *Eucosmomorpha*, *Hystrichophora*

Abundance: common, at lights.

Quick recognition: Naked proboscis, forewing usually with a falcate tip and often boldly patterned, labial palps with small terminal segment. Many are easy to identify to species by wing pattern, others are much more difficult, even with dissection.

Diagnosis: HEAD: ocelli present; chaetosemata present; head scales usually rough; proboscis naked, rarely reduced; labial palps porrect or descending, fairly long, usually tufted; antenna filiform, with one scale row per antennal segment, usually less than half the forewing length. THORAX: wings heteroneurous, forewing stout to slightly elongate, usually with a falcate tip, sometimes squared, usually with a bold complex pattern; hindwing greyish; legs with tibial spur formula of 0-2-4, hind tibial spurs long, rarely with tarsal spines. ABDOMEN: smooth.

Similar taxa: The single row of scales per antennal segment will separate Enarmoniini from similar looking Tortricinae. They can usually be separated from other Olethreutinae by wing pattern.

Taxonomic references: Heinrich 1923a (most spp.); Gilligan *et al.* 2008, Miller 1987, McDunnough 1955 (some spp.)

Tortricidae, Olethreutinae, Eucosmini (Fig. 138)

Superfamily: Tortricoidea

Number of Canadian species: over 308 spp. across Canada, most diverse in the West, many undescribed

Genera: *Barbara*, *Catastega*, *Epiblema*, *Epinotia*, *Eucosma*, *Gretchena*, *Griselda*, *Gypsonoma*, *Notocelia*, *Pelochrista*, *Phaneta*, *Proteoteras*, *Pseudexentera*, *Retinia*, *Rhopobota*,

Rhyacionia, *Sonia*, *Spilonota*, *Suleima*, *Zeiraphera*

Abundance: common, at lights.

Quick recognition: Naked proboscis, forewing usually elongate, labial palps with small terminal segment. Some are relatively easy to identify, most require dissection, some groups are very difficult.

Diagnosis: HEAD: ocelli present; chaetosemata present; head scales rough, often smooth on the frons; proboscis naked, rarely reduced; labial palps variable in direction, often short, usually tufted; antenna filiform, with one scale row per antennal segment, variable in length. THORAX: wings heteroneurous, forewing usually elongate, squared or acute, rarely falcate, pattern variable, often with metallic markings especially towards anal angle, males sometimes with a costal fold; hindwing usually greyish; legs with tibial spur formula of 0-2-4, hind tibial spurs usually long, rarely with tarsal spines. ABDOMEN: smooth.

Similar taxa: The single row of scales per antennal segment will separate Eucosmini from similar looking Tortricinae. They can often be separated from other Olethreutinae by wing pattern.

Taxonomic references: Brown 1992 (*Catastega*); Wright 2002 (some *Epiblema*); Brown 1980 (some *Epinotia*); Miller 1974, Powell 1968 (some *Eucosma*); Wright 2005, 2006, 2007a, 2007b, 2008 (some *Eucosma* and *Pelochrista*); McDunnough 1938a (some *Phaneta*); Miller 1986 (*Pseudexentera*); Powell & Miller 1978 (*Rhyacionia*); Mutuura & Freeman 1966 (*Zeiraphera*); Heinrich 1923a (most spp.); Gilligan *et al.* 2008, Miller 1987, Powell & Opler 2009, Heinrich 1923b, 1924, 1929, McDunnough 1925, 1935, 1942 (some spp.)

Tortricidae, Olethreutinae, Grapholitini (Fig. 138)

Superfamily: Tortricoidea

Number of Canadian species: 65 spp. across Canada

Genera: *Corticivora*, *Cydia*, *Dichrorampha*, *Grapholita*, *Ecdytolopha*, *Gymnandrosoma*, *Pammene*, *Pseudogalleria*, *Sereda*

Abundance: uncommon to common, at lights.

Quick recognition: Naked proboscis, forewing stout, either squared or acute, labial palps with small terminal segment. Some are relatively easy to identify, most require dissection, some groups are very difficult.

Diagnosis: HEAD: ocelli usually present; chaetosemata present; head scales usually rough; proboscis naked, rarely reduced; labial palps variable in direction, short, usually tufted; antenna filiform, with one scale row per antennal segment, variable in length. THORAX: sometimes with a scale tuft; wings heteroneurous, forewing usually stout, squared or acute, pattern variable, usually dark, often with metallic markings; hindwing greyish brown or white; legs with tibial spur formula of 0-2-4, hind tibial spurs long, rarely with tarsal spines. ABDOMEN: smooth, rarely with a dorsal scale tuft.

Similar taxa: The single row of scales per antennal segment will separate Grapholitini from similar looking Tortricinae. They can often be separated from other Olethreutinae by wing pattern.

Taxonomic references: Brown 1984 (*Corticivora*); Heinrich 1926 (most spp.); Gilligan *et al.* 2008, Miller 1987, Powell & Opler 2009, McDunnough 1935 (some spp.)

Urodidae (Fig. 140)

Superfamily: Urodoidea

Number of Canadian species: 1 sp. (*Wockia asperipunctella*) found sporadically across Canada

Genera: *Wockia*

Abundance: rare, does not frequent lights

Quick recognition: Naked proboscis, forewing elongate and pointed, grey with a darker grey patch of scales in the antemedial area.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough on vertex, smooth on frons; proboscis naked; labial palps porrect, short, slender; antenna filiform, with two scale rows per antennal segment, about half the forewing length. THORAX: wings heteroneurous, forewing elongate, pointed, grey, with a dark grey patch of raised scales in the antemedial area; hindwing grey; legs with tibial spur formula of 0-2-4, hind tibial spurs long. ABDOMEN: smooth.

Similar taxa: The quick recognition characters will separate Urodidae from all others.

Taxonomic references: Landry 1998b

Schreckensteiniidae (Fig. 141)

Superfamily: Schreckensteinoidea

Number of Canadian species: 2 spp. found sporadically across Canada

Genera: *Schreckensteinia*

Abundance: rare, not usually at lights

Quick recognition: Naked proboscis, forewing slender, hind tibia with spines and huge spurs, in live specimens hind legs held out sideways at rest. The two species are usually easy to separate, though dissection is often necessary on worn specimens.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth; proboscis naked; labial palps porrect, variable in length, slender; antenna filiform, with two scale rows per antennal segment, about half the forewing length. THORAX: wings heteroneurous, forewing slender, pointed, brownish, often with streaky markings; hindwing grey or brown; legs with tibial spur formula of 0-2-4, hind tibial spurs very long, hind tibial spines present. ABDOMEN: smooth.

Similar taxa: The quick recognition characters will separate Schreckensteiniidae from all others.

Taxonomic references: Forbes 1923

Epermeniidae (Fig. 142)

Superfamily: Epermenioidea

Number of Canadian species: 7 spp. across Canada

Genera: *Epermenia*, *Ochromolopis*

Abundance: rare, at lights

Quick recognition: Naked proboscis, smoothly scaled head, no ocelli, forewing slender, usually with some raised scales along the inner margin, hind tibia and tarsi with spines. Some species are fairly easy to recognize by forewing pattern, others need dissection.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth; proboscis naked, sometimes reduced; labial palps usually ascending, long, slender; antenna filiform, with one or two scale rows per antennal segment, greater than half the forewing length. THORAX: wings heteroneurous, forewing slender, pointed, usually with raised scales along the inner margin, pattern variable, greyish; hindwing grey; legs with tibial spur formula of 0-2-4, hind tibial spurs often long, hind tibial spines present, hind tarsal spines present. ABDOMEN: smooth, rarely boldly patterned.

Similar taxa: The quick recognition characters will separate Epermeniidae from all others.

Taxonomic references: Gaedike 2008

Alucitidae (Fig. 143)

Superfamily: Alucitoidea

Number of Canadian species: 3 spp. across Canada

Genera: *Alucita*

Abundance: common, rarer as you go east, at lights or flushed during the day

Quick recognition: Each wing is divided into six plumes and is banded light and dark grey. For specific identification dissection is usually necessary.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales usually rough on vertex, smooth on frons; proboscis naked; labial palps ascending, long, tufted; antenna filiform, with one scale row per antennal segment, greater than half the forewing length. THORAX: wings heteroneurous, divided into six plumes, banded light and dark grey or brown; legs with tibial spur formula of 0-2-4, hind tibial spurs long. ABDOMEN: smooth.

Similar taxa: Pterophoridae have the forewing notched and the hindwing divided into three plumes.

Taxonomic references: Landry & Landry 2004

Pterophoridae (Fig. 144)

Superfamily: Pterophoroidea

Number of Canadian species: 65 spp. across Canada, most diverse in the west

Genera: *Adaina*, *Amblyptilia*, *Capperia*, *Cnaemidophora*, *Dejongia*, *Emmelina*, *Geina*, *Gillmeria*, *Hellinsia*, *Oidaematophorus*, *Oxyptilus*, *Paraplattyptilia*, *Plattyptilia*, *Spennarches*, *Stenoptilia*, *Trichoptilus*

Abundance: common, at lights

Quick recognition: The forewing is notched and the hindwing is divided into three plumes, abdomen and legs are very long, live specimens hold the wings out to the sides in a T-shape. Specific identification is often challenging.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales usually smooth; proboscis naked; labial palps usually ascending, often short, usually slender; antenna filiform, with two scale rows per antennal segment, usually with long sensillae, usually less than half the forewing length. THORAX: rarely with a dorsal scale tuft; wings heteroneurous, forewing notched, usually with prominent lines in the postmedial area, typically brownish or white, hindwing divided into three plumes, sometimes boldly patterned; legs with tibial spur formula of 0-2-4, very long, hind tibial spurs short relative to the elongate legs. ABDOMEN: smooth, long, sometimes boldly patterned with chevrons.

Similar taxa: Alucitidae have each wing divided by six plumes.

Taxonomic references: Cashatt 1972 (some *Hellinsia*); Lange 1950; Landry & Gielis 2008 (some *Paraplatyptilia*); Barnes & Lindsey 1921 (most spp.); Landry 1987; McDunnough 1923, 1927, 1938b, 1939 (some spp.)

Copromorphidae (Fig. 145)

Superfamily: Copromorphoidea

Number of Canadian species: 2 spp. in BC and SW AB

Genera: *Ellabella*, *Lotisma*

Abundance: rare to uncommon, at lights

Quick recognition: Naked proboscis, no ocelli, often with raised scales on the forewing. The two species are easy to separate.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth, sometimes partially roughened; proboscis naked; labial palps usually ascending, variable in length, slender; antenna filiform, with two scale rows per antennal segment, roughly half the forewing length. THORAX: wings heteroneurous, forewing fairly broad, apex pointed, pattern variable, greyish, hindwing broad, greyish; legs with tibial spur formula of 0-2-4, hind tibial spurs variable in length. ABDOMEN: smooth.

Similar taxa: Carposinidae typically have a prominent reniform spot on the forewing. Lithosiini and Hypenodinae can be also separated by forewing pattern and by the presence of tympana on the metathorax.

Taxonomic references: Heppner 1984 (*Ellabella*); Heppner 1986 (*Lotisma*)

Carposinidae (Fig. 146)

Superfamily: Copromorphoidea

Number of Canadian species: 4 spp. across Canada

Genera: *Bondia*, *Carposina*

Abundance: uncommon, at lights

Quick recognition: Naked proboscis, no ocelli, with raised scales on the forewing, reniform spot prominent. The species are usually easy to separate.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales usually smooth; proboscis naked; labial palps usually ascending, usually long, usually slender; antenna filiform, with two scale rows per antennal segment, sometimes with prominent sensillae, longer than half the forewing length. THORAX: wings heteroneurous, forewing fairly broad, apex pointed, pattern variable, with a prominent reniform spot, greyish, sometimes with metallic markings, with raised scales, hindwing broad, usually greyish; legs with tibial spur formula of 0-2-4, hind tibial spurs variable in length. ABDOMEN: smooth.

Similar taxa: Copromorphidae lack a prominent reniform spot. Sparganothini can be separated by forewing pattern. Lithosiini can be separated by forewing pattern and by the presence of tympana on the metathorax.

Taxonomic references: Davis 1968

Pyralidae, Galleriinae (Fig. 147)

Superfamily: Pyraloidea

Number of Canadian species: 7 spp. sporadically across Canada

Genera: *Achroia*, *Aphomia*, *Cacotherapia*, *Corcyra*, *Galleria*, *Paralipsa*

Abundance: rare to locally common, at lights, some species associated with bee hives

Quick recognition: Reduced scaled proboscis, no ocelli, typically greyish, sometimes quite large. The species are fairly easy to separate.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth, sometimes rough on frons; proboscis scaled, reduced; labial palps variable in orientation, usually small, usually slender; antenna filiform, with two scale rows per antennal segment, usually shorter than half the forewing length. THORAX: wings heteroneurous, forewing variable, apex rounded or squared, sometimes notched in middle of outer margin, pattern variable, greyish, hindwing broad, greyish; legs with tibial spur formula of 0-2-4, hind tibial spurs variable in length; hind tarsal spines often present. ABDOMEN: smooth, with paired tympanal organs ventrally on the first abdominal segment.

Similar taxa: Phycitinae are quite variable and can look similar, but usually have a much broader hindwing compared to the forewing. To separate these two it is best to eliminate the few galleriines by forewing pattern.

Taxonomic references: Solis & Metz 2008 (*Aphomia*, *Paralipsa*); Powell & Opler 2009 (*Achroia*, *Galleria*)

Pyralidae, Chrysauginae (Fig. 148)

Superfamily: Pyraloidea

Number of Canadian species: 7 spp. sporadically across Canada, most spp. restricted to SE Canada

Genera: *Acallis*, *Arta*, *Condylolomia*, *Galasa*, *Tosale*

Abundance: uncommon, at lights

Quick recognition: Scaled proboscis, ocelli usually prominent, often boldly patterned, forewing sometimes with a large excavation in costa, legs often with large scale tufts, live specimens rest with body elevated and legs prominent. The species are fairly easy to separate.

Diagnosis: HEAD: ocelli usually present; chaetosemata usually present; head scales usually rough on vertex, usually smooth on frons; proboscis scaled; labial palps variable in orientation, usually small, usually slender; antenna filiform, with long sensillae, with two scale rows per antennal segment, variable in length. THORAX: wings heteroneurous, forewing usually boldly patterned, apex squared, sometimes excavated in middle of costa, pattern usually bold, usually brownish, hindwing broad, variable in colour, sometimes boldly patterned; legs with tibial spur formula of 0-2-4, hind tibial spurs usually short, legs often with distinct scale tufts. ABDOMEN: smooth, with paired tympanal organs ventrally on the first abdominal segment. Similar taxa: Chrysauginae can be similar to Phycitinae and many Crambidae subfamilies, but can be separated by forewing pattern.

Taxonomic references: Cashatt 1968; Covell 1984 (some spp.)

Pyralidae, Pyralinae (Fig. 149)

Superfamily: Pyraloidea

Number of Canadian species: 10 spp. across Canada

Genera: *Aglossa*, *Dolichomia*, *Herculia*, *Hypsopygia*, *Pseudasopia*, *Pyralis*

Abundance: uncommon, at lights, often indoors

Quick recognition: Scaled proboscis, ocelli absent, forewing typically with distinct AM and PM lines, forewing often triangular in shape, live specimens sometimes curl abdomen upwards at rest. The species are usually easy to separate.

Diagnosis: HEAD: ocelli absent; chaetosemata usually present; head scales usually rough; proboscis scaled, sometimes absent; labial palps usually ascending, usually small, usually slender; antenna filiform, rarely pectinate in males, sometimes with long sensillae, with two scale rows per antennal segment, often less than half forewing length. THORAX: wings heteroneurous, forewing often triangular, sometimes more elongate, forewing usually boldly patterned, usually with prominent AM and PM lines, apex squared or pointed, often reddish or pinkish, hindwing broad, usually greyish, usually boldly patterned; legs with tibial spur formula of 0-2-4, hind tibial spurs usually short, hind tarsal spines sometimes present. ABDOMEN: smooth, with paired tympanal organs ventrally on the first abdominal segment.

Similar taxa: Pyralinae can be separated from Galleriinae and others by the forewing pattern.

Taxonomic references: Powell & Opler 2009, Covell 1984 (some spp.)

Pyralidae, Epipaschiinae (Fig. 150)

Superfamily: Pyraloidea

Number of Canadian species: 15 spp. across Canada

Genera: *Epipaschia*, *Macalla*, *Oneida*, *Pococera*, *Toripalpus*

Abundance: uncommon, at lights

Quick recognition: Scaled proboscis, ocelli present, labial palps prominent and curved upwards, forewing typically greyish with distinct AM and PM lines, forewing with raised scales usually present. They can be tricky to identify to species.

Diagnosis: HEAD: ocelli present; chaetosemata usually present; head scales rough on vertex, usually smooth on frons; proboscis scaled; labial palps ascending, long, slender; antenna filiform, sometimes with bizarre ornamentation, usually with long sensillae, with two scale rows per antennal segment, usually less than half forewing length. THORAX: wings heteroneurous, forewing usually with prominent AM and PM lines, apex squared, greyish, hindwing broad, greyish; legs with tibial spur formula of 0-2-4, hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth, sometimes boldly patterned, with paired tympanal organs ventrally on the first abdominal segment.

Similar taxa: Epipaschiinae can be separated from Phycitinae by forewing pattern.

Taxonomic references: Holland & Schaus 1925 (*Epipaschia*, *Macalla*, most *Pococera*, some *Toripalpus*); Solis 1991 (*Oneida*); Solis 1993 (some *Toripalpus*)

Pyralidae, Phycitinae (Fig. 151)

Superfamily: Pyraloidea

Number of Canadian species: over 140 spp. across Canada

Genera: *Acrobasis*, *Ambesa*, *Anerastia*, *Apomyelois*, *Bandera*, *Cadra*, *Canarsia*, *Catastia*, *Caudellia*, *Coenochroa*, *Cuniberta*, *Dasyphyga*, *Dioryctria*, *Ephestia*, *Ephestiodes*, *Erelieva*, *Etiella*, *Eulogia*, *Eumysia*, *Eurythmia*, *Euzophera*, *Homoeosoma*, *Honora*, *Hulstia*, *Interjectio*, *Lipographis*, *Macrorrhinia*, *Melitara*, *Meroptera*, *Moodna*, *Myelopsis*, *Oreana*, *Ortholepis*, *Peoria*, *Philodema*, *Phobus*, *Phycitodes*, *Pima*, *Plodia*, *Polopeustis*, *Promylea*, *Psorosina*, *Pyla*, *Ragonotia*, *Rhagea*, *Rostrolaetilia*, *Salebriaria*, *Sarata*, *Sciota*, *Staudingeria*, *Telethusia*, *Trachycera*, *Tulsa*, *Vitula*, *Zophodia*

Abundance: common, at lights, some spp. diurnal

Quick recognition: Scaled proboscis, ocelli usually present, labial palps usually fairly long and curved upwards, forewing often with distinct AM and PM lines, usually greyish, forewing most often very narrow compared to broad hindwing, hind tarsal spines usually present. They

are often very difficult to identify to species.

Diagnosis: HEAD: ocelli usually present; chaetosemata usually present; head scales often smooth; proboscis scaled; labial palps usually ascending, usually long, usually slender; antenna filiform, sometimes with long sensillae, with two scale rows per antennal segment, usually less than half forewing length. THORAX: wings heteroneurous, forewing most often very slender compared to the hindwing, usually with prominent AM and PM lines, reniform spot often present, apex usually squared, usually greyish or brownish with white markings, hindwing broad, greyish, brownish, or whitish; legs with tibial spur formula of 0-2-4, hind tibial spurs short, hind tarsal spines usually present. ABDOMEN: smooth, rarely boldly patterned, rarely with dorsal scale tuft, with paired tympanal organs ventrally on the first abdominal segment.

Similar taxa: Phycitinae are best separated from other similar pyralids and crambids by eliminating the other taxa since phycitines are so polymorphic.

Taxonomic references: Neunzig 1986 (*Acrobasis*, *Trachycera*); Neunzig 2003 (*Ambesa*, *Canarsia*, *Catastia*, *Dioryctria*, *Interjectio*, *Lipographis*, *Meroptera*, *Oreana*, *Ortholepis*, *Philodema*, *Phobus*, *Pima*, *Polopeustis*, *Psorosina*, *Pyla*, *Salebriaria*, *Sarata*, *Sciota*, *Telethusia*, *Tulsa*); Shaffer 1968 (*Anerastia*, *Coenochroa*, *Peoria*, *Ragonotia*); Neunzig 1990 (*Apomyeloidis*, *Bandera*, *Cadra*, *Caudellia*, *Cuniberta*, *Ephestia*, *Ephestiodes*, *Erelieva*, *Eulogia*, *Eurythmia*, *Euzophera*, *Moodna*, *Myelopsis*, *Plodia*, *Vitula*); Neunzig 1997 (*Homoeosoma*, *Melitara*, *Phycitodes*, *Rhagea*, *Rostrolaetilia*, *Zophodia*); Heinrich 1956 (most spp.)

Crambidae, Scopariinae (Fig. 152)

Superfamily: Pyraloidea

Number of Canadian species: 17 spp. across Canada

Genera: *Cosipara*, *Eudonia*, *Gesneria*, *Scoparia*

Abundance: common, at lights

Quick recognition: Scaled proboscis, ocelli present, labial palps porrect or descending, forewing usually with distinct antemedial and postmedial lines, usually with distinct claviform, orbicular, or reniform spots, grey with black markings. Most are fairly easy to identify to species.

Diagnosis: HEAD: ocelli present; chaetosemata present; head scales usually rough on vertex, smooth on frons; proboscis scaled; labial palps porrect or descending, usually long, usually tufted; antenna filiform, sometimes with long sensillae, with two scale rows per antennal segment, usually roughly half forewing length. THORAX: wings heteroneurous, forewing fairly slender, usually with prominent antemedial and postmedial lines, reniform, orbicular, and claviform spots usually present, apex usually squared or rounded, greyish with black and white markings, hindwing broad, greyish or whitish; legs with tibial spur formula of 0-2-4, hind tibial spurs usually

short. ABDOMEN: smooth, with paired tympanal organs ventrally on the first abdominal segment.

Similar taxa: Scopariinae are easily separated from other crambids and pyralids by the characteristic forewing pattern.

Taxonomic references: Munroe 1972a, 1973

Crambidae, Crambinae, Argyriini (Fig. 153)

Superfamily: Pyraloidea

Number of Canadian species: 4 spp. in eastern Canada as far west as MB

Genera: *Argyria*, *Urola*

Abundance: uncommon, at lights

Quick recognition: Scaled proboscis, broad squared forewing, shining white, often with a distinct slanted orange or brown medial line. Easy to identify to species.

Diagnosis: HEAD: ocelli present; chaetosemata present; head scales rough, somewhat smoothed on frons; proboscis scaled; labial palps porrect or ascending, usually long, relatively short compared to other Crambinae, slender; antenna filiform, with two scale rows per antennal segment, usually less than half forewing length. THORAX: wings heteroneurous, forewing broad, shining white, often with a distinct slanted orange or brown medial line, apex squared, hindwing broad, white; legs with tibial spur formula of 0-2-4, hind tibial spurs often long. ABDOMEN: smooth, with paired tympanal organs ventrally on the first abdominal segment.

Similar taxa: Argyriini are easily separated from other crambids and pyralids by the characteristic forewing pattern.

Taxonomic references: Martinez & Brown 2007

Crambidae, Crambinae, Crambini (Fig. 154)

Superfamily: Pyraloidea

Number of Canadian species: 57 spp. throughout Canada

Genera: *Agriphila*, *Arequipa*, *Catoptria*, *Chrysoteuchia*, *Crambus*, *Euchromius*, *Fissicrambus*, *Loxocrambus*, *Microcrambus*, *Neodactria*, *Parapediasia*, *Pediasia*, *Platytes*, *Raphiptera*, *Tehama*, *Thaumatopsis*

Abundance: common to abundant, at lights, often flushed from grasses

Quick recognition: Scaled proboscis, very long porrect palps, elongate forewing with squared tip, usually streaky looking, often with silvery or golden streaks, broad hindwing. Some genera are challenging to identify to species.

Diagnosis: HEAD: ocelli present; chaetosemata present; head scales smooth, sometimes roughened on vertex; proboscis scaled; labial palps porrect or descending, very long, sometimes tufted; antenna filiform, rarely pectinate, with two scale rows per antennal segment, usually less than half forewing length. THORAX: wings heteroneurous, forewing slender, often streaked with silver or gold, often

with a complex pattern of lines in the subterminal area, usually brownish; hindwing broader, greyish brown or white; legs with tibial spur formula of 0-2-4, hind tibial spurs short. ABDOMEN: smooth, with paired tympanal organs ventrally on the first abdominal segment.

Similar taxa: Crambini are best separated from other crambids and pyralids by the forewing pattern.

Taxonomic references: Landry 1995 (key to genera, *Arequipa*, *Chrysoteuchia*, *Platytes*, *Raphiptera*, *Tehama*); Bird 2003-2006 (*Agriphila*); Bird 2003 (*Catoptria*); Klots 1940 (some *Crambus*); Kearfott 1908 (some *Crambus*, some *Neodactria*); Klots 1942 (some *Crambus*, some *Pediasia*); McDunnough 1921 (some *Crambus*); Fernald 1896 (some *Crambus*, *Fissicrambus*, most *Neodactria*, *Parapediasia*, some *Pediasia*, some *Thaumatopis*); Capps 1966 (*Euchromius*); McDunnough 1929 (*Loxocrambus*); Klots 1968 (*Microcrambus*); Bird 2003-2009 (most *Pediasia*)

Crambidae, Crambinae, Haimbachiini (Fig. 155)

Superfamily: Pyraloidea

Number of Canadian species: 5 spp. across Canada

Genera: *Chilo*, *Eoreuma*, *Occidentalia*, *Thopeutis*, *Xubida*

Abundance: rare, at lights

Quick recognition: Scaled proboscis, very long porrect palps, elongate forewing with squared tip, usually streaky looking, broad hindwing. Fairly easy to identify to species. Diagnosis: HEAD: ocelli usually present; chaetosemata present; head scales smooth, sometimes roughened on vertex; proboscis scaled; labial palps porrect, very long, usually slender; antenna filiform, with two scale rows per antennal segment, usually less than half forewing length. THORAX: wings heteroneurous, forewing slender, often streaked in pattern, usually brownish; hindwing usually broader, greyish or white; legs with tibial spur formula of 0-2-4, hind tibial spurs usually long. ABDOMEN: smooth, with paired tympanal organs ventrally on the first abdominal segment.

Similar taxa: Haimbachiini are best separated from other crambids and pyralids by the forewing pattern.

Taxonomic references: Fernald 1896 (*Chilo*, *Occidentalia*); Klots 1970 (*Eoreuma*, *Xubida*); Capps 1965 (*Haimbachia*)

Crambidae, Crambinae, Prionapterygini (Fig. 156)

Superfamily: Pyraloidea

Number of Canadian species: 2 spp. *Pseudoschoenobius opalescalis* in S. AB, *Prionapteryx nebulifera* in S. MB & S. ON

Genera: *Prionapteryx*, *Pseudoschoenobius*

Abundance: very rare, at lights

Quick recognition: Scaled proboscis, very long porrect or descending palps, elongate forewing with acute or falcate tip, broad hindwing. Easy to identify to species.

Diagnosis: HEAD: ocelli present or absent; chaetosemata

present; head scales smooth, sometimes roughened on vertex; proboscis scaled; labial palps descending or porrect, long, slender; antenna filiform, with two scale rows per antennal segment, less than half forewing length. THORAX: wings heteroneurous, forewing slender to very slender, apex either acute or falcate, boldly patterned or subdued, brownish, sometimes with metallic markings; hindwing broader, whitish; legs with tibial spur formula of 0-2-4, hind tibial spurs short. ABDOMEN: smooth, with paired tympanal organs ventrally on the first abdominal segment.

Similar taxa: Prionapterygini are best separated from other crambids and pyralids by the forewing pattern.

Taxonomic references: Fernald 1896

Crambidae, Schoenobiinae (Fig. 157)

Superfamily: Pyraloidea

Number of Canadian species: over 4 spp. across S. Canada

Genera: *Carectocultus*, *Donacaula*

Abundance: rare to common, at lights, associated with water

Quick recognition: Scaled proboscis, forewing acutely pointed, extremely long porrect palps, yellow or brown forewing, often with streaky markings. Difficult to identify to species.

Diagnosis: HEAD: ocelli present or absent; chaetosemata usually present; head scales rough or smooth; proboscis scaled, reduced; labial palps porrect, extremely long, sometimes tufted; antenna filiform, with long sensillae, with two scale rows per antennal segment, usually less than half forewing length. THORAX: wings heteroneurous, forewing slender, apex acute, typically streaked, yellow or brown; hindwing broad, whitish; legs with tibial spur formula of 0-2-4, hind tibial spurs short. ABDOMEN: smooth, with paired tympanal organs ventrally on the first abdominal segment.

Similar taxa: Schoenobiinae are best separated from others by the characteristic forewing shape and pattern.

Taxonomic references: none

Crambidae, Acentropiinae (Fig. 158)

Superfamily: Pyraloidea

Number of Canadian species: 19 spp. across Canada

Genera: *Acentria*, *Elophila*, *Eoparargyractis*, *Neocataclysta*, *Parapoynx*, *Petrophila*

Abundance: common to uncommon, at lights, associated with water, often flushed during the day

Quick recognition: Scaled proboscis, forewing elongate triangular, both wings usually boldly patterned. Usually easy to identify to species.

Diagnosis: HEAD: ocelli present, rarely absent; chaetosemata present; head scales smooth; proboscis scaled, rarely absent; labial palps ascending, rarely descending, short, sometimes tufted; antenna filiform,

often with long sensillae, with one or two scale rows per antennal segment, often less than half forewing length. THORAX: wings heteroneurous, female rarely apterous, forewing elongate triangular, apex acute or square, typically boldly patterned with many fine lines, varying in colour, but usually pale; hindwing broad, usually boldly patterned, varying in colour, sometimes with gold spots on the outer margin; legs with tibial spur formula of 0-2-4, hind tibial spurs usually short. ABDOMEN: smooth, often boldly patterned, with paired tympanal organs ventrally on the first abdominal segment.

Similar taxa: Acentropiinae are easy to separate from other crambids and pyralids by the wing pattern.

Taxonomic references: Scholtens & Balogh 1996 (*Acentria*); Munroe 1972a, 1973 (most spp.)

Crambidae, Odontiinae (Fig. 159)

Superfamily: Pyraloidea

Number of Canadian species: 6 spp. scattered across southern Canada

Genera: *Anatralata*, *Eustixia*, *Frechinia*, *Metrea*, *Microtheoris*, *Mimoschinia*

Abundance: rare to uncommon, at lights

Quick recognition: Scaled proboscis, most spp. have distinct forewing patterns. Easy to identify to species.

Diagnosis: HEAD: ocelli present; chaetosemata usually present; head scales smooth, often rough on vertex; proboscis scaled; labial palps usually porrect, usually short, usually tufted; antenna filiform, often with long sensillae, with two scale rows per antennal segment, often less than half forewing length. THORAX: wings heteroneurous, forewing triangular, apex acute or square, typically boldly patterned, varying in colour, usually pale, rarely with raised scales; hindwing broad, usually whitish; legs with tibial spur formula of 0-2-4, hind tibial spurs usually long. ABDOMEN: smooth, with paired tympanal organs ventrally on the first abdominal segment.

Similar taxa: Odontiinae are easy to separate from other crambids and pyralids by the wing pattern.

Taxonomic references: Munroe 1972b, 1973

Crambidae, Evergestinae (Fig. 160)

Superfamily: Pyraloidea

Number of Canadian species: 13 spp. throughout Canada, most diverse in the west.

Genera: *Cylindrifrons*, *Evergestis*, *Orenaia*, *Prorasea*

Abundance: common to uncommon, at lights

Quick recognition: Scaled proboscis, most spp. have distinct forewing patterns. Fairly easy to identify to species.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales usually rough on vertex, smooth on frons; proboscis scaled; labial palps porrect or ascending, usually short, tufted; antenna filiform, with two scale rows per antennal segment, often greater than half forewing length.

THORAX: wings heteroneurous, forewing triangular, apex acute or square, typically boldly patterned with fine lines, varying in colour; hindwing broad, often slightly boldly patterned; legs with tibial spur formula of 0-2-4, hind tibial spurs often long. ABDOMEN: smooth, with paired tympanal organs ventrally on the first abdominal segment. Similar taxa: Evergestinae are easy to separate from other crambids and pyralids by the wing pattern.

Taxonomic references: Munroe 1973

Crambidae, Glaphyriinae (Fig. 161)

Superfamily: Pyraloidea

Number of Canadian species: 12 spp. mainly in southern ON and QC, also in southern BC.

Genera: *Abegesta*, *Aethiophysa*, *Chalcoela*, *Dicymolomia*, *Glaphyria*, *Hellula*, *Lipocosma*, *Lipocosmodes*, *Nephrogramma*, *Stegae*, *Xanthophysa*

Abundance: rare to uncommon, at lights

Quick recognition: Scaled proboscis, most spp. have distinct forewing and hindwing patterns. Fairly easy to identify to species.

Diagnosis: HEAD: ocelli present; chaetosemata absent, but scale tufts present in that location; head scales usually rough on vertex, smooth on frons; proboscis scaled; labial palps usually porrect, usually short, usually tufted; antenna filiform, with two scale rows per antennal segment, usually about half forewing length. THORAX: wings heteroneurous, forewing triangular, apex square, typically boldly patterned with fine antemedial and postmedial lines or blotches, varying in colour; hindwing broad, usually with a rough continuation of forewing pattern; legs with tibial spur formula of 0-2-4, hind tibial spurs long. ABDOMEN: smooth, with paired tympanal organs ventrally on the first abdominal segment.

Similar taxa: Glaphyriinae are easy to separate from other crambids and pyralids by the wing pattern.

Taxonomic references: Munroe 1972b, 1973

Crambidae, Pyraustinae (Fig. 162)

Superfamily: Pyraloidea

Number of Canadian species: 52 spp. throughout Canada.

Genera: *Achyra*, *Anania*, *Crocidophora*, *Fumibotys*, *Hahncappsia*, *Loxostege*, *Nascia*, *Neohelvitotys*, *Ostrinia*, *Perispasta*, *Pyrausta*, *Saucrobotys*, *Sitochroa*, *Uresiphita*

Abundance: common, at lights

Quick recognition: Scaled proboscis, most spp. have distinct forewing and hindwing patterns. Often easy to identify to species.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough on vertex, smooth on frons; proboscis scaled; labial palps usually porrect, usually short, usually tufted; antenna filiform, usually with two scale rows per antennal segment, greater than half forewing length. THORAX: wings heteroneurous, forewing triangular, apex

square or acute, typically boldly patterned with spots and lines, often brownish, often with bright colours; hindwing broad, often boldly patterned, usually brownish; legs with tibial spur formula of 0-2-4, hind tibial spurs usually short. ABDOMEN: smooth, occasionally boldly patterned, with paired tympanal organs ventrally on the first abdominal segment.

Similar taxa: Pyraustinae are easy to separate from most other crambids and pyralids by the wing pattern. Spilomelinae are difficult to separate except by familiarity with the wing patterns of the various genera.

Taxonomic references: Munroe 1976a, 1976b

Crambidae, Spilomelinae (Fig. 163)

Superfamily: Pyraloidea

Number of Canadian species: 47 spp. throughout Canada.

Genera: *Anageshna*, *Blepharomastix*, *Choristostigma*, *Desmia*, *Diacme*, *Diaphania*, *Diastictis*, *Diathrausta*, *Framinghamia*, *Herpetogramma*, *Hymenia*, *Lineodes*, *Loxostegopsis*, *Mecyna*, *Nomophila*, *Palpita*, *Pantographa*, *Polygrammodes*, *Spolodea*, *Udea*

Abundance: common, at lights

Quick recognition: Scaled proboscis, most spp. have distinct forewing and hindwing patterns. Often easy to identify to species.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough on vertex, smooth on frons; proboscis scaled; labial palps usually porrect, usually short, often tufted; antenna filiform, often with long sensillae, usually with two scale rows per antennal segment, usually greater than half forewing length. THORAX: wings heteroneurous, forewing triangular, apex square or acute, typically boldly patterned with spots and lines, often brownish, often with bright colours; hindwing broad, often boldly patterned, usually brownish; legs with tibial spur formula of 0-2-4, hind tibial spurs short. ABDOMEN: smooth, rarely boldly patterned, with paired tympanal organs ventrally on the first abdominal segment.

Similar taxa: Spilomelinae are easy to separate from most other crambids and pyralids by the wing pattern. Pyraustinae are difficult to separate except by familiarity with the wing patterns of the various genera.

Taxonomic references: Munroe 1956a (*Anageshna*); Powell & Opler 2009 (*Choristostigma*, *Diaphania*, some *Diathrausta*, some *Herpetogramma*, *Lineodes*, *Mecyna*, *Nomophila*); Covell 1984 (*Desmia*, *Diacme*, *Diaphania*, some *Herpetogramma*, *Hymenia*, *Nomophila*, *Pantographa*, *Polygrammodes*, *Spolodea*); Munroe 1956b (*Diastictis*); Munroe 1956c (*Diathrausta*); Munroe 1952 (*Palpita*); Munroe 1966 (*Udea*)

Thyrididae (Fig. 164)

Superfamily: Thyridoidea

Number of Canadian species: 2 spp. *Thyris maculata* across

southern Canada, *Pseudothyris sepulchralis* in extreme southern ON.

Genera: *Pseudothyris*, *Thyris*

Abundance: rare to uncommon, diurnal

Quick recognition: Naked proboscis, both wings dark with a distinct pale blotchy pattern. Easy to identify to species. Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth; proboscis naked; labial palps usually ascending, long, tufted; antenna filiform, with two scale rows per antennal segment, greater than half forewing length. THORAX: stout, wings heteroneurous, forewing triangular, apex square, dark with pale blotches; hindwing broad, patterned like forewing; legs with tibial spur formula of 0-2-4, hind tibial spurs long, tarsal spines present. ABDOMEN: smooth, boldly patterned.

Similar taxa: The naked proboscis, lack of ocelli, and characteristic wing pattern are distinctive.

Taxonomic references: Covell 1984

Hesperiidae, Eudaminae (Fig. 165)

Superfamily: Hesperioidea

Number of Canadian species: 5 spp. through much of Canada, most diverse in extreme southern ON.

Genera: *Achalarus*, *Epargyreus*, *Thorybes*, *Urbanus*

Abundance: uncommon to common, diurnal

Quick recognition: Hooked and clubbed antenna, broad dark or chocolate brown wings, stout body.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough; proboscis naked; labial palps ascending, short, roughly scaled; antenna hooked and clubbed, far apart at base, with many rows of scales per antennal segment, varying in length. THORAX: stout, wings heteroneurous, forewing triangular, apex square, brown, often with paler markings in the medial and postmedial areas; hindwing broad, brown, usually unicolourous, sometimes with tails; hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth.

Similar taxa: Eudamines are easily separated from other skippers by the forewing pattern.

Taxonomic references: Layberry *et al.* 1998

Hesperiidae, Pyrginae (Fig. 166)

Superfamily: Hesperioidea

Number of Canadian species: 19 spp. throughout Canada.

Genera: *Erynnis*, *Pholisora*, *Pyrgus*, *Staphylus*

Abundance: common, diurnal

Quick recognition: Clubbed and often hooked antenna, broad brown or grey wings with paler markings, stout body.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough, sometimes smooth; proboscis naked; labial palps ascending or porrect, variable in length, tufted; antenna clubbed, often hooked, far apart at base, with many scale rows per antennal segment, less than half forewing length. THORAX: stout, wings heteroneurous, forewing

broad, apex square, brown or grey with paler markings, postmedial line always at least partially visible; hindwing broad, brown, often unicolourous; hind tibial spurs short, hind tarsal spines present. ABDOMEN: hairy.

Similar taxa: Pyrgines are easily separated from other skippers by the forewing pattern.

Taxonomic references: Layberry *et al.* 1998

Hesperiidae, Heteropterinae (Fig. 167)

Superfamily: Hesperioidea

Number of Canadian species: 1 sp. (*Carterocephalus palaemon*) throughout Canada.

Genera: *Carterocephalus*

Abundance: uncommon to common, diurnal

Quick recognition: Clubbed antenna, wings distinctly checkered brown and orange, stout body.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough; proboscis naked; labial palps ascending, long, tufted; antenna clubbed, with a slight hook, far apart at base, with many scale rows per antennal segment, approximately half forewing length. THORAX: stout, wings heteroneurous, forewing broad, apex square, distinctly checkered brown and orange; hindwing broad, with a similar pattern as the forewing; hind tibial spurs short, hind tibial and tarsal spines present. ABDOMEN: hairy.

Similar taxa: Heteropterinae are easily separated from other skippers by the wing pattern.

Taxonomic references: Layberry *et al.* 1998

Hesperiidae, Hesperinae (Fig. 168)

Superfamily: Hesperioidea

Number of Canadian species: 47 spp. throughout Canada, most diverse in the southeast.

Genera: *Amblyscirtes*, *Anatrytone*, *Ancyloxypha*, *Atalopedes*, *Atrytonopsis*, *Calpodes*, *Euphyes*, *Hesperia*, *Hylephila*, *Oarisma*, *Ochlodes*, *Panoquina*, *Poanes*, *Polites*, *Pompeius*, *Thymelicus*, *Wallengrenia*

Abundance: common, diurnal

Quick recognition: Clubbed and often hooked antenna, broad stout wings, stout body.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales usually rough; proboscis naked; labial palps usually ascending, usually short, tufted; antenna clubbed, usually hooked, far apart at base, with many scale rows per antennal segment, usually less than half forewing length. THORAX: stout, wings heteroneurous, forewing broad, apex square, pattern variable, males sometimes with raised patches of sex scales, often orange, brown, or black; hindwing broad, usually with a similar pattern as the forewing; hind tibial spurs short, hind tibial spines sometimes present, tarsal spines present. ABDOMEN: hairy.

Similar taxa: Hesperinae are easily separated from other

skippers by the wing pattern.

Taxonomic references: Layberry *et al.* 1998

Hesperiidae, Megathyminae (Fig. 169)

Superfamily: Hesperioidea

Number of Canadian species: 1 sp. (*Megathymus streckeri*) in extreme SE AB.

Genera: *Megathymus*

Abundance: very rare, diurnal, associated with yucca.

Quick recognition: Very large, clubbed antenna, broad stout wings, stout body.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth; proboscis naked; labial palps ascending, short, slightly tufted; antenna clubbed, far apart at base, with many scale rows per antennal segment, less than half forewing length. THORAX: robust, wings heteroneurous, forewing broad, apex square, brown with distinct broad cream markings in postmedial area; hindwing broad, brown; hind tibial spurs short, hind tibial and tarsal spines present. ABDOMEN: hairy.

Similar taxa: Megathyminae can be separated from all other Canadian skippers by its massive size.

Taxonomic references: Brock & Kaufman 2006

Papilionidae, Parnassiinae (Fig. 170)

Superfamily: Papilionoidea

Number of Canadian species: 4 spp. mostly restricted to the western Cordillera.

Genera: *Parnassius*

Abundance: uncommon to common, diurnal, in mountain and foothill areas

Quick recognition: Clubbed antenna, wings white or yellow with black spots.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough; proboscis naked; labial palps ascending or porrect, short, tufted; antenna clubbed, with many scale rows per antennal segment or naked, less than half forewing length. THORAX: wings heteroneurous, forewing triangular, apex rounded, white or yellow with black shading and spots; hindwing broad, with a similar pattern as the forewing, but with some red spots submarginally; hind tibial spurs short, hind tibial and tarsal spines present. ABDOMEN: hairy.

Similar taxa: Parnassiines can be separated from all other butterflies by the forewing pattern.

Taxonomic references: Layberry *et al.* 1998

Papilionidae, Papilioninae (Fig. 171)

Superfamily: Papilionoidea

Number of Canadian species: 14 spp. throughout Canada.

Genera: *Battus*, *Eurytides*, *Papilio*

Abundance: common, diurnal

Quick recognition: Clubbed antenna, distinct wing pattern, hindwing with tail.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales usually rough; proboscis naked; labial palps ascending or porrect, short, tufted; antenna clubbed, usually unscaled, less than half forewing length. THORAX: wings heteroneurous, forewing triangular, apex rounded or acute, lines often distinct, especially subterminal, black, often with yellow; hindwing broad, with a similar pattern as the forewing, with at least indication of a tail, normally with at least some metallic blue marginally; hind tibial spurs short, hind tibial and tarsal spines present. ABDOMEN: smooth, usually boldly striped.

Similar taxa: Papilioninae can be separated from all other butterflies by the forewing pattern coupled with hindwing tails.

Taxonomic references: Layberry *et al.* 1998

Pieridae, Pierinae (Fig. 172)

Superfamily: Papilionoidea

Number of Canadian species: 18 spp. throughout Canada.

Genera: *Anthocaris*, *Ascia*, *Euchloe*, *Neophasia*, *Pieris*, *Pontia*

Abundance: common, diurnal

Quick recognition: Clubbed antenna, wings usually white with black markings.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough; proboscis naked; labial palps usually ascending, usually short, tufted; antenna clubbed, with many scale rows per antennal segment, less than half forewing length. THORAX: slender, hairy; wings heteroneurous, forewing squared, usually white with black markings, especially apically; hindwing broad, sometimes with a similar pattern as the forewing, white; hind tibial spurs short, hind tibial and tarsal spines present. ABDOMEN: smooth or hairy.

Similar taxa: Pierinae are most similar to Coliadinae and can be separated by wing pattern.

Taxonomic references: Layberry *et al.* 1998

Pieridae, Coliadinae (Fig. 173)

Superfamily: Papilionoidea

Number of Canadian species: 22 spp. throughout Canada.

Genera: *Colias*, *Eurema*, *Nathalis*, *Phoebis*, *Zerene*

Abundance: common, diurnal

Quick recognition: Clubbed antenna, wings usually yellow with black markings.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough; proboscis naked; labial palps usually ascending, short, often tufted; antenna clubbed, with many scale rows per antennal segment, less than half forewing length. THORAX: slender, hairy; wings heteroneurous, forewing squared, usually yellow with black markings, especially apically; hindwing broad, sometimes with a similar pattern as the forewing, usually yellow; hind tibial spurs short, hind tibial and tarsal spines present.

ABDOMEN: smooth or hairy.

Similar taxa: Coliadinae are most similar to Pierinae but can be separated by wing pattern.

Taxonomic references: Layberry *et al.* 1998

Lycaenidae, Miletinae (Fig. 174)

Superfamily: Papilionoidea

Number of Canadian species: 1 sp. (*Feniseca tarquinius*) from E. SK eastwards.

Genera: *Feniseca*

Abundance: rare, diurnal, most common among alder shrubs that harbour wooly aphids

Quick recognition: Clubbed and banded antenna, wings boldly marked with orange and brown.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales somewhat roughened; proboscis naked; labial palps partially ascending, fairly short, slender; antenna clubbed, banded, with many scale rows per antennal segment, less than half forewing length. THORAX: slender, hairy; wings heteroneurous, forewing squared, orange with brown markings; hindwing broad, with a similar pattern as the forewing; hind tibial spurs short, hind tarsal spines present. ABDOMEN: slightly hairy.

Similar taxa: Miletinae are easily separated from other lycaenids by the wing pattern.

Taxonomic references: Layberry *et al.* 1998

Lycaenidae, Lycaeninae (Fig. 175)

Superfamily: Papilionoidea

Number of Canadian species: 12 spp. throughout Canada

Genera: *Lycaena*

Abundance: common to uncommon, diurnal

Quick recognition: Clubbed and banded antenna, wings often iridescent, especially in males.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough; proboscis naked; labial palps ascending or porrect, variable in length, tufted; antenna clubbed, banded, with many scale rows per antennal segment, usually less than half forewing length. THORAX: slender, hairy; wings heteroneurous, forewing squared, variable in pattern, often orange and black, usually iridescent in males; hindwing broad, usually with a similar pattern as the forewing; hind tibial spurs short, hind tibial and tarsal spines present. ABDOMEN: slightly hairy.

Similar taxa: Lycaeninae can be separated from other lycaenids by wing pattern.

Taxonomic references: Layberry *et al.* 1998

Lycaenidae, Theclinae (Fig. 176)

Superfamily: Papilionoidea

Number of Canadian species: 31 spp. throughout Canada

Genera: *Callophrys*, *Calycopis*, *Erora*, *Parrhasius*, *Satyrium*

Abundance: common to uncommon, diurnal, rarely

crepuscular

Quick recognition: Clubbed and banded antenna, hindwings often with slender tail, wing pattern usually more complex ventrally than dorsally.

Diagnosis: HEAD: ocelli absent; chaetosemata present; eye hairy; head scales usually rough; proboscis naked; labial palps ascending or porrect, variable in length, often tufted; antenna clubbed, banded, with many scale rows per antennal segment, less than half forewing length. THORAX: slender, hairy; wings heteroneurous, forewing squared, pattern usually weak, often brown, pattern typically more distinctive and composed of many fine lines on ventral side; hindwing broad, usually with a similar pattern as the forewing, usually with a slender tail; hind tibial spurs short, hind tibial spines often present, tarsal spines present. ABDOMEN: slightly hairy.

Similar taxa: Theclinae can be separated from other lycaenids by ventral wing pattern.

Taxonomic references: Layberry *et al.* 1998

Lycaenidae, Polyommatainae (Fig. 177)

Superfamily: Papilionoidea

Number of Canadian species: 19 spp. throughout Canada

Genera: *Celastrina*, *Cupido*, *Echinargus*, *Euphilotes*, *Glaucopsyche*, *Leptotes*, *Lycaeides*, *Plebejus*

Abundance: common, diurnal

Quick recognition: Clubbed and banded antenna, wings often iridescent blue with black.

Diagnosis: HEAD: ocelli absent; chaetosemata present; eye sometimes hairy; head scales rough; proboscis naked; labial palps usually ascending, variable in length, tufted; antenna clubbed, banded, with many scale rows per antennal segment, less than half forewing length. THORAX: slender, hairy; wings heteroneurous, forewing squared, usually iridescent blue with black markings; hindwing broad, with a similar pattern as the forewing; hind tibial spurs short, hind tibial spines rarely present, tarsal spines present. ABDOMEN: slightly hairy.

Similar taxa: Polyommatainae can be separated from other lycaenids by wing pattern.

Taxonomic references: Layberry *et al.* 1998

Riodinidae (Fig. 178)

Superfamily: Papilionoidea

Number of Canadian species: 1 sp. (*Apodemia mormo*) in S. BC and S. SK

Genera: *Apodemia*

Abundance: rare, diurnal

Quick recognition: Clubbed and banded antenna, wings brown and orange with prominent white spots.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough; proboscis naked; labial palps usually ascending, short, slightly tufted; antenna clubbed, banded, with many scale rows per antennal segment, greater than

half forewing length. THORAX: slender, hairy; wings heteroneurous, forewing squared, brown and orange with prominent white spots; hindwing broad, with a similar pattern as the forewing; hind tibial spurs short, hind tibial and tarsal spines present. ABDOMEN: smooth.

Similar taxa: Riodinidae can be separated from other butterflies by the wing pattern.

Taxonomic references: Layberry *et al.* 1998

Nymphalidae, Libytheinae (Fig. 179)

Superfamily: Papilionoidea

Number of Canadian species: 1 sp. (*Libytheana carinenta*) a stray in ON and QC

Genera: *Libytheana*

Abundance: rare, diurnal

Quick recognition: Clubbed antenna, extremely long labial palps.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough; proboscis naked; labial palps porrect, very long, slightly tufted; antenna clubbed, with many scale rows per antennal segment, less than half forewing length. THORAX: wings heteroneurous, forewing squared at apex, brown with orange markings basally and white spots apically; hindwing broad, brown with orange; forelegs reduced to small brushes; hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth.

Similar taxa: The very long labial palps and wing pattern are distinctive.

Taxonomic references: Layberry *et al.* 1998

Nymphalidae, Danainae (Fig. 180)

Superfamily: Papilionoidea

Number of Canadian species: 1 sp. (*Danaus plexippus*) throughout southern Canada, more common to the south and east

Genera: *Danaus*

Abundance: common to rare migrant, diurnal; associated with milkweeds

Quick recognition: Clubbed antenna, bold orange and black wing pattern, hind tibia unspined.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough; proboscis naked; labial palps ascending, short, tufted; antenna clubbed, unscaled, less than half forewing length. THORAX: wings heteroneurous, forewing triangular, apex acute and rounded, orange with black veins and margins with white spots; hindwing broad, similar in pattern to forewing; forelegs reduced to small brushes; hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth, black with white spots.

Similar taxa: *Limenitis archippus* is a convincing mimic of this species and can be separated by having a curved line through the hindwing and hind tibial spines that *D. plexippus* lacks.

Taxonomic references: Layberry *et al.* 1998

Nymphalidae, Limenitidinae (Fig. 181)

Superfamily: Papilionoidea

Number of Canadian species: 4 spp. throughout Canada

Genera: *Limenitis*

Abundance: common, diurnal

Quick recognition: Clubbed antenna, either black with a broad white band or bold orange and black wing pattern, hind tibia spined.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough; proboscis naked; labial palps ascending, short, at least semi-tufted; antenna clubbed, unscaled, usually roughly half forewing length. THORAX: wings heteroneurous, forewing triangular, apex somewhat square, either predominantly black with a broad white band or orange with black veining; hindwing broad, similar in pattern to forewing; forelegs reduced to small brushes; hind tibial spurs short, hind tibial and tarsal spines present. ABDOMEN: smooth, usually striped.

Similar taxa: *Limenitis archippus* is a convincing mimic of *D. plexippus*; *L. archippus* can be recognized by the curved black line bisecting the hindwing pattern and the presence of hind tibial spines.

Taxonomic references: Layberry *et al.* 1998**Nymphalidae, Heliconiinae** (Fig. 182)

Superfamily: Papilionoidea

Number of Canadian species: 27 spp. throughout Canada

Genera: *Agraulis*, *Argynnis*, *Boloria*, *Euptoieta*

Abundance: common, diurnal

Quick recognition: Clubbed antenna, upperside of wings usually orange with many black spots and lines, underside of hindwing often with prominent silvery spots or complex patterns.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough; proboscis naked; labial palps ascending, variable in length, tufted; antenna clubbed, with many scale rows per segment, variable in length. THORAX: wings heteroneurous, forewing triangular, apex somewhat square to rounded, typically orange with a complex series of black spots and lines; hindwing broad, dorsally similar in pattern to forewing, ventrally usually with abundant silvery spots or with a complex pattern; forelegs reduced to small brushes; hind tibial spurs short, hind tibial and tarsal spines present. ABDOMEN: smooth to hairy, rarely boldly patterned.

Similar taxa: Heliconiines can be easily separated from other butterflies by the wing pattern.

Taxonomic references: Layberry *et al.* 1998**Nymphalidae, Apaturinae** (Fig. 183)

Superfamily: Papilionoidea

Number of Canadian species: 2 spp. in extreme southern

MB, ON, and QC

Genera: *Asterocampa*

Abundance: locally uncommon, diurnal

Quick recognition: Clubbed antenna, distinct wing pattern.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough; proboscis naked; labial palps ascending, short, fairly slender; antenna clubbed, with many scale rows per segment, usually greater than half the forewing length. THORAX: wings heteroneurous, forewing triangular, typically orange or grey with a complex series of dark spots and lines; hindwing broad, similar in pattern to forewing; forelegs reduced to small brushes; hind tibial spurs short, hind tibial and tarsal spines present. ABDOMEN: smooth. Similar taxa: Apaturinae can be easily separated from other butterflies by the wing pattern.

Taxonomic references: Layberry *et al.* 1998**Nymphalidae, Nymphalinae** (Fig. 184)

Superfamily: Papilionoidea

Number of Canadian species: 33 spp. throughout Canada

Genera: *Aglais*, *Chlosyne*, *Euphydryas*, *Junonia*, *Nymphalis*, *Phyciodes*, *Polygonia*, *Vanessa*

Abundance: common, diurnal; many species hibernate as adults

Quick recognition: Clubbed antenna, distinct wing pattern, wings margins often jagged.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough; proboscis naked; compound eye sometimes with long interfacetal hairs; labial palps ascending, usually long, usually tufted; antenna clubbed, with many scale rows per segment, usually less than half the forewing length. THORAX: wings heteroneurous, forewing triangular to more squared, variable in pattern, often orange and black, often with jagged outer margin; hindwing broad, similar in pattern to forewing, often jagged, sometimes with tail; forelegs reduced to small brushes; hind tibial spurs short, hind tibial and tarsal spines present. ABDOMEN: smooth to hairy.

Similar taxa: Nymphalinae can be easily separated from other butterflies by the wing pattern.

Taxonomic references: Layberry *et al.* 1998**Nymphalidae, Satyrinae** (Fig. 185)

Superfamily: Papilionoidea

Number of Canadian species: 34 spp. throughout Canada

Genera: *Cercyonis*, *Coenonympha*, *Erebia*, *Lethe*, *Megisto*, *Neominois*, *Oeneis*

Abundance: common, diurnal

Quick recognition: Slightly clubbed antenna, usually drab brown, grey, or black.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough; proboscis naked; compound eye sometimes with long interfacetal hairs; labial palps ascending, usually long, tufted; antenna with a slight club, with many scale rows per segment, less than half the forewing length. THORAX: wings heteroneurous, forewing

usually triangular, variable in pattern, often drab greyish or brownish; hindwing broad, similar in pattern to forewing, often with eyespots ventrally; forelegs reduced to small brushes; hind tibial spurs short, hind tibial and tarsal spines present. ABDOMEN: smooth to hairy.

Similar taxa: Satyrinae can be easily separated from other butterflies by the wing pattern.

Taxonomic references: Layberry *et al.* 1998

Drepanidae, Thyatirinae (Fig. 186)

Superfamily: Drepanoidea

Number of Canadian species: 8 spp. throughout much of Canada

Genera: *Ceranemota*, *Euthyatira*, *Habrosyne*, *Pseudothyatira*

Abundance: uncommon to common, at lights

Quick recognition: Overall noctuid-like, with tympana ventrally on the first abdominal segment. Some species are difficult to separate.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough; proboscis naked; compound eye sometimes with long interfacetal hairs; labial palps variable in orientation, usually short, tufted; antenna filiform, rarely pectinate, with two scale rows per segment, less than half the forewing length. THORAX: wings heteroneurous, forewing usually elongate and rectangular, variable in pattern, greyish or sometimes brownish; hindwing broad, drab grey or brownish; hind tibial spurs usually short, hind tibial spines often present, hind tarsal spines present. ABDOMEN: hairy, sometimes with dorsal scale tufts, tympana present ventrally on the first abdominal segment. Similar taxa: Thyatirinae are superficially similar to Notodontidae and Noctuidae and are separated by forewing pattern and by the tympana being on the abdomen instead of the metathorax as they are in Noctuoidea.

Taxonomic references: Troubridge & Lafontaine 2004a (pictures and distribution), Clarke & Benjamin 1938 (*Ceranemota*); Handfield 1999 (*Euthyatira*, *Habrosyne*, *Pseudothyatira*)

Drepanidae, Drepaninae (Fig. 187)

Superfamily: Drepanoidea

Number of Canadian species: 4 spp. throughout Canada

Genera: *Drepana*, *Eudeilina*, *Oreta*

Abundance: common, at lights

Quick recognition: Overall broad-winged geometrid-like, most spp. with a distinct hook at the forewing apex. Easy to identify to species.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth; proboscis naked; labial palps usually porrect, short, usually slender; antenna filiform or pectinate, with two scale rows per segment, less than half the forewing length. THORAX: wings heteroneurous, forewing triangular, usually with a prominent hook at the apex, variable in pattern, often brownish or yellowish,

often with many fine lines; hindwing broad, usually paler, usually with a similar pattern to forewing; hind tibial spurs variable in length. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment.

Similar taxa: Drepaninae are superficially similar to Geometridae and are separated by forewing pattern, and often hooked apex.

Taxonomic references: Handfield 1999

Uraniidae, Epipleminae (Fig. 188)

Superfamily: Uranoidea

Number of Canadian species: 2 spp. across Canada

Genera: *Calledapteryx*, *Callizia*

Abundance: uncommon, at lights

Quick recognition: Overall geometrid-like, small, both wings with a dark marking in middle of outer margin, live specimens rest characteristically with the hindwing sagging away from the forewings. Easy to identify to species.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth; proboscis naked; labial palps porrect, short, slender; antenna filiform, with two scale rows per segment, less than half the forewing length. THORAX: wings heteroneurous, forewing triangular, grey or brown with darker fine markings, prominent dark marks present in middle of outer margin; hindwing broad, with a similar pattern to forewing; hind tibial spurs long. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment.

Similar taxa: Uraniids can be separated from other similar moths by the forewing pattern.

Taxonomic references: Handfield 1999

Geometridae, Larentiinae, Cidariini (Fig. 189)

Superfamily: Geometroidea

Number of Canadian species: 34 spp. throughout Canada

Genera: *Colostygia*, *Dysstroma*, *Ecliptoptera*, *Eulithis*, *Eurhinosea*, *Eustroma*, *Plemyria*, *Thera*

Abundance: common, at lights

Quick recognition: Very broad delicate wings, forewing usually with many fine complex lines, hindwing usually pale and patterned different than forewing. Some genera are very difficult to identify to species.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth; proboscis naked; labial palps usually porrect or ascending, usually short, usually tufted; antenna filiform, often with long sensillae, with two scale rows per segment, roughly half the forewing length or less. THORAX: wings heteroneurous, forewing triangular, typically with many fine complex lines; hindwing broad, paler, usually with prominent discal spot; hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth, sometimes boldly patterned, tympana present ventrally on the first abdominal segment.

Similar taxa: Cidariini can be separated from other similar geometrids by wing pattern.

Taxonomic references: Troubridge & Lafontaine 2004b (pictures and distribution); Handfield 1999 (eastern spp.)

Geometridae, Larentiinae, Hydriomenini (Fig. 190)

Superfamily: Geometroidea

Number of Canadian species: 53 spp. throughout Canada

Genera: *Anticlea*, *Ceratodalia*, *Coryphista*, *Entephria*, *Hydriomena*, *Mesoleuca*, *Perizoma*, *Rheumaptera*, *Spargania*, *Triphosa*

Abundance: common, at lights

Quick recognition: Very broad delicate wings, forewing usually with many fine complex lines or blotchy looking, hindwing usually pale and patterned different than forewing. Most genera are difficult to identify to species. Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth, rarely roughened on vertex; proboscis naked; labial palps porrect, short, tufted; antenna filiform, rarely with long sensillae, with two scale rows per segment, usually less than half the forewing length. THORAX: wings heteroneurous, forewing triangular, typically with many fine complex lines or large blotches; hindwing broad, paler, often with prominent discal spot; hind tibial spurs usually short, hind tarsal spines present. ABDOMEN: smooth, rarely boldly patterned, tympana present ventrally on the first abdominal segment.

Similar taxa: Hydriomenini can be separated from other similar geometrids by wing pattern.

Taxonomic references: Troubridge & Lafontaine 2004b (pictures and distribution); Handfield 1999 (eastern spp.)

Geometridae, Larentiinae, Stamnodini (Fig. 191)

Superfamily: Geometroidea

Number of Canadian species: 6 spp. From BC and YT east to QC, most diverse in the West

Genera: *Stamnoctenis*, *Stamnodes*

Abundance: locally uncommon to rare, at lights, some species diurnal

Quick recognition: Broad delicate wings, upperside with subdued pattern and grey, brown, or orange, underside of hindwing with complex pattern, at rest usually with wings folded upwards over the back. Moderately easy to identify to species.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales often smooth on vertex, often rough on frons; proboscis naked; labial palps descending or ascending, short, usually tufted; antenna filiform, rarely with long sensillae, with two scale rows per segment, about half the forewing length. THORAX: wings heteroneurous, forewing triangular, patterned smeared through the centre of wing, antemedial, medial, and postmedial lines most visible along costa; hindwing broad, with a similar pattern dorsally, ventrally with a complex shading; hind tibial spurs short, hind tarsal spines rarely present. ABDOMEN: smooth, rarely boldly patterned, tympana present ventrally on the

first abdominal segment.

Similar taxa: Stamnodini can be recognized easily by the bold pattern on the underside of the hindwing relative to the ventral surface.

Taxonomic references: Troubridge & Lafontaine 2004b (pictures and distribution)

Geometridae, Larentiinae, Xanthorhoini (Fig. 192)

Superfamily: Geometroidea

Number of Canadian species: 35 spp. throughout Canada

Genera: *Costaconvexa*, *Disclisoprocta*, *Enchoria*, *Epirrhoe*, *Euphyia*, *Orthonama*, *Psychophora*, *Xanthorhoe*, *Zenophleps*

Abundance: common, at lights

Quick recognition: Broad delicate wings, forewing with many fine often scalloped lines, the medial area is often shaded in, the hindwing is usually light with a faint pattern. Most species are easy to identify, others are very difficult. Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth; proboscis naked; labial palps variably oriented, usually short, usually tufted; antenna filiform, often with long sensillae, with two scale rows per segment, variable in length. THORAX: wings heteroneurous, forewing triangular, patterned consists of many fine and often scalloped lines, medial area often darkly shaded, discal dots usually present; hindwing broad to somewhat narrow, pale, with a faint pattern of fine lines, discal dot usually prominent; hind tibial spurs short, hind tarsal spines usually present. ABDOMEN: smooth, rarely with small dorsal scale tuft, often boldly patterned, tympana present ventrally on the first abdominal segment.

Similar taxa: Xanthorhoini can be separated from other Larentiinae by forewing pattern.

Taxonomic references: Troubridge & Lafontaine 2004b (pictures and distribution); Handfield 1999 (eastern spp.)

Geometridae, Larentiinae, Asthenini (Fig. 193)

Superfamily: Geometroidea

Number of Canadian species: 11 spp. throughout Canada

Genera: *Hydrelia*, *Trichodezia*, *Venusia*

Abundance: common, at lights or diurnal

Quick recognition: small delicate geometrids, forewing usually grey with many fine lines that are accented on the veins in *Venusia* and most *Hydrelia*; other *Hydrelia* with mostly white forewing with either broad brown bands or finer yellow lines; forewing black with a prominent white line in *Trichodezia*. Specific identification is often fairly easy.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth; proboscis naked; labial palps porrect or descending, short, usually slightly tufted; antenna filiform, rarely pectinate, often with long sensillae, with two scale rows per segment, half the forewing length or less. THORAX: wings heteroneurous, forewing triangular,

usually grey with many fine lines that are accented on the veins, sometimes white with brown blotches or yellow lines, rarely jet black with a prominent white line from mid-costa to anal angle; hindwing often relatively narrow, usually pale, often with some indication of forewing pattern, discal dot usually present; hind tibial spurs often long, hind tarsal spines often present. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment. Similar taxa: Asthenini can be separated from other Larentiinae by forewing pattern.

Taxonomic references: Troubridge & Lafontaine 2004b (pictures and distribution); Handfield 1999 (eastern spp.)

Geometridae, Larentiinae, Operophterini (Fig. 194)

Superfamily: Geometroidea

Number of Canadian species: 6 spp. throughout Canada

Genera: *Epirrita*, *Operophtera*

Abundance: common to abundant, at lights and diurnal

Quick recognition: Autumn-flying geometrids with broad delicate wings, in males forewing light grey with darker grey scalloped lines and bands, females brachypterous. Specific identification is often easy.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth, sometimes roughened on vertex; proboscis naked; labial palps porrect or descending, short, sometimes tufted; antenna filiform, with long sensillae, with two or three scale rows per segment, less than half the forewing length. THORAX: females brachypterous, wings heteroneurous, forewing triangular, grey with many fine lines and bands that are scalloped; hindwing relatively narrow, pale, with some faint lines, discal dot often present; hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment in males.

Similar taxa: The late season flight time, size, and wing pattern will separate Operophterini from other geometrids. Taxonomic references: Troubridge & Lafontaine 2004b (pictures and distribution); Handfield 1999 (eastern spp.)

Geometridae, Larentiinae, Euduliini (Fig. 195)

Superfamily: Geometroidea

Number of Canadian species: 2 spp. across southern Canada

Genera: *Eubaphe*

Abundance: locally uncommon to rare, at lights

Quick recognition: Unmistakeable translucent wings either solid orange or white and yellow. Both species are easy to identify.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth; proboscis naked; labial palps slightly ascending, short, slender; antenna filiform, with two scale rows per segment, usually less than half the forewing length. THORAX: wings heteroneurous, translucent, forewing rounded or apically pointed, either solid orange or

yellow with white blotches; hindwing somewhat squared, similar in pattern to forewing, sometimes paler; hind tibial spurs short, hind tarsal spines absent. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment. Similar taxa: The forewing pattern and translucency is diagnostic.

Taxonomic references: Powell & Opler (western sp.); Handfield 1999 (eastern sp.)

Geometridae, Larentiinae, Eupitheciini (Fig. 196)

Superfamily: Geometroidea

Number of Canadian species: 67 spp. throughout Canada

Genera: *Eupithecia*, *Horisme*, *Pasiphila*, *Prorella*

Abundance: common, at lights

Quick recognition: Usually small to very small geometrids with many fine lines on the forewing and a relatively small hindwing. Specific identification usually requires dissection.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth, sometimes slightly roughened on vertex; proboscis naked; labial palps variable in orientation, usually short, usually slightly tufted; antenna filiform, sometimes with long sensillae, with two scale rows per segment, usually less than half the forewing length. THORAX: wings heteroneurous, forewing triangular, often with many fine lines, discal dot usually present; hindwing usually very small, often rounded, often similar in pattern to forewing but paler, discal dot often present; hind tibial spurs variable in length, hind tarsal spines sometimes present. ABDOMEN: smooth, often boldly patterned, ovipositor rarely prominent, tympana present ventrally on the first abdominal segment.

Similar taxa: The triangular forewing and relatively small hindwing will separate Eupitheciini from most other Larentiinae.

Taxonomic references: Troubridge & Lafontaine 2004b (pictures and distribution); Bolte 1990 (*Eupithecia*)

Geometridae, Larentiinae, Lobophorini (Fig. 197)

Superfamily: Geometroidea

Number of Canadian species: 14 spp. throughout Canada

Genera: *Acasis*, *Aplocera*, *Carsia*, *Cladara*, *Dyspteris*, *Heterophleps*, *Lobophora*

Abundance: common, at lights

Quick recognition: Usually delicate geometrids with many fine lines on the forewing and a small and elongate hindwing. Specific identification is usually easy.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth; proboscis naked; labial palps variable in orientation, usually short, usually tufted; antenna filiform, sometimes with long sensillae, with two or three scale rows per segment, variable in length. THORAX: wings heteroneurous, forewing triangular, often with many fine lines, discal dot often prominent; hindwing usually

small and elongate, usually paler with faint or no pattern, discal dot often present; hind tibial spurs usually short, hind tarsal spines sometimes present. ABDOMEN: smooth, rarely boldly patterned, tympana present ventrally on the first abdominal segment.

Similar taxa: Lobophorini can be separated from other geometrids by forewing pattern.

Taxonomic references: Troubridge & Lafontaine 2004b (pictures and distribution); Handfield 1999 (eastern spp.)

Geometridae, Sterrhinae (Fig. 198)

Superfamily: Geometroidea

Number of Canadian species: 25 spp. throughout Canada

Genera: *Cyclophora*, *Haematopis*, *Idaea*, *Leptostales*, *Scopula*, *Pleuopruca*, *Lobocleta*

Abundance: common, at lights

Quick recognition: Geometrids typically pale in colour with several fine lines that run through both fore and hindwings.

Specific identification can be challenging.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth; proboscis naked; labial palps porrect or ascending, short, usually tufted; antenna filiform, sometimes pectinate, with long sensillae, with two scale rows per segment, usually less than half forewing length. THORAX: wings heteroneurous, forewing triangular, often with an angular bulge in middle of outer margin, pale white, grey, brown, or yellow, typically with fine darker lines, discal dot often prominent; hindwing broad, often with angular bulge in outer margin, with pattern continuing from forewing, discal dot often present; hind tibial spurs usually short, hind tarsal spines rarely present. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment.

Similar taxa: Sterrhinae can be separated from other geometrids by wing pattern.

Taxonomic references: Troubridge & Lafontaine 2004b (pictures and distribution); Handfield 1999 (eastern spp.)

Geometridae, Geometrinae (Fig. 199)

Superfamily: Geometroidea

Number of Canadian species: 16 spp. throughout Canada

Genera: *Chlorochlamys*, *Chlorosea*, *Dichorda*, *Hemithea*, *Hethemia*, *Mesothea*, *Nemoria*, *Synchlora*

Abundance: common, at lights or diurnal

Quick recognition: Geometrids that usually have green wings with white lines. Specific identification is usually easy.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth, rarely roughened; proboscis naked; labial palps usually porrect or ascending, short, sometimes slightly tufted; antenna filiform or pectinate, often with long sensillae, with two or three scale rows per segment, usually less than half forewing length. THORAX: wings heteroneurous, forewing triangular, usually green with

white antemedial and postmedial lines; hindwing broad, sometimes with angular bulge on outer margin, with pattern usually continuing from forewing; hind tibial spurs short, hind tarsal spines usually present. ABDOMEN: smooth, often boldly patterned, tympana present ventrally on the first abdominal segment.

Similar taxa: Few other geometrids are predominantly green and those can be separated by wing pattern.

Taxonomic references: Ferguson 1985

Geometridae, Archiearinae (Fig. 200)

Superfamily: Geometroidea

Number of Canadian species: 3 spp. throughout Canada

Genera: *Archiearis*, *Boudinotiana*, *Leucobrepbos*

Abundance: locally uncommon, diurnal in early spring

Quick recognition: Stout and very hairy, hindwing boldly patterned with black and orange or white. Specific identification is easy.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head rough and long; proboscis naked; labial palps porrect or descending, short, tufted with long hairs; antenna filiform or pectinate, sometimes with long sensillae, usually scaleless, usually less than half forewing length. THORAX: wings heteroneurous, forewing elongate triangular, with prominent antemedial and postmedial lines, black and white or brownish; hindwing broad, boldly patterned black with white or orange, often with very long hairs along inner margin; hind tibial spurs short, hind tarsal spines present. ABDOMEN: densely hairy.

Similar taxa: No other moths with such a bold hindwing are that densely hairy.

Taxonomic references: Troubridge & Lafontaine 2004b (pictures and distribution)

Geometridae, Ennominae, Alsophilini (Fig. 201)

Superfamily: Geometroidea

Number of Canadian species: 1 sp. (*Alsophila pometaria*) from AB to NS

Genera: *Alsophila*

Abundance: common, at lights

Quick recognition: Late season geometrid with grey wings with white lines, females brachypterous.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth; proboscis reduced; labial palps porrect or descending, short, very slightly tufted; antenna filiform, with long sensillae, with two scale rows per segment, less than half forewing length. THORAX: wings heteroneurous, females brachypterous, forewing triangular, grey with white antemedial and postmedial lines; hindwing broad, paler grey with white postmedial line and dark discal spot; hind tibial spurs short, hind tarsal spines rarely visible. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment in males.

Similar taxa: Male Alsophilini can be separated from other

geometrids by forewing pattern.

Taxonomic references: McGuffin 1988

Geometridae, Ennominae, Cassymini (Fig. 202)

Superfamily: Geometroidea

Number of Canadian species: 3 spp. from NT to NS

Genera: *Nematocampa*, *Protitame*

Abundance: common, at lights

Quick recognition: *Nematocampa* easily recognized by the complex wing pattern, *Protitame* is a small white geometrid. Specific identification can be difficult.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth; proboscis naked; labial palps porrect or ascending, short, sometimes tufted; antenna filiform or pectinate, with long sensillae, with two scale rows per segment, less than half forewing length. THORAX: wings heteroneurous, forewing sometimes with slight bulge in outer margin, white or yellow with either faint yellow spots or with abundant fine dark lines and spots and heavy shading beyond the postmedial line; hindwing broad, sometimes with slight bulge in outer margin, pattern continuous with forewing; hind tibial spurs short, hind tarsal spines sometimes present. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment. Similar taxa: *Nematocampa* is unmistakable. *Protitame* can be difficult to separate from similar small white geometrids and drepanids.

Taxonomic references: Ferguson 2008

Geometridae, Ennominae, Macariini (Fig. 203)

Superfamily: Geometroidea

Number of Canadian species: 66 spp. throughout Canada

Genera: *Digrammia*, *Epelis*, *Eumacaria*, *Fernaldella*, *Heliomata*, *Isturgia*, *Macaria*, *Melilla*, *Speranza*

Abundance: common, at lights or diurnal

Quick recognition: Moderate-sized geometrids often with prominent lines on the forewing that are expanded to triangles at the costa, often with a prominent spot in middle of wing just beyond postmedial line, antennae often pectinate. Identification can be challenging for some species.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth, rarely rough on frons; proboscis naked, rarely reduced; labial palps variable in orientation, usually short, usually tufted; antenna usually pectinate, sometimes filiform, with long sensillae, with two scale rows per segment, scales not organized into rows in some diurnal species, often less than half forewing length. THORAX: wings heteroneurous, female rarely brachypterous, forewing triangular, sometimes falcate or with that appearance due to dark scaling in the fringe below the apex, lines often prominent especially at the costa where they can be expanded to triangles, a prominent spot in middle of wing is often present beyond the postmedial line;

hindwing broad, sometimes pointed in outer margin, pattern sometimes similar to forewing; hind tibial spurs variable in length, hind tarsal spines usually present. ABDOMEN: smooth, rarely boldly patterned, tympana present ventrally on the first abdominal segment.

Similar taxa: Macariini can usually be separated from other geometrids by forewing pattern.

Taxonomic references: Ferguson 2008

Geometridae, Ennominae, Boarmini (Fig. 204)

Superfamily: Geometroidea

Number of Canadian species: 28 spp. throughout Canada

Genera: *Aethalura*, *Anavitrinellia*, *Cleora*, *Dasyfidonia*, *Ectropis*, *Ematurga*, *Epimecis*, *Glena*, *Gnophos*, *Hesperumia*, *Iridopsis*, *Neolcis*, *Orthofidonia*, *Protoarmia*, *Stenoporpa*

Abundance: common, at lights

Quick recognition: Usually moderate-sized geometrids with grey wings, many black lines usually present on the forewing and continue to the hindwing. Specific identification is usually easy.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough or smooth; proboscis naked; labial palps usually ascending or porrect, usually short, tufted; antenna usually pectinate, sometimes filiform, with long sensillae, with two scale rows per segment or scales not organized into rows, usually less than half forewing length. THORAX: wings heteroneurous, forewing triangular, usually grey, lines often prominent and black, often jagged; hindwing broad, rarely scalloped, pattern usually similar to forewing; hind tibial spurs usually short, hind tarsal spines usually present. ABDOMEN: smooth, rarely boldly patterned, tympana present ventrally on the first abdominal segment.

Similar taxa: Boarmini can be separated from other geometrids by forewing pattern.

Taxonomic references: McGuffin 1977

Geometridae, Ennominae, Melanolophini (Fig. 205)

Superfamily: Geometroidea

Number of Canadian species: 6 spp. across Canada

Genera: *Eufidonia*, *Melanolophia*

Abundance: common, at lights or diurnally

Quick recognition: Moderate-sized geometrids, wings usually with prominent lines and discal dots, usually heavily speckled with dark spots. Specific identification often requires dissection.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth; proboscis naked; labial palps variable in orientation, short, at least slightly tufted; antenna usually pectinate, sometimes filiform, usually with long sensillae, with two scale rows per segment, usually roughly half forewing length. THORAX: wings heteroneurous, forewing triangular, white or grey heavily speckled with dark spots,

dark lines and discal dots usually prominent; hindwing broad, sometimes scalloped, pattern often similar to forewing; hind tibial spurs short, hind tarsal spines often present. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment.

Similar taxa: Melanophini can be separated from other geometrids by forewing pattern.

Taxonomic references: McGuffin 1977

Geometridae, Ennominae, Bistonini (Fig. 206)

Superfamily: Geometroidea

Number of Canadian species: 13 spp. throughout Canada

Genera: *Biston*, *Erannis*, *Hypagyrtis*, *Lycia*, *Paleacrita*, *Phigalia*

Abundance: common, at lights

Quick recognition: Moderate-sized to large geometrids, often thick bodied, females often apterous. Specific identification is usually easy.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth or rough; proboscis naked, often absent; labial palps usually porrect, short, often tufted; antenna pectinate or filiform, usually with long sensillae, with two scale rows per segment, sometimes scales not organized into rows, usually less than half forewing length. THORAX: wings heteroneurous, females often apterous, forewing triangular, variable in pattern, typically with prominent lines; hindwing broad, pattern sometimes similar to forewing; hind tibial spurs short, hind tarsal spines usually present. ABDOMEN: smooth or hairy, often boldly patterned, tympana present ventrally on the first abdominal segment except in apterous females.

Similar taxa: Bistonini can be separated from other geometrids by forewing pattern.

Taxonomic references: McGuffin 1977

Geometridae, Ennominae, Baptini (Fig. 207)

Superfamily: Geometroidea

Number of Canadian species: 3 spp. across Canada

Genera: *Lomographa*

Abundance: common, diurnal or at lights

Quick recognition: Small delicate geometrids, either with gently dusted forewings with prominent lines or immaculate white. Specific identification is easy.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth; proboscis naked; labial palps porrect or descending, short, tufted; antenna filiform, with two scale rows per segment, usually roughly half forewing length. THORAX: wings heteroneurous, forewing triangular, either completely translucent white or light grey heavily speckled with dark grey and prominent antemedial and postmedial lines; hindwing broad, usually with less pattern, often with discal spots especially ventrally; hind tibial spurs usually short, hind tarsal spines present. ABDOMEN: smooth, tympana usually present ventrally on the first abdominal

segment.

Similar taxa: Baptini can be separated from other geometrids by forewing pattern.

Taxonomic references: McGuffin 1981

Geometridae, Ennominae, Caberini (Fig. 208)

Superfamily: Geometroidea

Number of Canadian species: 18 spp. across Canada

Genera: *Apodrepanulatrix*, *Cabera*, *Drepanulatrix*, *Erastria*, *Eudrepanulatrix*, *Ixala*, *Sericosema*

Abundance: common to uncommon, at lights

Quick recognition: Moderate-sized to small geometrids, wing pattern typically diffuse or faint and with abundant dusting throughout, usually pale, antenna usually pectinate. Specific identification can be challenging in the west.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth, sometimes roughened on vertex; proboscis naked; labial palps porrect or ascending, often short, at least partially tufted; antenna usually pectinate, with long sensillae, with scales not organized into rows, usually roughly half forewing length or less. THORAX: wings heteroneurous, forewing triangular to somewhat elongate, usually pale with abundant dusting, lines usually diffuse or faint; hindwing broad, often with less pattern; hind tibial spurs variable in length, hind tarsal spines present. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment.

Similar taxa: Caberini can be separated from other geometrids by forewing pattern.

Taxonomic references: Troubridge & Lafontaine 2004b (pictures and distribution); McGuffin 1981 (most spp.)

Geometridae, Ennominae, Angeronini (Fig. 209)

Superfamily: Geometroidea

Number of Canadian species: 17 spp. across Canada

Genera: *Aspitates*, *Euchlaena*, *Lytrosis*, *Xanthotype*

Abundance: common, at lights or diurnal

Quick recognition: Moderate-sized to large geometrids, wing pattern typically with prominent antemedial and postmedial lines, pattern often continues to hindwing, antennae usually pectinate. Specific identification can be challenging.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth, often roughened on vertex; proboscis naked; labial palps porrect or ascending, short, sometimes tufted; antenna usually pectinate, often with long sensillae, with two scale rows per segment or with scales not organized into rows, usually roughly half forewing length or less. THORAX: wings heteroneurous, forewing triangular, sometimes with a bulge in middle of outer margin, rarely scalloped, usually drab brown or grey, antemedial and postmedial lines usually prominent; hindwing broad, sometimes scalloped, often with a continuation of the forewing pattern; hind tibial spurs short, hind tarsal spines

present. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment.

Similar taxa: Angeronini can be separated from other geometrids by forewing pattern.

Taxonomic references: McGuffin 1981

Geometridae, Ennominae, Azelini (Fig. 210)

Superfamily: Geometroidea

Number of Canadian species: 6 spp. across Canada

Genera: *Pero*

Abundance: common, at lights

Quick recognition: Thick-bodied geometrids, forewing slightly scalloped, antemedial and postmedial lines prominent, reniform spot prominent. Specific identification can be challenging.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough, sometimes smooth; proboscis naked; labial palps porrect or ascending, short, tufted; antenna filiform, with two scale rows per segment, roughly half forewing length or greater. THORAX: wings heteroneurous, forewing triangular, at least slightly scalloped, drab brown or grey, antemedial and postmedial lines prominent, pale reniform spot usually prominent; hindwing broad, slightly scalloped, drab with a single pale line; hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment. Similar taxa: Azelini have the rough appearance of some noctuids which have the tympana on the metathorax instead of the abdomen.

Taxonomic references: McGuffin 1987

Geometridae, Ennominae, Nacophorini (Fig. 211)

Superfamily: Geometroidea

Number of Canadian species: 4 spp. from E. AB to NS and in S. BC, most diverse in BC

Genera: *Animomyia*, *Gabriola*, *Phaeoura*

Abundance: uncommon, at lights

Quick recognition: Usually large thick-bodied geometrids, antemedial and postmedial lines prominent, reniform spot often prominent. Specific identification is easy.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough on vertex, smooth on frons; proboscis naked; labial palps porrect or ascending, short, usually tufted; antenna filiform or pectinate, often with long sensillae, with two or more scale rows per segment, less than half forewing length. THORAX: wings heteroneurous, forewing triangular, sometimes elongate, typically drab grey, antemedial and postmedial lines prominent, reniform spot usually prominent; hindwing broad, slightly scalloped, drab or with a faint continuation of the forewing pattern; hind tibial spurs short, hind tarsal spines usually present. ABDOMEN: smooth, rarely with dorsal scale tuft, sometimes boldly patterned, tympana present ventrally on the first abdominal segment.

Similar taxa: Nacophorini can be separated from other geometrids by forewing pattern.

Taxonomic references: Troubridge & Lafontaine 2004b (pictures and distribution); McGuffin 1981 (*Gabriola*, *Phaeoura*)

Geometridae, Ennominae, Campaeini (Fig. 212)

Superfamily: Geometroidea

Number of Canadian species: 1 sp. (*Campaea perlata*) throughout Canada

Genera: *Campaea*

Abundance: common to abundant, at lights

Quick recognition: Moderate-sized pale green geometrid with white antemedial and postmedial lines.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth; proboscis naked; labial palps porrect, short, slightly tufted; antenna pectinate, with long sensillae, with many scale rows per segment, roughly half forewing length. THORAX: wings heteroneurous, forewing triangular, pale greenish white, antemedial and postmedial lines white, edged with green; hindwing broad, slightly scalloped, similar to the forewing pattern; hind tibial spurs short, hind tarsal spines absent. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment. Similar taxa: Campaeini can be separated from other geometrids by forewing pattern.

Taxonomic references: McGuffin 1981

Geometridae, Ennominae, Ennomini (Fig. 213)

Superfamily: Geometroidea

Number of Canadian species: 3 spp. across Canada

Genera: *Ennomos*

Abundance: common, at lights

Quick recognition: Thick or thin-bodied geometrids, both wings scalloped, either yellow with abundant darker speckling or pure white. Specific identification is easy.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough; proboscis naked, sometimes reduced; labial palps porrect or descending, about twice the length of the compound eye, tufted; antenna pectinate, with many scale rows per segment, roughly half forewing length or less. THORAX: wings heteroneurous, forewing triangular, scalloped, either yellow with abundant brown speckling or pure white, dark antemedial and postmedial lines and reniform spot sometimes prominent; hindwing broad, scalloped, usually similar to forewing pattern; hind tibial spurs short, hind tarsal spines rarely visible. ABDOMEN: smooth, sometimes boldly patterned, tympana present ventrally on the first abdominal segment.

Similar taxa: Ennomini can be separated from other geometrids by forewing shape and pattern.

Taxonomic references: Troubridge & Lafontaine 2004b (pictures and distribution); McGuffin 1987 (most spp.)

Geometridae, Ennominae, Epiranthidini (Fig. 214)

Superfamily: Geometroidea

Number of Canadian species: 1 sp. (*Spodolepis substriataria*) across CanadaGenera: *Spodolepis*

Abundance: uncommon, at lights

Quick recognition: Slender-bodied geometrid with very large delicate wings, forewing with prominent black jagged antemedial and postmedial lines, reniform spot outlined in black.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth, sometimes roughened on vertex; proboscis naked; labial palps variable in orientation, short, tufted; antenna filiform, with two scale rows per segment, less than half forewing length. THORAX: wings heteroneurous, forewing triangular with a bulge in the middle of the outer margin, light brown to heavily speckled in dark grey, dark jagged antemedial and postmedial lines prominent, reniform spot outlined in black; hindwing somewhat slender, pale with prominent discal dot; hind tibial spurs usually short, hind tarsal spines present. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment.

Similar taxa: Epiranthidini can be separated from other geometrids by forewing pattern.

Taxonomic references: McGuffin 1987

Geometridae, Ennominae, Lithinini (Fig. 215)

Superfamily: Geometroidea

Number of Canadian species: 10 spp. from SK to NF and in BC

Genera: *Gueneria*, *Homochlodes*, *Petrophora*, *Philedia*, *Tacparia*, *Thallopaga*

Abundance: uncommon to common, at lights

Quick recognition: Moderate-sized geometrids, usually brown with prominent postmedial line, pattern often mottled. Specific identification can be challenging.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales smooth; proboscis naked; labial palps usually ascending, usually short, at least slightly tufted; antenna filiform, with two scale rows per segment, typically less than half forewing length. THORAX: wings heteroneurous, forewing triangular sometimes with a bulge in the middle of the outer margin, rarely with a falcate apex, usually brown, postmedial line always prominent, others variably so; hindwing broad, similar in pattern to forewing; hind tibial spurs long, hind tarsal spines often present. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment.

Similar taxa: Lithinini can be separated from other geometrids by forewing pattern.

Taxonomic references: McGuffin 1987

Geometridae, Ennominae, Anagogini (Fig. 216)

Superfamily: Geometroidea

Number of Canadian species: 23 spp. throughout Canada

Genera: *Cepphis*, *Metanema*, *Metarranthis*, *Plagodis*, *Probole*, *Selenia*

Abundance: common, at lights

Quick recognition: Small to fairly large geometrids, forewing with a prominent bulge in outer margin, hindwing often with a similar bulge, pattern on forewing and hindwing usually similar, antenna pectinate. Specific identification is usually easy.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough or smooth; proboscis naked; labial palps usually ascending, usually short, usually tufted; antenna pectinate, with two or more scale rows per segment, typically less than half forewing length. THORAX: wings heteroneurous, forewing triangular with a bulge in the middle of the outer margin, rarely scalloped, antemedial and postmedial lines usually prominent, discal dot often prominent; hindwing broad, usually with bulge in outer margin, rarely scalloped, usually similar in pattern to forewing; hind tibial spurs usually long, hind tarsal spines usually present. ABDOMEN: smooth, tympana present ventrally on the first abdominal segment.

Similar taxa: Anagogini can be separated from other geometrids by forewing pattern.

Taxonomic references: Troubridge & Lafontaine 2004b (pictures and distribution); McGuffin 1987 (most spp.); Handfield 1999 (eastern spp.)

Geometridae, Ennominae, Ourapterygini (Fig. 217)

Superfamily: Geometroidea

Number of Canadian species: 38 spp. throughout Canada

Genera: *Antepione*, *Besma*, *Caripeta*, *Cingilia*, *Enypia*, *Eugonobapta*, *Eusarca*, *Eutrapela*, *Lambdina*, *Meris*, *Neoterpes*, *Nepytia*, *Patalene*, *Plataea*, *Prochoerodes*, *Sabulodes*, *Sicya*, *Synaxis*, *Tetraxis*

Abundance: common, at lights

Quick recognition: Moderate-sized to large geometrids, forewing typically boldly patterned and angular with prominent antemedial and postmedial lines, discal dot usually prominent. Specific identification is usually easy.

Diagnosis: HEAD: ocelli absent; chaetosemata present; head scales rough or smooth on vertex, usually smooth on frons; proboscis naked; labial palps usually ascending, short, usually tufted; antenna filiform or pectinate, with two or more scale rows per segment, roughly half forewing length or less. THORAX: wings heteroneurous, forewing triangular, often with a bulge in the middle of the outer margin, antemedial and postmedial lines usually prominent, discal dot often prominent; hindwing broad, usually with bulge in outer margin, sometimes prolonged into slight tail, rarely scalloped, sometimes similar in pattern to forewing; hind tibial spurs usually short, hind tarsal spines present.

ABDOMEN: smooth, tympana present ventrally on the first abdominal segment.

Similar taxa: Ourapterygini can be separated from other geometrids by forewing pattern.

Taxonomic references: McGuffin 1987

Lasiocampidae, Macromphaliinae (Fig. 218)

Superfamily: Lasiocampoidea

Number of Canadian species: 4 spp. across Canada, most diverse in the East

Genera: *Tolype*

Abundance: uncommon to common, at lights

Quick recognition: Very stout-bodied hairy moths, with stubby wings, forewing is typically grey with abundant wavy white lines. Specific identification can be tricky.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough; proboscis absent; labial palps descending or porrect, short, tufted; antenna pectinate, with two or more scale rows per segment, roughly half forewing length or less. THORAX: wings heteroneurous, forewing broad to somewhat elongate, rounded, grey, typically with many prominent pale wavy lines; hindwing broad, grey, sometimes with some white lines; hind tibial spurs short, hind tarsal spines present. ABDOMEN: with long, soft hairs.

Similar taxa: There are no other moths that are this stout with a grey and white wing pattern.

Taxonomic references: Franclemont 1973

Lasiocampidae, Lasiocampinae (Fig. 219)

Superfamily: Lasiocampoidea

Number of Canadian species: 5 spp. throughout Canada, most diverse in the East

Genera: *Heteropacha*, *Malacosoma*, *Phyllodesma*

Abundance: common to abundant, at lights

Quick recognition: Very stout-bodied hairy moths, with stubby wings, forewing is usually brown with distinct antemedial and postmedial lines. Specific identification is usually easy but can be very difficult in *Malacosoma*.

Diagnosis: HEAD: ocelli absent; compound eye hairy; chaetosemata absent; head scales rough; proboscis absent; labial palps usually porrect, short, tufted; antenna pectinate, with many scale rows per segment, less than half forewing length. THORAX: wings heteroneurous, forewing broad to somewhat elongate, rounded to pointed, sometimes slightly scalloped, usually brown, rarely grey, typically with prominent antemedial and postmedial lines; hindwing broad, sometimes scalloped, similar in colour to forewing, sometimes with faint lines; hind tibial spurs short, hind tarsal spines present. ABDOMEN: very hairy.

Similar taxa: The general stoutness combined with characteristic wing pattern is diagnostic.

Taxonomic references: Franclemont 1973

Mimallonidae (Fig. 220)

Superfamily: Mimallonoidea

Number of Canadian species: 2 spp. in extreme S. ON

Genera: *Cicinnus*, *Lacosoma*

Abundance: rare, at lights

Quick recognition: Medium-sized stout-bodied moths, forewing falcate with prominent discal spot. Specific identification is easy.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough, sometimes slightly smooth on frons; proboscis absent; labial palps porrect, short, tufted or slender; antenna pectinate, with long sensillae, with many scale rows per segment, less than half forewing length. THORAX: wings heteroneurous, forewing triangular, apex falcate, with a bulge in middle of outer margin, sometimes scalloped, brown or grey, discal spot dark and prominent, typically with dark postmedial line; hindwing broad, sometimes scalloped, similar in pattern to forewing; hind tibial spurs short, hind tarsal spines present. ABDOMEN: hairy.

Similar taxa: The wing shape and pattern is diagnostic.

Taxonomic references: Franclemont 1973

Bombycidae, Apatelodinae (Fig. 221)

Superfamily: Bombycoidea

Number of Canadian species: 2 spp. in S. ON and S. QC

Genera: *Apatelodes*, *Olceclostera*

Abundance: rare, at lights

Quick recognition: Medium-sized fairly stout-bodied moths, forewing grey with slight falcate apex, subterminal white spot present below costa in subapical area, antemedial and postmedial lines thin jagged and black. Specific identification is easy.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough; proboscis absent; labial palps ascending, short, tufted; antenna pectinate, with long sensillae, with many scale rows per segment, less than half forewing length. THORAX: wings heteroneurous, forewing triangular, apex slightly falcate, with a bulge in apical half of outer margin, sometimes scalloped, grey, white spot present below costa in subterminal area, antemedial and postmedial lines thin black and jagged; hindwing broad, sometimes slightly scalloped, either paler or darker than forewing; hind tibial spurs long, hind tarsal spines absent. ABDOMEN: hairy.

Similar taxa: The wing shape and pattern is diagnostic.

Taxonomic references: Franclemont 1973

Bombycidae, Bombycinae (Fig. 222)

Superfamily: Bombycoidea

Number of Canadian species: 1 non-native sp. (*Bombyx mori*) reared for silk production

Genera: *Bombyx*

Abundance: restricted to silkworm colonies

Quick recognition: Medium-sized plump moths, forewing white with falcate apex, other dark lines and spots may be present. Specific identification is easy.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough; proboscis absent; labial palps minute; antenna pectinate, with many scale rows per segment, less than half forewing length. THORAX: wings heteroneurous, forewing triangular, apex falcate, with a bulge in outer margin, white, rarely with darker lines and spots; hindwing broad, with prominent anal bulge, white; hind tibial spurs short, hind tarsal spines rarely visible. ABDOMEN: hairy. Similar taxa: The wing shape and pattern is diagnostic.

Taxonomic references: Franclemont 1973

Saturniidae, Ceratocampinae (Fig. 223)

Superfamily: Bombycoidea

Number of Canadian species: 8 spp. from S. MB to NS, most diverse in S. ON

Genera: *Anisota*, *Dryocampa*, *Eacles*, *Sphingicampa*

Abundance: rare to common, at lights or diurnal

Quick recognition: Medium-sized to large robust-bodied moths, wings often with some pink or purple shading, usually with slanted postmedial line and discal spot. Specific identification is easy, except in *Anisota*.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough, sometimes smooth especially on frons; proboscis usually reduced; labial palps small; antenna pectinate or filiform, usually unscaled, rarely with one scale row per segment, less than half forewing length. THORAX: wings heteroneurous, forewing triangular, usually with some pink or purple shading, usually with slanted straight postmedial line, discal spot usually prominent; hindwing broad, usually similar to forewing in pattern and colour; hind tibial spurs short, hind tarsal spines absent. ABDOMEN: smooth or hairy, rarely boldly patterned.

Similar taxa: Ceratocampinae can be separated from other large moths by wing pattern.

Taxonomic references: Tuskes *et al.* 1996

Saturniidae, Hemileucinae (Fig. 224)

Superfamily: Bombycoidea

Number of Canadian species: 5 spp. from BC to QC, most diverse in the West

Genera: *Automeris*, *Hemileuca*

Abundance: rare to uncommon, at lights or diurnal

Quick recognition: Large robust-bodied moths, both wings usually boldly patterned, large discal spot present on forewing. Specific identification is easy.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough; proboscis absent; labial palps rudimentary; antenna pectinate, sometimes with long sensillae, unscaled, less than half forewing length. THORAX: wings heteroneurous, forewing triangular, typically with

distinct antemedial and postmedial lines, discal spot large; hindwing broad, usually similar to forewing in pattern and colour; hind tibial spurs short, hind tarsal spines usually absent. ABDOMEN: hairy, often boldly patterned and coloured.

Similar taxa: Hemileucinae can be separated from other large moths by wing pattern.

Taxonomic references: Tuskes *et al.* 1996

Saturniidae, Saturniinae (Fig. 225)

Superfamily: Bombycoidea

Number of Canadian species: 8 spp. across Canada, most diverse in the East

Genera: *Actias*, *Antheraea*, *Callosamia*, *Hyalophora*, *Samia*

Abundance: common, at lights or diurnal

Quick recognition: Very large stout-bodied moths, wings very large, large discal spot present on both wings. Specific identification is easy.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough, rarely smooth on frons; proboscis absent; labial palps small, usually tufted; antenna pectinate, usually with long sensillae, unscaled, less than half forewing length. THORAX: wings heteroneurous, forewing triangular, typically with distinct antemedial and postmedial lines, discal spot large and may be transparent; hindwing broad, similar to forewing in pattern and colour, sometimes with a long tail; hind tibial spurs short, hind tarsal spines sometimes present. ABDOMEN: hairy, sometimes boldly patterned.

Similar taxa: Saturniinae can be separated from other large moths by wing pattern.

Taxonomic references: Tuskes *et al.* 1996

Sphingidae, Sphinginae (Fig. 226)

Superfamily: Bombycoidea

Number of Canadian species: 21 spp. across Canada, most diverse in the East

Genera: *Agrius*, *Ceratonia*, *Dolba*, *Lapara*, *Manduca*, *Paratreia*, *Sphinx*

Abundance: common, at lights

Quick recognition: Usually large thick-bodied moths, abdomen tapered, forewing elongate and pointed, hindwing much smaller, typically grey or brown with complex pattern. Specific identification is usually easy.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough; proboscis present; labial palps ascending or porrect, usually short, tufted; antenna filiform, with two or more scale rows per segment, less than half forewing length. THORAX: wings heteroneurous, elongate and pointed, usually grey or brown, typically with many lines, small discal dot usually present; hindwing small, usually boldly banded; hind tibial spurs variable in length, hind tarsal spines present. ABDOMEN: smooth and tapered, rarely with dorsal scale tuft, usually boldly patterned.

Similar taxa: Similar sphingids are usually more colourful at least on the hindwing.

Taxonomic references: Tuttle 2007

Sphingidae, Smerinthinae (Fig. 227)

Superfamily: Bombycoidea

Number of Canadian species: 8 spp. throughout Canada

Genera: *Amorpha*, *Pachysphinx*, *Paonias*, *Smerinthus*

Abundance: common, at lights

Quick recognition: Usually large thick-bodied moths, thorax often with dark central streak, abdomen usually fairly blunt, forewing elongate and pointed, hindwing much smaller often with pink or purple, often with eyespots, proboscis reduced. Specific identification is usually easy but can be challenging in the west.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough; proboscis reduced; labial palps ascending or porrect, usually short, usually tufted; antenna filiform or pectinate, with many scale rows per segment, less than half forewing length. THORAX: wings heteroneurous, elongate and pointed, sometimes scalloped, usually grey or brown, typically with some prominent lines, small discal dot usually present; hindwing small, often with eyespots, usually with some pink or purple shading; hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth and somewhat blunt, rarely boldly patterned.

Similar taxa: Similar sphingids usually have a more sharply pointed abdomen and more prominent proboscis.

Taxonomic references: Tuttle 2007

Sphingidae, Macroglossinae (Fig. 228)

Superfamily: Bombycoidea

Number of Canadian species: 28 spp. throughout Canada

Genera: *Aellopos*, *Amphion*, *Darapsa*, *Deidamia*, *Deilephila*, *Erinnyis*, *Eumorpha*, *Hemaris*, *Hyles*, *Proserpinus*, *Sphecodina*, *Xylophanes*

Abundance: common, at lights or diurnal

Quick recognition: Large to medium-sized thick-bodied moths, abdomen usually tapered, sometimes with anal tufts, usually at least one of the wings with bright colours or bold patterns, sometimes transparent, forewing elongate and pointed, hindwing much smaller. Specific identification can be challenging.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough; proboscis naked; labial palps usually ascending, usually short, tufted; antenna filiform, sometimes with long sensillae, with two or more scale rows per segment, variable in length. THORAX: wings heteroneurous, elongate and pointed, sometimes scalloped, variable in colour and pattern, typically with some bold pattern or bright colours, centre of wing sometimes transparent; hindwing small, boldly patterned or brightly coloured; hind tibial spurs usually short, hind tarsal spines present. ABDOMEN: smooth and tapered, sometimes with

anal tufts, often boldly patterned.

Similar taxa: Macroglossinae can be separated from other sphingids by wing pattern.

Taxonomic references: Tuttle 2007 (most spp.); Schmidt 2009a (some *Hemaris*)

Notodontidae, Pygaerinae (Fig. 229)

Superfamily: Noctuoidea

Number of Canadian species: 5 spp. throughout Canada

Genera: *Clostera*

Abundance: common, at lights

Quick recognition: Medium-sized moths with a hairy box-like thorax and slender abdomen with prominent anal tuft, forewing grey to brown with lighter lines, obvious white crescent on costa in subterminal area followed by some warmer brown shading. Specific identification is usually easy.

Diagnosis: HEAD: ocelli absent; compound eye hairy; chaetosemata absent; head scales rough; proboscis naked, sometimes reduced; labial palps ascending, short, tufted; antenna pectinate, sometimes with long sensillae, with two or more scale rows per segment, less than half forewing length. THORAX: with metathoracic tympanum; with prominent dorsal tuft, usually brown through centre; wings heteroneurous, forewing rectangular, brown or grey with many pale lines throughout, subterminal line at costa a prominent crescent followed by some warm brown shading; hindwing rounded, dull grey or brown; hind tibial spurs short, hind tarsal spines absent. ABDOMEN: relatively slender and smooth, with prominent anal tuft.

Similar taxa: Pygaerinae can be separated from other noctuoids by wing pattern stout thorax and relatively slender abdomen with prominent anal tuft, and hairy eye.

Taxonomic references: Handfield 1999

Notodontidae, Notodontinae (Fig. 230)

Superfamily: Noctuoidea

Number of Canadian species: 18 spp. throughout Canada, most diverse in the East

Genera: *Cerura*, *Furcula*, *Gluphisia*, *Hyperaeschra*, *Nerice*, *Notodonta*, *Odontosia*, *Pheosia*

Abundance: common, at lights

Quick recognition: Medium-sized stout, hairy moths, forewing sometimes with prominent scale tuft in middle of inner margin, often boldly patterned with black and white. Specific identification is easy in the east, sometimes challenging in the west.

Diagnosis: HEAD: ocelli absent; compound eye sometimes hairy; chaetosemata absent; head scales rough; proboscis naked, often reduced; labial palps ascending or porrect, short, tufted; antenna pectinate, sometimes with long sensillae, with two or more scale rows per segment, less than half forewing length. THORAX: with metathoracic tympanum; often with dorsal tuft; wings heteroneurous,

forewing often with apex projecting well beyond anal angle, often with prominent tuft along inner margin, pattern variable, sometimes boldly marked with black and white; hindwing rounded to square, paler, sometimes with partial forewing pattern; hind tibial spurs short, hind tarsal spines sometimes visible. ABDOMEN: stout and very hairy.

Similar taxa: Notodontinae can be separated from other noctuoids by wing pattern, few other noctuoids have a prominent tuft along the inner margin of the forewing.

Taxonomic references: Troubridge & Lafontaine 2004c (western spp.); Handfield 1999 (eastern spp.)

Notodontidae, Phalerinae (Fig. 231)

Superfamily: Noctuoidea

Number of Canadian species: 11 spp. across Canada, most diverse in the East

Genera: *Datana*, *Ellida*, *Nadata*, *Peridea*

Abundance: common, at lights

Quick recognition: Medium-sized stout, hairy moths, thorax typically with a prominent dorsal tuft. Specific identification is easy except in *Datana*.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough; proboscis naked, often reduced; labial palps usually ascending, short, tufted; antenna filiform or pectinate, often with long sensillae, with two scale rows per segment, half forewing length or less. THORAX: with metathoracic tympanum; often with dorsal scale tuft; wings heteroneurous, forewing sometimes with apex projecting well beyond anal angle, sometimes more squared, sometimes with slightly scalloped outer margin, sometimes with prominent tuft along inner margin, pattern variable, often yellow and brown; hindwing rounded to square, paler, sometimes with partial forewing pattern on inner margin; hind tibial spurs usually short, hind tarsal spines present. ABDOMEN: thick and hairy, sometimes with dorsal scale tuft.

Similar taxa: Phalerinae can be separated from other noctuoids by wing pattern.

Taxonomic references: Handfield 1999

Notodontidae, Heterocampinae (Fig. 232)

Superfamily: Noctuoidea

Number of Canadian species: 19 spp. across Canada, most diverse in the East

Genera: *Heterocampa*, *Hyparpax*, *Lochmaeus*, *Macrurocampa*, *Misogada*, *Oligiocentria*, *Schizura*

Abundance: common, at lights

Quick recognition: Medium-sized stout, hairy moths, forewing typically with curved slender reniform spot. Specific identification is usually easy.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough; proboscis naked, sometimes reduced; labial palps ascending or porrect, short, at least slightly tufted; antenna filiform or pectinate, usually with long

sensillae, with two scale rows per segment, rarely one scale row, half forewing length or less. THORAX: with metathoracic tympanum; often with dorsal scale tuft; wings heteroneurous, forewing sometimes with apex projecting well beyond anal angle, sometimes with slightly scalloped outer margin, pattern variable, reniform spot often a thin curved line; hindwing rounded to square, paler, often with dark markings at anal angle; hind tibial spurs usually short, hind tarsal spines usually present. ABDOMEN: thick and hairy, sometimes with dorsal scale tuft, rarely boldly patterned.

Similar taxa: Heterocampinae can be separated from other noctuoids by wing pattern, especially the slender curved reniform spot.

Taxonomic references: Handfield 1999

Notodontidae, Nystaleinae (Fig. 233)

Superfamily: Noctuoidea

Number of Canadian species: 5 spp. from AB to NS

Genera: *Dasylophia*, *Symmerista*

Abundance: uncommon to common, at lights

Quick recognition: Medium-sized stout moths, forewing often with irregular white edging along the outer half of the costa. Specific identification requires dissection in *Symmerista*.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales rough; proboscis naked, sometimes reduced; labial palps ascending or porrect, often short, slender; antenna filiform or pectinate, usually with long sensillae, with two scale rows per segment, half forewing length or greater. THORAX: with metathoracic tympanum; usually with dorsal scale tuft; wings heteroneurous, forewing somewhat elongate, sometimes with slightly scalloped outer margin, costa often with irregular white margin along costa; hindwing rounded, drab, unpatterned; hind tibial spurs often long, hind tarsal spines present. ABDOMEN: thick and hairy, sometimes with dorsal scale tuft.

Similar taxa: Nystaleinae can be separated from other noctuoids by wing pattern, elongate forewings, and slender labial palps.

Taxonomic references: Handfield 1999

Erebidae, Lymantriinae (Fig. 234, 235)

Superfamily: Noctuoidea

Number of Canadian species: 17 spp. throughout Canada

Genera: *Dasychira*, *Euproctis*, *Gynaephora*, *Leucoma*, *Lymantria*, *Orgyia*

Abundance: uncommon to common, at lights, sometimes diurnal

Quick recognition: Medium-sized and very hairy moths, forewing is usually triangular, forelegs often very hairy and held prominently forwards at rest, females in some species wingless. Specific identification can be challenging in *Dasychira* and *Orgyia*.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales usually rough; proboscis naked, sometimes reduced; labial palps variable in orientation, short, tufted; antenna usually pectinate, usually with long sensillae, with many scale rows per segment, less than half forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, females sometimes apterous; forewing usually triangular, typically grey, brown, reddish, or white, often with dark jagged antemedial, postmedial, and subterminal lines; hindwing rounded, usually unpatterned; forelegs often prominently hairy, hind tibial spurs short, hind tarsal spines sometimes present. ABDOMEN: thick and hairy, sometimes with dorsal scale tuft.

Similar taxa: The combination of densely hairy forelegs and forewing pattern is usually diagnostic. In species with a pure white wing, Lymantriinae can usually be separated from similar looking Arctiini by the lack of patterning on the abdomen.

Taxonomic references: Handfield 1999 (eastern spp.); Troubridge & Lafontaine 2004c (western spp.)

Erebidae, Arctiinae, Lithosiini (Fig. 236)

Superfamily: Noctuoidea

Number of Canadian species: 13 spp. throughout Canada.

Genera: *Acsala*, *Bruceia*, *Cisthene*, *Clemensia*, *Crambidia*, *Eilema*, *Hypoprepia*, *Lycomorpha*

Abundance: common at lights, some species are diurnal
Quick recognition: Small to medium-sized erebids, forewing usually slender, hindwing usually relatively broad, forewing pattern either boldly patterned, drab grey, or pure white. Specific identification is easy, except in *Crambidia*.

Diagnosis: HEAD: ocelli absent; chaetosemata absent; head scales smooth, rarely rough; proboscis naked, rarely absent; labial palps ascending or porrect, short, rarely tufted; antenna filiform, rarely pectinate, usually with long sensillae, with two scale rows per segment, half the forewing length or less. THORAX: with metathoracic tympanum; wings heteroneurous, forewing usually slender, apex usually squared, either boldly patterned with bright colours, drab grey, or pure white, rarely with all wing scales raised making it translucent; hindwing triangular to squared, usually relatively broad, sometimes boldly patterned and brightly coloured, otherwise drab; hind tibial spurs usually short, hind tarsal spines usually present. ABDOMEN: smooth, rarely hairy, sometimes boldly patterned.

Similar taxa: Brightly coloured species are easy to separate from all others by forewing pattern. The more drably patterned species can be separated from superficially similar crambids by the lack of a scaled proboscis. More broad winged species can be confused with Herminiinae, but are easily separated by forewing pattern.

Taxonomic references: Troubridge & Lafontaine 2004c

(western spp.); Handfield 1999 (eastern spp.)

Erebidae, Arctiinae, Arctiini (Fig. 237)

Superfamily: Noctuoidea

Number of Canadian species: 82 spp. throughout Canada.

Genera: *Acerbia*, *Apantesis*, *Arctia*, *Cisseps*, *Ctenucha*, *Cycnia*, *Dodia*, *Estigmene*, *Euchaetes*, *Gnophaela*, *Grammia*, *Halysidota*, *Haploa*, *Holoarctia*, *Hyphantria*, *Leptarctia*, *Lophocampa*, *Neoarctia*, *Pararctia*, *Parasemia*, *Phragmatobia*, *Platarctia*, *Platyprepia*, *Pygarctia*, *Pyrrharctia*, *Spilosoma*, *Turuptiana*, *Tyria*, *Utetheisa*, *Virbia*

Abundance: common at lights, some species are diurnal
Quick recognition: Medium-sized erebids, usually stout, forewing elongate to triangular, forewing often boldly or brightly patterned, or pure white. Specific identification is often easy, but is challenging in a few genera like *Grammia* and *Virbia*.

Diagnosis: HEAD: ocelli usually present; chaetosemata absent; head scales usually rough; proboscis naked, rarely reduced; labial palps usually porrect or slightly descending, usually short, often tufted; antenna usually pectinate, usually with long sensillae, usually with two scale rows per segment, usually less than half the forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing usually stout, sometimes triangular or elongate, apex squared or acute, usually either boldly patterned with bright colours, or pure white; hindwing rounded, sometimes boldly patterned and brightly coloured, otherwise drab; hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth or hairy, usually boldly patterned.

Similar taxa: Most Arctiini have distinctive wing patterns and aren't easily confused with other taxa. Some of the species that have pure white wings can be confused with Lymantriinae, and can usually be separated by having a boldly patterned abdomen.

Taxonomic references: Troubridge & Lafontaine 2004c (western spp.); Handfield 1999 (most eastern spp.); Schmidt 2009b (*Grammia*); Zaspel *et al.* 2008 (*Virbia*)

Erebidae, Herminiinae (Fig. 238)

Superfamily: Noctuoidea

Number of Canadian species: 48 spp. across Canada

Genera: *Bleptina*, *Chytolita*, *Idia*, *Lascoria*, *Macrochilo*, *Palthis*, *Phalaenophana*, *Phalaenostola*, *Reabotis*, *Redectis*, *Renia*, *Tetanolita*, *Zanclognatha*

Abundance: common, at lights

Quick recognition: Small to moderate-sized erebids with a triangular forewing, reniform spot and antemedial, postmedial, and subterminal lines usually prominent, labial palps often large and ascending, often with large scale tufts on legs in males. Specific identification can be difficult.

Diagnosis: HEAD: ocelli present; chaetosemata absent;

head scales rough or smooth on vertex, usually smooth on frons; proboscis naked; labial palps usually ascending, long, often slender, sometimes tufted; antenna filiform, rarely pectinate, rarely with a subapical thickening and hook, with two scale rows per segment, variable in length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing usually triangular, sometimes with bulge in outer margin, rarely notched, yellow, brown, or grey, pattern variable, usually with prominent reniform spot and antemedial, postmedial, and subterminal lines; hindwing rounded to squared, often with some patterning, sometimes with a continuation of the forewing pattern; hind tibial spurs variable in length, hind tarsal spines present. ABDOMEN: smooth.

Similar taxa: Herminiinae are similar to several other noctuid subfamilies and can usually be separated from them by forewing pattern.

Taxonomic references: Troubridge & Lafontaine 2004c (western spp.); Handfield 1999 (eastern spp.)

Erebidae, Pangraptinae (Fig. 239)

Superfamily: Noctuoidea

Number of Canadian species: 2 spp. from AB to NS

Genera: *Ledaea*, *Pangrapta*

Abundance: uncommon to rare, at lights or diurnal

Quick recognition: *Ledaea perditalis* is easily recognized by the grey forewings with dark lower half of the postmedial line and dark slanted mark at the apex and with sharply produced apex and bulge in the outer margin. *Pangrapta decoralis* has a similar shaped forewing that varies in colour but always has a prominent broad dark band that edges the inside of the postmedial line and has prominent reniform spots on both the forewing and hindwing.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough or smooth; proboscis naked; labial palps ascending, long, slender; antenna filiform, with long sensillae, with two scale rows per segment, roughly half forewing length or less. THORAX: with metathoracic tympanum; wings heteroneurous, forewing with a bulge in outer margin, and a produced apex, grey or brown, reniform spot may be prominent, antemedial, postmedial and subterminal lines often prominent; hindwing rounded, sometimes slightly scalloped, sometimes with a continuation of the forewing pattern; hind tibial spurs long, hind tarsal spines present. ABDOMEN: smooth.

Similar taxa: Pangraptinae are similar to several other erebids and can be separated from them by forewing pattern.

Taxonomic references: Handfield 1999

Erebidae, Hypeninae (Fig. 240)

Superfamily: Noctuoidea

Number of Canadian species: 19 spp. across Canada

Genera: *Colobochyla*, *Hypena*, *Lomanaltes*, *Melanomma*

Abundance: common, at lights

Quick recognition: Moderate-sized erebids with a broad hindwing and either a triangular or slender brownish forewing, often with a bulge in the middle of the outer margin or with the costa slightly concave. Specific identification is not usually difficult.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough, rarely smooth; proboscis naked; labial palps usually porrect or ascending, long to very long, tufted, rarely slender; antenna filiform, with long sensillae, with two scale rows per segment, typically greater than half forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing either triangular or slender, often with bulge in outer margin or with the costa slightly concave, brownish, with prominent lines and often with dark spots; hindwing rounded to squared, usually broad relative to forewing, usually drab brown; hind tibial spurs usually short, hind tarsal spines present. ABDOMEN: smooth, often with dorsal scale tuft.

Similar taxa: The lack of a scaled proboscis and presence of a metathoracic tympanum will separate Hypeninae from superficially similar Crambidae. It can be separated from similar erebids by wing pattern.

Taxonomic references: Troubridge & Lafontaine 2004c (western spp.); Handfield 1999 (eastern spp.)

Erebidae, Rivulinae (Fig. 241)

Superfamily: Noctuoidea

Number of Canadian species: 2 spp. across Canada

Genera: *Oxycilla*, *Rivula*

Abundance: uncommon to common, at lights

Quick recognition: Both species are small with fairly blunt wings. *Rivula propinqualis* has a yellow forewing with fine dark oblique medial and postmedial lines and prominent grey smeared blotch bordering the medial line at the costa. The rarer *Oxycilla malaca* is light brown with darker brown markings in the medial and terminal areas and with a prominent curved pale postmedial line.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales usually rough on frons, smooth on vertex; proboscis naked; labial palps porrect, long, tufted; antenna filiform, with long sensillae, with two scale rows per segment, usually less than half forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing fairly blunt, either yellow with thin dark oblique medial and postmedial lines, or brown with darker brown shading in medial and terminal areas and a pale curved postmedial line; hindwing may slightly excavated along outer margin, drab; hind tibial spurs long, hind tarsal spines sometimes visible. ABDOMEN: smooth.

Similar taxa: The characteristic forewing pattern will separate Rivulinae from all other similar erebids.

Taxonomic references: Handfield 1999

Erebidae, Scoliopteryginae (Fig. 242)

Superfamily: Noctuoidea

Number of Canadian species: 4 spp. throughout Canada

Genera: *Alabama*, *Anomis*, *Scoliopteryx*

Abundance: uncommon to rare, at lights

Quick recognition: Usually moderate-sized noctuids, often boldly patterned, usually with at least slightly scalloped forewing. Specific identification is easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales usually rough; proboscis naked; labial palps ascending, long, at most slightly tufted; antenna filiform or pectinate, usually with long sensillae, with two scale rows per segment, half forewing the length or less. THORAX: sometimes with slight dorsal scale tuft, with metathoracic tympanum; wings heteroneurous, forewing variable in shape, usually at least slightly scalloped, with prominent bulge in middle of outer margin, lines thin and prominent; hindwing rounded to squared, pattern usually dull; hind tibial spurs usually long, hind tarsal spines present. ABDOMEN: smooth to hairy.

Similar taxa: Scoliopteryginae can be separated from similar erebids by forewing pattern and by the scalloped forewing margin.

Taxonomic references: Troubridge & Lafontaine 2004d

Erebidae, Calpinae (Fig. 243)

Superfamily: Noctuoidea

Number of Canadian species: 3 spp. from AB to NS

Genera: *Calyptra*, *Eudocima*, *Plusiodonta*

Abundance: uncommon to rare, at lights

Quick recognition: Usually moderate-sized erebids, often boldly patterned, with distinct scale tufts on inner margin of forewing. Specific identification is easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales usually rough; proboscis naked; labial palps ascending, long, slender or tufted; antenna filiform or pectinate, sometimes with long sensillae, with two scale rows per segment, half forewing the length or less. THORAX: sometimes with dorsal scale tuft, with metathoracic tympanum; wings heteroneurous, forewing variable in shape, sometimes with prominent bulge in middle of outer margin, with scale tuft along inner margin, pattern and colour variable; hindwing rounded to squared, pattern usually dull, rarely very contrasting; hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth to hairy, rarely with dorsal scale tuft, rarely brightly coloured.

Similar taxa: Calpinae can be separated from similar erebids by forewing pattern and by the scale tuft along the inner margin.

Taxonomic references: Handfield 1999

Erebidae, Hypocalinae (Fig. 244)

Superfamily: Noctuoidea

Number of Canadian species: 2 spp. in extreme southern ON and QC

Genera: *Hypocala*, *Hypsoropha*

Abundance: very rare, at lights

Quick recognition: *Hypocala andremona* is a rare stray with a variable forewing pattern and a prominent black hindwing with yellow streaks. *Hypsoropha hormos* has a grey forewing with a series of prominent white dots composing the lower part of the postmedial line.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough or slightly smoothed; proboscis naked; labial palps ascending, long, tufted; antenna filiform, usually with long sensillae, with two scale rows per segment, usually less than half the forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing slightly scalloped on outer margin, sometimes with bulge in middle of outer margin, variable in pattern, or grey with a series of prominent white dots composing the lower part of the postmedial line; hindwing squared to rounded, black with prominent yellow streaks or drab brown; hind tibial spurs long, hind tarsal spines present. ABDOMEN: smooth, sometimes boldly patterned, sometimes with dorsal scale tuft.

Similar taxa: Hypocalinae can be separated from similar erebids by wing pattern.

Taxonomic references: Handfield 1999

Erebidae, Scolecocampinae (Fig. 245)

Superfamily: Noctuoidea

Number of Canadian species: 4 spp. in S. BC, S. MB, and S. ON

Genera: *Gabara*, *Nigetia*, *Phobolusia*, *Scolecocampa*

Abundance: rare, at lights

Quick recognition: An odd-assemblage of often boldly patterned small to fairly large noctuids. Specific identification is easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales usually somewhat roughened; proboscis naked; labial palps usually ascending, usually long, tufted; antenna filiform, with long sensillae, with two scale rows per segment, usually less than half forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing variable in shape from elongate with a pointed apex to triangular, variable in colour and pattern; hindwing rounded to slightly squared, unpatterned; hind tibial spurs long, hind tarsal spines sometimes present. ABDOMEN: smooth, rarely with slight dorsal scale tuft.

Similar taxa: The lack of a scaled proboscis and presence of a metathoracic tympanum will separate Scolecocampinae from superficially similar Crambidae. It can be separated from similar erebids by wing pattern.

Taxonomic references: Troubridge & Lafontaine 2004c, 2004d

Erebidae, Hyphenodinae (Fig. 246)

Superfamily: Noctuoidea

Number of Canadian species: 9 spp. from AB to NS

Genera: *Dyspyralis*, *Hyphenodes*, *Parahyphenodes*

Abundance: common to rare, at lights

Quick recognition: Tiny erebids typically with a prominent reniform spot and medial line on the forewing, ocelli absent. Specific identification can be challenging.

Diagnosis: HEAD: ocelli absent, rarely barely visible; chaetosemata absent; head scales smooth; proboscis naked; labial palps usually ascending, long, slender; antenna filiform, sometimes with long sensillae, with two, rarely three scale rows per segment, usually roughly half forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing fairly slender with a slight bulge in outer margin, brown or grey, reniform spot typically prominent, orbicular spot tiny or obscured, medial and subterminal lines often heavily shaded and prominent; hindwing squared to pointed at apex; hind tibial spurs long, hind tarsal spines absent. ABDOMEN: smooth, rarely with dorsal scale tuft.

Similar taxa: The combination of size, lack of ocelli, and presence of a metathoracic tympanum will separate Hyphenodinae from all others.

Taxonomic references: Handfield 1999; Ferguson 1954 (*Hyphenodes*)

Erebidae, Boletobiinae (Fig. 247)

Superfamily: Noctuoidea

Number of Canadian species: 5 spp. throughout Canada

Genera: *Metalectra*, *Mycterophora*, *Parascotia*

Abundance: uncommon to rare, at lights

Quick recognition: Geometrid-like with broad wings and similar forewing and hindwing pattern, antenna often pectinate. Specific identification is fairly easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough or smooth; proboscis naked; labial palps porrect or ascending, fairly long, at least somewhat tufted; antenna filiform or pectinate, with long sensillae, with two scale rows per segment, usually roughly half forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing very broad and triangular, with prominent jagged antemedial, postmedial, and subterminal lines; hindwing rounded, with a continuation of the forewing pattern; hind tibial spurs long, hind tarsal spines sometimes present. ABDOMEN: smooth.

Similar taxa: Boletobiinae can be separated from geometrids by the presence of a metathoracic tympanum. They can be separated from other erebids by the forewing pattern.

Taxonomic references: Troubridge & Lafontaine 2004c (western spp.); Handfield 1999 (eastern spp.)

Erebidae, Phytometrinae (Fig. 248)

Superfamily: Noctuoidea

Number of Canadian species: 7 spp. across southern Canada.

Genera: *Hyperstrotia*, *Isogona*, *Phytometra*, *Spargaloma*

Abundance: common, at lights or diurnal

Quick recognition: An odd-assemblage of boldly-patterned and sometimes colourful small to medium-sized erebids. Specific identification is easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales usually smooth on vertex, smooth or rough on frons; proboscis naked; labial palps ascending, long, usually tufted; antenna filiform, with long sensillae, with two scale rows per segment, usually roughly half forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing usually somewhat triangular, apex often pointed, rarely rounded, variable in colour and pattern but sometimes brightly coloured in yellow and pink; hindwing somewhat rounded, often unpatterned; hind tibial spurs long, hind tarsal spines present. ABDOMEN: smooth. Similar taxa: The lack of a scaled proboscis and presence of a metathoracic tympanum will separate Phytometrinae from superficially similar Crambidae. It can be separated from similar erebids by wing pattern.

Taxonomic references: Troubridge & Lafontaine 2004d

Erebidae, Erebinae, Toxocampini (Fig. 249)

Superfamily: Noctuoidea

Number of Canadian species: 2 spp. in BC

Genera: *Lygephila*, *Tathorhynchus*

Abundance: uncommon to rare, at lights

Quick recognition: *Lygephila victoria* is a stout, moderate-sized erebid, forewing fairly broad and grey with antemedial, medial, and subterminal lines well represented at the costa by dark smudges, hindwing with a smudged darker outer band. *Tathorhynchus exsiccata* has a narrower forewing with a dark mid-basal streak and dark streak between the small white orbicular and reniform spots, the hindwing is similar to *L. victoria*.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough; proboscis naked; labial palps ascending, long, at least slightly tufted; antenna filiform, with long sensillae, with two scale rows per segment, greater than half the forewing length. THORAX: with dorsal scale tuft, with metathoracic tympanum; wings heteroneurous, forewing slightly stout to relatively slender, sometimes with prominent bulge in middle of outer margin, most commonly grey with darker suffused antemedial, medial, and subterminal lines that are expanded at the costa, rarely with pale orbicular and reniform spots connected by a black streak; hindwing squared, pattern dull with smudged dark outer band, sometimes with discal lunule; hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth.

Similar taxa: Toxocampini can be separated from similar

erebids by forewing pattern.

Taxonomic references: Powell & Opler 2009

Erebidae, Erebininae, Thermesiini (Fig. 250)

Superfamily: Noctuoidea

Number of Canadian species: 2 spp. Neotropical strays found throughout Canada

Genera: *Ascalapha*, *Thysania*

Abundance: very rare, at lights or bait

Quick recognition: Gigantic erebids with boldly patterned fore and hindwings. Specific identification is easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough; proboscis naked; labial palps ascending, short, slender; antenna filiform, with two scale rows per segment, less than half forewing the length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing triangular and pointed, sometimes scalloped, with a complex pattern, reniform and orbicular spots present, antemedial, medial, postmedial and subterminal lines prominent, grey or brown; hindwing squared, scalloped, pattern continuing from the forewing; hind tibial spurs variable in length, hind tarsal spines present. ABDOMEN: smooth, sometimes slightly patterned.

Similar taxa: Nothing is similar.

Taxonomic references: Covell 1984; Handfield 1999

Erebidae, Erebininae, Catocalini (Fig. 251)

Superfamily: Noctuoidea

Number of Canadian species: 56 spp. across Canada, most diverse in the SE.

Genera: *Catocala*, *Spiloloma*

Abundance: common, at lights

Quick recognition: Fairly small to very large, forewing with a complex pattern of lines and spots, hindwing usually boldly patterned with a bright yellow, orange, red, pink or white contrasted with broad curved black bands. Specific identification can be challenging, especially in the west.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough; proboscis naked; labial palps ascending, variable in length, often slender; antenna filiform, usually with long sensillae, with two scale rows per segment, roughly half the forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing broad, with squared apex to slightly pointed apex, outer margin usually straight, sometimes with slight medial bulge, pattern complex, antemedial and postmedial lines present and usually jagged and black, other lines are often present, reniform, orbicular and claviform spots often present, ground colour usually grey; hindwing rounded to slightly squared, either yellow, orange, red, pink, or white, contrasted with broad black curved bands along the outer margin and through the middle, rarely solid black or grey with fine jagged lines, fringe usually at least partially contrastingly pale; hind tibial spurs short, hind tibial spines

present, hind tarsal spines present. ABDOMEN: smooth, sometimes with a small dorsal scale tuft.

Similar taxa: Other noctuids with a boldly patterned hindwing typically have a more complex pattern. When present, the broad curved black line through the centre of the hindwing is diagnostic.

Taxonomic references: Troubridge & Lafontaine 2004c, 2004d

Erebidae, Erebininae, Melipotini (Fig. 252)

Superfamily: Noctuoidea

Number of Canadian species: 18 spp. across Canada, most diverse in the West

Genera: *Bulia*, *Cissusa*, *Drasteria*, *Melipotis*, *Phoberia*

Abundance: uncommon to common, at lights

Quick recognition: Moderate-sized noctuids often with brightly and boldly patterned hindwings, forewing pattern variable but usually complex. Specific identification can be challenging.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough; proboscis naked; labial palps ascending, usually short, tufted; antenna filiform, rarely with long sensillae, with two scale rows per segment, half the forewing length or greater. THORAX: with metathoracic tympanum; wings heteroneurous, forewing somewhat square to triangular, variable in pattern, usually with a prominent reniform spot, lines typically well marked, especially postmedial line, typically grey or brown; hindwing rounded to squared, often boldly patterned with black and white, yellow, orange, or pink, often drably patterned; hind tibial spurs usually short, hind tarsal spines present. ABDOMEN: smooth.

Similar taxa: Melipotini can be separated from similar noctuids by wing pattern.

Taxonomic references: Troubridge & Lafontaine 2004c (western spp.); Handfield 1999 (eastern spp.)

Erebidae, Erebininae, Euclidiini (Fig. 253)

Superfamily: Noctuoidea

Number of Canadian species: 9 spp. throughout Canada

Genera: *Caenurgina*, *Celiptera*, *Doryodes*, *Euclidia*, *Mocis*

Abundance: common, at lights or flushed during the day

Quick recognition: Moderate-sized noctuids typically with fairly broad wings, forewing usually brown with large darker blotches. Specific identification can be challenging.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough or smooth; proboscis naked; labial palps ascending, usually long, usually slender; antenna filiform, rarely pectinate, sometimes with long sensillae, with two scale rows per segment, usually half the forewing length or greater. THORAX: with metathoracic tympanum; wings heteroneurous, forewing usually broad, rarely slender and pointed, usually brown with large darker blotches in the antemedial and postmedial area; hindwing rounded, often

boldly patterned; hind tibial spurs usually short, hind tibial spines sometimes present, hind tarsal spines present. ABDOMEN: smooth.

Similar taxa: Euclidiini can be separated from similar erebids by wing pattern.

Taxonomic references: Troubridge & Lafontaine 2004c (western spp.); Handfield 1999 (eastern spp.)

Erebidae, Erebinac, Poaphilini (Fig. 254)

Superfamily: Noctuoidea

Number of Canadian species: 3 spp. from SK to NS.

Genera: *Allotria*, *Argyrostromis*, *Parallelia*

Abundance: common, at lights

Quick recognition: All species with similar triangular forewings but with different patterns. *Allotria elonympha* has a dark forewing with obscure markings and a yellow hindwing with broad contrasting black border. *Argyrostromis anilis* is chocolate brown with thin straight lines from anal angle to nearly medial area of costa and in the upper third of the postmedial area. *Parallelia bistriaris* has a brown forewing with thin, nearly straight pale antemedial and postmedial lines and frosty suffusion in the subterminal area.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough; proboscis naked; labial palps ascending, short, slender; antenna filiform, with two scale rows per segment, variable in length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing broad, triangular, with squared apex, the antemedial and postmedial lines are always present; hindwing rounded to squared, either solid brown with a paler fringe or boldly patterned yellow with broad black outer band; hind tibial spurs short, hind tibial spines present, hind tarsal spines present. ABDOMEN: fairly smooth, sometimes with a small dorsal scale tuft.

Similar taxa: These three species can be separated from all other erebids by wing pattern.

Taxonomic references: Covell 1984

Erebidae, Erebinac, Ophiusini (Fig. 255)

Superfamily: Noctuoidea

Number of Canadian species: 18 spp. from BC to NS, most diverse in SE Canada.

Genera: *Amolita*, *Euparthenos*, *Lesmone*, *Zale*

Abundance: common, at lights

Quick recognition: Moderate to large, often thick-bodied noctuids usually with fairly broad wings, forewing typically with a squared apex, pattern often continuous from forewing to hindwing, hindwing rarely boldly patterned with yellow and black. Specific identification can be challenging in *Zale*.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough, rarely smooth on frons; proboscis naked; labial palps ascending, usually roughly twice as long as

compound eye, at least somewhat slender; antenna filiform, rarely pectinate, usually with long sensillae, with two scale rows per segment, variable in length. THORAX: with metathoracic tympanum, sometimes with dorsal scale tuft; wings heteroneurous, forewing usually broad, with squared apex, often with a complex pattern of lines, the antemedial and postmedial lines are usually present, typically grey or brown, reniform and orbicular spots often present; hindwing rounded to squared, sometimes scalloped, pattern is often continuous with the forewing, rarely with bold yellow and black patterning, sometimes drab but at least similar to ground colour of forewing; hind tibial spurs usually short, hind tibial spines often present, hind tarsal spines present. ABDOMEN: fairly smooth, usually with a small dorsal scale tuft.

Similar taxa: Ophiusini can be separated from similar erebids by a combination of wing pattern and usual presence of a small dorsal scale tuft.

Taxonomic references: Handfield 1999

Erebidae, Eulepidotinae (Fig. 256)

Superfamily: Noctuoidea

Number of Canadian species: 4 spp. in SE Canada.

Genera: *Anticarsia*, *Panopoda*

Abundance: rare to uncommon, at lights

Quick recognition: Moderate-sized, often thick-bodied noctuids with fairly broad wings, forewing with a prominent reniform spot and antemedial and postmedial lines. Specific identification is usually easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales usually rough on vertex, rough or smooth on frons; proboscis naked; labial palps ascending, roughly twice as long as compound eye or longer, usually slender; antenna filiform, usually with long sensillae, with two scale rows per segment, roughly half the forewing length or greater. THORAX: with metathoracic tympanum; wings heteroneurous, forewing broad, grey or brownish with a pale postmedial line, reniform spot usually dark, other markings variable; hindwing rounded to squared, usually drably patterned; hind tibial spurs long, hind tarsal spines present. ABDOMEN: smooth to hairy.

Similar taxa: Eulepidotinae can be separated from similar erebids by wing pattern.

Taxonomic references: Covell 1984

Euteliidae (Fig. 257)

Superfamily: Noctuoidea

Number of Canadian species: 6 spp. in S. BC and from SK to NS, most diverse in SE Canada.

Genera: *Eutelia*, *Marathyssa*, *Paectes*

Abundance: rare to uncommon, at lights

Quick recognition: Moderate-sized noctuids, often with complexly patterned wings, anal area of forewing often has a curved line, at rest the wings are held out away from

the body and sometimes rolled. Specific identification is usually easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough or smooth; proboscis naked; labial palps ascending or porrect, roughly twice the length of the compound eye or more, usually slender; antenna usually pectinate, with long sensillae, with two scale rows per segment, variable in length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing fairly slender, with at least a slight bulge on the outer margin, with squared to rounded apex, pattern usually complex, curved black lines usually present in anal area, with a tiny black reniform spot, antemedial and postmedial lines usually present; hindwing squared to rounded, sometimes boldly patterned; hind tibial spurs long, hind tarsal spines present. ABDOMEN: smooth, often boldly coloured.

Similar taxa: Euteliidae can be separated from other noctuids by the characteristic wing pattern.

Taxonomic references: Troubridge & Lafontaine 2004d

Nolidae (Fig. 258)

Superfamily: Noctuoidea

Number of Canadian species: 16 spp. throughout Canada except the far north.

Genera: *Baileya*, *Garella*, *Meganola*, *Nola*, *Nycteola*

Abundance: uncommon to rare, at lights

Quick recognition: Small noctuids, forewing usually grey with darker lines, males sometimes with a small basal costal fold, sometimes with raised scales. Specific identification is fairly easy, except in *Nycteola* which often requires dissection.

Diagnosis: HEAD: ocelli usually absent; chaetosemata absent; head scales usually smooth; proboscis naked; labial palps variable in orientation, variable in length, usually tufted; antenna filiform, rarely pectinate, usually with long sensillae, with two scale rows per segment, usually less than half the forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing triangular to rectangular, with squared to pointed apex, grey to white with prominent lines, postmedial line typically with a curve around the reniform area, often with some small patches of raised scales, males sometimes with a small basal costal fold; hindwing squared to rounded, drab; hind tibial spurs variable, hind tarsal spines present. ABDOMEN: smooth. Similar taxa: Wing pattern, usual lack of ocelli, and presence of metathoracic tympana will separate Nolidae from all other similar looking moths.

Taxonomic references: Troubridge & Lafontaine 2004c (western spp.); Handfield 1999 (eastern spp.)

Noctuidae, Plusiinae (Fig. 259)

Superfamily: Noctuoidea

Number of Canadian species: 60 spp. throughout Canada.

Genera: *Abrostola*, *Allagrapha*, *Anagrapha*, *Argyrogramma*,

Autographa, *Chrysanympha*, *Ctenoplusia*, *Diachrysia*, *Eosphoropteryx*, *Euchalcia*, *Exyra*, *Megalographa*, *Plusia*, *Polychrysia*, *Pseudeva*, *Pseudoplusia*, *Rachiplusia*, *Syngrapha*, *Trichoplusia*

Abundance: common, at lights, some species at flowers

Quick recognition: medium-sized stout noctuids, often with prominent thoracic and abdominal scale tufts, forewings usually held sharply roof-like at rest, often with a hook at the anal angle, and a prominent silvery stigma in the middle of the forewing. Specific identification is easy for most, but can be challenging in *Autographa* and *Syngrapha*. Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales usually rough; proboscis naked; labial palps ascending, often long, usually tufted; antenna filiform, sometimes with long sensillae, with two scale rows per segment, usually greater than half the forewing length. THORAX: with metathoracic tympanum; often with prominent dorsal scale tuft; wings heteroneurous, forewing at least somewhat triangular, with squared to pointed apex, anal angle often produced into a hook, variable in colour and pattern, though pattern usually complex, silvery stigma usually present in middle of forewing, larger metallic patches often present; hindwing squared to rounded, drab to boldly bicoloured in yellow and brown; hind tibial spurs usually short, hind tibial spines rarely present, hind tarsal spines present. ABDOMEN: smooth, prominent dorsal scale tuft usually present.

Similar taxa: The combination of quick recognition characters will separate most plusiines from other noctuids. Taxonomic references: Lafontaine & Poole 1991 (most spp.); D. Handfield & L. Handfield 2006 (some *Plusia*).

Noctuidae, Bagisarinae (Fig. 260)

Superfamily: Noctuoidea

Number of Canadian species: 3 spp. in southernmost MB, ON, and QC.

Genera: *Amyna*, *Bagisara*

Abundance: very rare, at lights.

Quick recognition: medium-sized stout to moderately stout noctuids, forewing slightly triangular, lines usually prominent.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales slightly roughened on vertex, smooth on frons; proboscis naked; labial palps ascending, short, slender; antenna filiform, with two scale rows per segment, greater than half the forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing somewhat triangular, with squared apex, either greyish brown with fine yellow medial, postmedial, and subterminal lines or more mottled brownish with jagged lines; hindwing broad, drab with discal lunule, sometimes with darker outer shading or prominent medial line; hind tibial spurs long, hind tarsal spines present. ABDOMEN: smooth.

Similar taxa: Bagisarinae can be separated from other

noctuids by wing pattern.

Taxonomic references: Covell 1984, Handfield 1999 (*Amyna*); Troubridge & Lafontaine 2004c (*Bagisara*)

Noctuidae, Eustrotiinae (Fig. 261)

Superfamily: Noctuoidea

Number of Canadian species: 8 spp. throughout Canada.

Genera: *Capis*, *Cobubatha*, *Deltote*, *Prodelote*, *Maliattha*

Abundance: common, at lights.

Quick recognition: Small noctuids, usually with boldly-marked and often colourful forewings, reniform spot usually prominent. Specific identification is easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales usually smooth; proboscis naked; labial palps ascending or porrect, variable in length, usually slender; antenna filiform, with long sensillae, with two scale rows per segment, usually less than half the forewing length. THORAX: with metathoracic tympanum; sometimes with prominent dorsal scale tuft; wings heteroneurous, forewing at least somewhat triangular, with squared apex, variable in colour and pattern, pattern usually complex, reniform spot usually present; hindwing squared to rounded, drab; hind tibial spurs long, hind tarsal spines present. ABDOMEN: smooth, dorsal scale tuft sometimes present.

Similar taxa: The forewing pattern and size will separate Eustrotiinae from similar noctuids.

Taxonomic references: Troubridge & Lafontaine 2004d (most spp.); L. Handfield & D. Handfield 2006 (some *Capis*).

Noctuidae, Acontiinae (Fig. 262)

Superfamily: Noctuoidea

Number of Canadian species: 15 spp. across Canada.

Genera: *Ponometia*, *Spragueia*, *Tarache*

Abundance: uncommon to common, at lights.

Quick recognition: Small noctuids, usually with white and grey mottled forewings, usually resemble bird-droppings at rest. Specific identification is usually easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales smooth; proboscis naked; labial palps ascending, short, slender; antenna filiform, sometimes with long sensillae, with two scale rows per segment, variable in length. THORAX: with metathoracic tympanum; sometimes with dorsal scale tuft; wings heteroneurous, forewing slender to somewhat triangular, with squared to acute apex, variable in colour and pattern, often good bird-dropping mimics; hindwing squared, broad, drab; hind tibial spurs usually short, hind tarsal spines present. ABDOMEN: smooth, rarely boldly banded.

Similar taxa: Acontiinae can be separated from similar noctuids by wing pattern.

Taxonomic references: Troubridge & Lafontaine 2004c, 2004d; Lafontaine & Poole 2010 (key to genera)

Noctuidae, Pantheinae (Fig. 263)

Superfamily: Noctuoidea

Number of Canadian species: 7 spp. across Canada.

Genera: *Charadra*, *Colocasia*, *Panthea*

Abundance: common, at lights.

Quick recognition: Stout, hairy noctuids, moderate sized to large, eye hairy, forewing grey with darker prominent lines and spots. Specific identification is fairly easy.

Diagnosis: HEAD: ocelli present or absent; chaetosemata absent; head scales rough; proboscis naked, reduced; labial palps porrect, short, densely hairy; antenna filiform or pectinate, variable number of scale rows per segment, usually less than half the forewing length. THORAX: with metathoracic tympanum; sometimes with dorsal scale tuft; wings heteroneurous, forewing somewhat triangular, usually with acute apex, light to dark grey, usually with darker prominent orbicular and reniform spots, and jagged lines; hindwing rounded, drab, but usually with some faint pattern, usually with a checkered fringe; legs densely hairy, hind tibial spurs short, hind tarsal spines present. ABDOMEN: hairy, rarely with dorsal scale tuft.

Similar taxa: Pantheinae are easily recognized by the hairy eyes, hairy body, and wing pattern.

Taxonomic references: Handfield 1999 (eastern spp.); Anweiler 2009 (*Panthea*)

Noctuidae, Dilobinae (Fig. 264)

Superfamily: Noctuoidea

Number of Canadian species: 1 sp. (*Raphia frater*) across Canada.

Genera: *Raphia*

Abundance: common, at lights.

Quick recognition: Stout, hairy noctuid, forewing grey with darker, curved antemedial and postmedial lines and hollow reniform and orbicular spots, hindwing pale with sharpest markings at anal angle.

Diagnosis: HEAD: ocelli very difficult to see; chaetosemata absent; head scales rough, sometimes smooth on frons; proboscis naked; labial palps variable in orientation, short, at least somewhat tufted; antenna filiform or pectinate, two scale rows per segment, usually less than half the forewing length. THORAX: with metathoracic tympanum; sometimes with dorsal scale tuft; wings heteroneurous, forewing slightly triangular, with somewhat acute apex, grey with darker, curved antemedial and postmedial lines and hollow reniform and orbicular spots; hindwing squared, drab, with sharpest markings at anal angle; legs hairy, hind tibial spurs short, hind tarsal spines present. ABDOMEN: hairy, sometimes with slight dorsal scale tuft.

Similar taxa: This species is easily recognized by its wing pattern.

Taxonomic references: Covell 1984; Handfield 1999; Powell & Opler 2009

Noctuidae, Balsinae (Fig. 265)

Superfamily: Noctuoidea

Number of Canadian species: 3 spp. in southern Canada as far west as SK.

Genera: *Balsa*

Abundance: uncommon, at lights.

Quick recognition: Small noctuids with broad rectangular wings, forewing grey with dark medial and postmedial lines prominent on costal half. Specific identification can be challenging.

Diagnosis: HEAD: ocelli usually visible; chaetosemata absent; head scales generally smooth; proboscis naked; labial palps usually ascending, usually short, slender; antenna filiform, rarely pectinate, two scale rows per segment, variable in length. THORAX: with metathoracic tympanum; sometimes with subtle dorsal scale tuft; wings heteroneurous, forewing rectangular, with square apex, grey with dark medial and postmedial lines prominent on costal half; hindwing squared, drab; hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth, sometimes with slight dorsal scale tuft.

Similar taxa: Balsinae are easily recognized by their size and forewing pattern.

Taxonomic references: Covell 1984; Handfield 1999

Noctuidae, Acronictinae (Fig. 266)

Superfamily: Noctuoidea

Number of Canadian species: 54 spp. throughout Canada.

Genera: *Acronicta*, *Agriopodes*, *Cerma*, *Harrisimemna*, *Polygrammate*, *Simyra*

Abundance: common, at lights.

Quick recognition: Typically medium-sized stout noctuids with white, grey or black forewings, often with dark streaks at the base, near the anal angle and near the apex. Specific identification is challenging for some *Acronicta* groups.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough, sometimes smooth on frons; proboscis naked; labial palps ascending or porrect, short, often tufted; antenna filiform, rarely pectinate, rarely with long sensillae, two scale rows per segment, usually less than half forewing length. THORAX: with metathoracic tympanum; often with dorsal scale tuft; wings heteroneurous, forewing rectangular to triangular, with square to acute apex, white, grey, or black with prominent lines and spots, often with dark streaks at the base, near the anal angle and near the apex; hindwing squared to rounded, drab, sometimes with discal spot and medial line; hind tibial spurs variable, hind tarsal spines present. ABDOMEN: smooth, often with dorsal scale tuft, rarely boldly patterned.

Similar taxa: Acronictinae are usually readily identified by their forewing markings.

Taxonomic references: Troubridge & Lafontaine 2004c (western spp.); Handfield 1999 (eastern spp.)

Noctuidae, Cuculliinae (Fig. 267)

Superfamily: Noctuoidea

Number of Canadian species: 18 spp. across Canada, especially the southern portions.

Genera: *Cucullia*

Abundance: uncommon to common, at lights.

Quick recognition: Stout noctuids with sharply pointed forewing and prominent forward projecting scale tuft on thorax, forewing pattern often grey and streaky with most prominent markings along inner margin. Specific identification can be challenging.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough, sometimes smooth on frons; proboscis naked; labial palps ascending, short, tufted; antenna filiform, two scale rows per segment, half forewing length or greater. THORAX: with metathoracic tympanum; often with prominent forward projecting scale tuft; wings heteroneurous, forewing elongate and acutely pointed, often grey and streaky with most prominent markings along inner margin; hindwing usually squared, drab, sometimes with dark outer shade; hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth, sometimes with dorsal scale tuft.

Similar taxa: Cuculliinae are easily recognized by the wing shape, pattern, and forward projecting scale tuft.

Taxonomic references: Poole 1995 (most spp.); Handfield & Handfield 2010 (some spp.)

Noctuidae, Amphipyrinae, Amphipyryni (Fig. 268)

Superfamily: Noctuoidea

Number of Canadian species: 3 spp. across Canada.

Genera: *Amphipyra*

Abundance: common, at lights.

Quick recognition: Stout noctuids with rectangular shiny forewings, brownish to greyish with closely set orbicular and reniform spots, the most common species with coppery hindwing. Specific identification is easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough, sometimes smooth on frons; proboscis naked; labial palps ascending, usually long, slender; antenna filiform, two scale rows per segment, greater than half forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing rectangular, shiny, brownish to greyish with closely set orbicular and reniform spots, lines may be present, sometimes paler in subterminal area; hindwing rounded, drab or metallic copper; hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth, sometimes banded.

Similar taxa: Amphipyryni are most easily identified by wing pattern.

Taxonomic references: Handfield 1999

Noctuidae, Amphipyrinae, Psaphidini (Fig. 269)

Superfamily: Noctuoidea

Number of Canadian species: 13 spp. across Canada, more diverse in southern areas.

Genera: *Acopa*, *Brachionycha*, *Copivaleria*, *Feralia*, *Psaphida*

Abundance: uncommon, at lights.

Quick recognition: Stout, hairy noctuids often with acutely pointed forewings, pattern either subdued or complex, sometimes green, most species active in early spring. Specific identification is easy.

Diagnosis: HEAD: ocelli present or absent; chaetosemata absent; head scales rough, rarely smooth on frons; proboscis naked; labial palps ascending or porrect, short, hairy; antenna filiform or pectinate, two scale rows per segment, half forewing length or greater. THORAX: with metathoracic tympanum; wings heteroneurous, forewing often acutely pointed, sometimes broadly triangular with more squared apex, pattern either subdued or complex, sometimes green, reniform spot usually prominent; hindwing rounded to squared, often with diffuse shading and a discal spot; hind tibial spurs short, hind tarsal spines present. ABDOMEN: hairy, rarely with dorsal scale tuft, sometimes boldly patterned.

Similar taxa: Psaphidini can be separated from other really hairy noctuids by wing shape and pattern.

Taxonomic references: Poole 1995 (all except *Acopa*); Troubridge & Lafontaine 2004c (*Acopa* and western spp.)

Noctuidae, Amphipyriinae, Stiriini (Fig. 270)

Superfamily: Noctuoidea

Number of Canadian species: 10 spp. from southern BC to southern ON.

Genera: *Annaphila*, *Azenia*, *Cirrhophanus*, *Plagiomimicus*, *Stiria*

Abundance: rare, at lights, some species diurnal.

Quick recognition: Moderately slender noctuids, forewing triangular, either bright yellow with grey or brown markings, or grey to brown, hindwing sometimes boldly patterned. Specific identification is easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough or smooth; proboscis naked; labial palps ascending or porrect, usually short, usually tufted; antenna filiform, rarely with long sensillae, two scale rows per segment, half forewing length or less. THORAX: with metathoracic tympanum; wings heteroneurous, forewing triangular, some species bright yellow with brown or grey markings, others grey to brown, sometimes with prominent lines; hindwing rounded to squared, usually drab, sometimes boldly patterned; hind tibial spurs usually long, hind tarsal spines present, sometimes difficult to see. ABDOMEN: smooth.

Similar taxa: Stiriini have fairly distinct wing markings.

Taxonomic references: Poole 1995 (all except *Annaphila*); Troubridge & Lafontaine 2004c (*Annaphila* and western spp.)

Noctuidae, Oncocnemidinae (Fig. 271)

Superfamily: Noctuoidea

Number of Canadian species: 62 spp. throughout Canada, most diverse in the West.

Genera: *Behrensia*, *Calophasia*, *Catabena*, *Pleromelloida*, *Pseudacontia*, *Sympistis*

Abundance: uncommon to common, at lights, some species diurnal.

Quick recognition: A diverse group of stout noctuids, a channel is cut across the top of the base of the abdomen, best viewed laterally. Specific identification can be very challenging in *Sympistis*, but is otherwise easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough, rarely smooth; proboscis naked; labial palps ascending, usually short, usually tufted; antenna filiform, rarely pectinate with long sensillae, two scale rows per segment, half forewing length or greater. THORAX: with metathoracic tympanum, sometimes with dorsal scale tuft; wings heteroneurous, forewing triangular to rectangular, variable in pattern, usually grey, lines and spots often prominent, sometimes with dark dashes; hindwing rounded to squared, sometimes boldly patterned; hind tibial spurs short, hind tibial spines rarely present, hind tarsal spines present. ABDOMEN: smooth to hairy, rarely with dorsal scale tufts.

Similar taxa: The channel across the base of the abdomen will separate Oncocnemidinae from most other noctuids. The other noctuids with this channel like some Stiriini and Agaristinae have distinctively different wing patterns. Taxonomic references: Troubridge 2008 (*Sympistis*); Troubridge & Lafontaine 2004c (most western spp.); Handfield 1999 (eastern spp.)

Noctuidae, Agaristinae (Fig. 272)

Superfamily: Noctuoidea

Number of Canadian species: 7 spp. throughout Canada, most diverse in southern ON.

Genera: *Alypia*, *Androloma*, *Eudryas*, *Psychomorpha*

Abundance: uncommon to rare, most species diurnal, some at lights.

Quick recognition: Most species jet black with large white, yellow or red blotches on both wings, *Eudryas* with a large white blotch through most of the forewing and a yellow hindwing. Specific identification is usually easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough, rarely smooth; eye rarely slightly hairy; proboscis naked; labial palps ascending or porrect, usually short, hairy; antenna often with an elongate club, rarely pectinate with long sensillae, two scale rows per segment, rarely scale-less, half forewing length or greater. THORAX: with metathoracic tympanum, usually furry, often with brightly coloured tegulae, rarely with dorsal scale tuft; wings heteroneurous, forewing usually triangular, in most species jet black with large white or yellow blotches, in

Eudryas more mottled grey or brown with a broad white blotch through most of the wing; hindwing rounded to squared, jet black with white blotches in most, rarely with a large red blotch, in Eudryas bright yellow with a brownish border; hind tibial spurs short, hind tibial spines sometimes present, hind tarsal spines present. ABDOMEN: usually hairy, rarely with dorsal scale tufts, sometimes boldly patterned.

Similar taxa: The combination of boldly marked wings and size are unmistakable.

Taxonomic references: Powell & Opler 2009 (most western spp.); Covell 1984 (eastern spp.)

Noctuidae, *Condicinae* (Fig. 273)

Superfamily: Noctuoidea

Number of Canadian species: 12 spp. throughout Canada.

Genera: *Condica*, *Crambodes*, *Homophoberia*, *Leuconycta*, *Ogdoconta*, *Perigea*

Abundance: uncommon to common, at lights.

Quick recognition: Somewhat slender-bodied noctuids with variable wing pattern, usually consisting of typical lines and spots, sometimes streaky. Specific identification is usually easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough or smooth on vertex, smooth on frons; proboscis naked; labial palps ascending or porrect, short, slender; antenna filiform, sometimes with long sensillae, two scale rows per segment, half forewing length or less. THORAX: with metathoracic tympanum, usually with dorsal scale tuft; wings heteroneurous, forewing usually triangular, sometimes elongate, pattern variable, lines and spots often prominent, markings sometimes streaky; hindwing squared, drab, sometimes with discal lunule; hind tibial spurs long, hind tarsal spines present. ABDOMEN: smooth, usually with dorsal scale tuft.

Similar taxa: *Condicinae* are best separated from similar noctuids by wing pattern.

Taxonomic references: Troubridge & Lafontaine 2004c (western spp.); Handfield 1999 (eastern spp.)

Noctuidae, *Heliiothinae* (Fig. 274)

Superfamily: Noctuoidea

Number of Canadian species: 42 spp. across Canada, most diverse in the south and west.

Genera: *Eutricopis*, *Helicoverpa*, *Heliocheilus*, *Heliiothis*, *Melaporphyria*, *Pyrrhia*, *Schinia*

Abundance: uncommon to common, most species diurnal at flowers, some species come to lights.

Quick recognition: Small to medium-sized noctuids with variable but usually boldly patterned or brightly coloured wings. Specific identification is usually easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough, rarely smooth on frons; proboscis naked; labial palps usually ascending, usually short, tufted;

antenna filiform, sometimes with long sensillae, two scale rows per segment, variable in length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing variable in shape, usually triangular, pattern variable, usually boldly patterned or brightly coloured, lines and spots often prominent; hindwing rounded to squared, often boldly patterned or brightly coloured; hind tibial spurs variable, hind tibial spines often present, hind tarsal spines present. ABDOMEN: smooth, rarely with dorsal scale tuft. Similar taxa: *Heliiothinae* are usually easily separated from other noctuids by the wing pattern.

Taxonomic references: Troubridge & Lafontaine 2004c, d

Noctuidae, *Eriopinae* (Fig. 275)

Superfamily: Noctuoidea

Number of Canadian species: 2 spp. MB to NF.

Genera: *Callopietria*

Abundance: uncommon to common, at lights.

Quick recognition: Small noctuids with wings held sharply roof-like at rest, forewing brown with large silver spots or mottled brown and purple, abdomen with a small dorsal scale tuft. Specific identification is easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough, rarely smooth on frons; proboscis naked; labial palps usually ascending, short, fairly slender; antenna filiform, with long sensillae, two scale rows per segment, roughly half forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing triangular, sometimes with a hook at anal angle, brown with large silver spots or mottled brown and purple; hindwing squared, drab; hind tibial spurs variable, hind tarsal spines present. ABDOMEN: smooth, with small dorsal scale tuft. Similar taxa: *Eriopinae* are unmistakable because of their distinctive forewing pattern.

Taxonomic references: Handfield 1999

Noctuidae, *Bryophilinae* (Fig. 276)

Superfamily: Noctuoidea

Number of Canadian species: 2 spp. in BC and adjacent AB.

Genera: *Cryphia*

Abundance: uncommon to rare, at lights.

Quick recognition: Fairly small, slender noctuids with mottled greyish wings, antemedial and postmedial lines as well as orbicular, claviform, and reniform spots usually prominent, a small dorsal scale tuft present on abdomen. Specific identification is challenging.

Diagnosis: HEAD: ocelli usually visible; chaetosemata absent; head scales rough on vertex, smooth on frons; proboscis naked; labial palps porrect, short, slender; antenna filiform, with long sensillae, two scale rows per segment, roughly half forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing with a slightly acute apex, mottled grey with

prominent antemedial and postmedial lines as well as orbicular, claviform, and reniform spots; hindwing squared, drab; hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth, with small dorsal scale tuft.

Similar taxa: Bryophilinae are best recognized by a combination of forewing pattern and dorsal abdominal scale tuft.

Taxonomic references: Powell & Opler 2009

Noctuidae, Noctuinae, Pseudeustrotiini (Fig. 277)

Superfamily: Noctuoidea

Number of Canadian species: 2 spp. from AB to NF.

Genera: *Anterastria*, *Pseudeustrotia*

Abundance: common, at lights.

Quick recognition: Small slender noctuids with blunt wings, forewing either with a slanted pink bar from costa to middle or evenly dark with white reniform spot and white costal tips of postmedial and subterminal lines. Specific identification is easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales smooth, rarely rough on vertex; proboscis naked; labial palps ascending, short, slender; antenna filiform, sometimes with long sensillae, two scale rows per segment, half forewing length or less. THORAX: with metathoracic tympanum; wings heteroneurous, forewing blunt with square apex, either with a slanted pink bar from costa to middle or evenly dark with white reniform spot and white costal tips of postmedial and subterminal lines; hindwing squared with slight indentation in upper half of outer margin, drab; hind tibial spurs long, hind tarsal spines present. ABDOMEN: smooth, with small dorsal scale tuft, rarely boldly patterned.

Similar taxa: Pseudeustrotiini can be separated from other similar noctuids by forewing pattern.

Taxonomic references: Handfield 1999

Noctuidae, Noctuinae, Phosphilini (Fig. 278)

Superfamily: Noctuoidea

Number of Canadian species: 2 spp. in extreme southern MB and ON.

Genera: *Phosphila*

Abundance: common, at lights.

Quick recognition: A stout medium-sized noctuid with mottled green and grey forewing and large white reniform spot or mottled brown with a slightly darker medial area and prominent dark dashes in the lower medial and postmedial areas.

Diagnosis: HEAD: ocelli usually visible; chaetosemata absent; head scales rough on vertex, smooth on frons; proboscis naked; labial palps ascending or porrect, variable in length, slender; antenna filiform, two scale rows per segment, half forewing length or greater. THORAX: with metathoracic tympanum; wings heteroneurous, forewing triangular, either mottled green and grey, reniform spot

large and white, or mottled brown with a slightly darker medial area and prominent dark dashes in the lower medial and postmedial areas; hindwing drab grey with some dark line on outer half; hind tibial spurs long, hind tarsal spines present. ABDOMEN: smooth, usually with dorsal scale tuft.

Similar taxa: Our species of Phosphilini are easy to recognize by forewing pattern.

Taxonomic references: Covell 1984

Noctuidae, Noctuinae, Prodenini (Fig. 279)

Superfamily: Noctuoidea

Number of Canadian species: 4 spp. across Canada.

Genera: *Spodoptera*

Abundance: common to rare, at lights, migratory.

Quick recognition: A stout medium-sized noctuid with mottled forewing pattern and broad white hindwing with sharp black veins.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales usually rough on vertex, usually smooth on frons; proboscis naked; labial palps usually ascending, short, usually slender; antenna filiform, two scale rows per segment, variable in length. THORAX: with metathoracic tympanum, often with dorsal scale tuft; wings heteroneurous, forewing elongate, usually with a complex mottled pattern; hindwing broad, white with prominent dark veins; hind tibial spurs variable in length, hind tarsal spines present. ABDOMEN: smooth to hairy, usually with dorsal scale tuft.

Similar taxa: Prodenini can be separated from other noctuids by wing pattern and shape.

Taxonomic references: Powell & Opler 2009 (western spp.); Handfield 1999 (eastern spp.)

Noctuidae, Noctuinae, Elaphriini (Fig. 280)

Superfamily: Noctuoidea

Number of Canadian species: 5 spp. across Canada.

Genera: *Elaphria*, *Galgula*

Abundance: common, at lights.

Quick recognition: Fairly small noctuids with prominent postmedial line and reniform spot. Specific identification is easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough or smooth on vertex, smooth on frons; proboscis naked; labial palps usually ascending, short, slender; antenna filiform, usually with long sensillae, two scale rows per segment, roughly half forewing length. THORAX: with metathoracic tympanum, sometimes with dorsal scale tuft; wings heteroneurous, forewing rectangular or triangular, variable in pattern, reniform spot and postmedial line typically prominent; hindwing squared, drab; hind tibial spurs variable in length, hind tarsal spines present. ABDOMEN: smooth, rarely with dorsal scale tuft. Similar taxa: Elaphriini can be separated from similarly

sized noctuids by forewing pattern.

Taxonomic references: Handfield 1999

Noctuidae, Noctuinae, Caradrinini (Fig. 281)

Superfamily: Noctuoidea

Number of Canadian species: 10 spp. across Canada.

Genera: *Caradrina*, *Protoperigea*, *Proxenus*

Abundance: uncommon, at lights.

Quick recognition: Fairly small noctuids with subdued pattern. Specific identification can be challenging.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough, rarely smooth on frons; proboscis naked; labial palps usually ascending, usually short, slender or tufted; antenna filiform, sometimes with long sensillae, two scale rows per segment, usually longer than half forewing length. THORAX: with metathoracic tympanum, sometimes with dorsal scale tuft; wings heteroneurous, forewing rectangular or triangular, sometimes fairly elongate, variable in pattern, though usually subdued; hindwing broad, squared, usually pale; hind tibial spurs short, hind tarsal spines present. ABDOMEN: smooth.

Similar taxa: Caradrinini can be difficult to characterize, though some species can be easily separated from other noctuids by wing pattern.

Taxonomic references: Troubridge & Lafontaine 2004c, d

Noctuidae, Noctuinae, Dypterygiini (Fig. 282)

Superfamily: Noctuoidea

Number of Canadian species: 3 spp. from AB to NS.

Genera: *Dypterygia*, *Magusa*, *Trachea*

Abundance: uncommon to rare, at lights.

Quick recognition: Stout noctuids with varying pattern. Specific identification is easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough; proboscis naked; labial palps ascending or porrect, short, slender or tufted; antenna filiform, sometimes with long sensillae, two scale rows per segment, greater than half forewing length. THORAX: with metathoracic tympanum, at least with slight dorsal scale tuft; wings heteroneurous, forewing somewhat rectangular, sometimes elongate, variable in pattern; hindwing rounded or broadly triangular, drab; hind tibial spurs long, hind tarsal spines present. ABDOMEN: smooth, sometimes with dorsal scale tuft.

Similar taxa: The three Dypterygiini can be recognized by their wing pattern.

Taxonomic references: Handfield 1999

Noctuidae, Noctuinae, Actinotiini (Fig. 283)

Superfamily: Noctuoidea

Number of Canadian species: 4 spp. in BC and from MB to NF.

Genera: *Alastria*, *Iodopepla*, *Nedra*

Abundance: uncommon to rare, at lights.

Quick recognition: Stout noctuids with usually with streaky forewing pattern and U-shaped reniform spot. Specific identification is easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough; proboscis naked; labial palps ascending, short, slender or tufted; antenna filiform, usually with long sensillae, two scale rows per segment, usually greater than half forewing length. THORAX: with metathoracic tympanum, often with dorsal scale tuft; wings heteroneurous, forewing somewhat rectangular, pattern usually streaky, reniform spot usually U-shaped; hindwing squared to rounded, drab; hind tibial spurs variable, hind tarsal spines present. ABDOMEN: hairy to smooth, sometimes with dorsal scale tuft.

Similar taxa: All of our Actinotiini have distinctive forewing patterns.

Taxonomic references: Lafontaine & Troubridge 2004 (*Alastria*); Handfield 1999 (*Iodopepla*); Troubridge & Lafontaine 2004c (*Nedra*)

Noctuidae, Noctuinae, Phlogophorini (Fig. 284)

Superfamily: Noctuoidea

Number of Canadian species: 4 spp. across Canada

Genera: *Conservula*, *Euplexia*, *Phlogophora*

Abundance: common, at lights.

Quick recognition: Stout noctuids often with a broad V-shaped blotch through the centre of the forewing, at rest the costal edge forms a distinct crease. Specific identification is easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough; proboscis naked; labial palps usually ascending, short, slender or tufted; antenna filiform, often with long sensillae, two scale rows per segment, usually greater than half forewing length. THORAX: with metathoracic tympanum, with dorsal scale tuft; wings heteroneurous, forewing triangular, sometimes with an acute apex, often scalloped, often light brown with large dark brown V-shaped blotch through centre of wing, reniform spot usually prominent; hindwing squared to triangular, often slightly scalloped, with some diffuse lines; hind tibial spurs usually short, hind tarsal spines present. ABDOMEN: hairy to smooth, with dorsal scale tuft.

Similar taxa: Phlogophorini can be recognized by the forewing pattern and resting posture.

Taxonomic references: Handfield 1999

Noctuidae, Noctuinae, Apameini (Fig. 285)

Superfamily: Noctuoidea

Number of Canadian species: 129 spp. throughout Canada

Genera: *Achatodes*, *Amphipoea*, *Apamea*, *Benjaminiola*, *Capsula*, *Chortodes*, *Eremobina*, *Helotropha*, *Hydraecia*, *Lateroligia*, *Lemmeria*, *Loscopia*, *Macronoctua*, *Meropleon*, *Neoligia*, *Papaipema*, *Resapamea*, *Rhizedra*, *Spartiniphaga*, *Xylomoia*

Abundance: common, at lights.

Quick recognition: A diverse group of usually stout noctuids. Specific identification is challenging in some groups, but usually easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough, rarely smooth on frons; proboscis naked; labial palps usually ascending or porrect, usually short, usually tufted; antenna filiform, usually with long sensillae, two scale rows per segment, usually greater than half forewing length. THORAX: with metathoracic tympanum, often with dorsal scale tuft; wings heteroneurous, forewing usually somewhat rectangular with bulging outer margin, pattern variable; hindwing variable in shape and pattern, usually drab; hind tibial spurs variable, hind tarsal spines present. ABDOMEN: hairy to smooth, often with dorsal scale tuft.

Similar taxa: Apameini are difficult to characterize, it is easiest to eliminate less diverse tribes first.

Taxonomic references: Troubridge & Lafontaine 2004c (most western spp.); Handfield 1999 (most eastern spp.); Mikkola *et al.* 2009 (*Apamea*, *Laterologia*); Troubridge & Lafontaine 2002 (*Neologia*)

Noctuidae, Noctuinae, Arzamini (Fig. 286)

Superfamily: Noctuoidea

Number of Canadian species: 3 spp. across Canada

Genera: *Bellura*

Abundance: common, at lights, associated with wetlands.

Quick recognition: Stout brown large to medium-sized noctuids, abdomen long, reniform spot slanted. Specific identification is easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough; proboscis naked; labial palps ascending or porrect, short, tufted; antenna usually pectinate, often with long sensillae, two scale rows per segment, less than half forewing length. THORAX: with metathoracic tympanum, with dorsal scale tuft; wings heteroneurous, forewing usually triangular, with acute or square apex, brown with darker markings, reniform spot slanted towards apex; hindwing rounded with square apex, brown with dark discal spot; hind tibial spurs variable, hind tarsal spines present. ABDOMEN: long, hairy.

Similar taxa: Arzamini are easily recognized by the forewing shape and pattern.

Taxonomic references: Handfield 1999

Noctuidae, Noctuinae, Xylenini (Fig. 287)

Superfamily: Noctuoidea

Number of Canadian species: 131 spp. throughout Canada

Genera: *Agrochola*, *Anathix*, *Andropolia*, *Aseptis*, *Brachylomia*, *Cerapoda*, *Chaetagnela*, *Chytonix*, *Cosmia*, *Dryotype*, *Enargia*, *Epidemas*, *Epiglaea*, *Eucirroedia*, *Eupsilia*, *Fagitana*, *Fishia*, *Hillia*, *Homoglaea*, *Hyppa*, *Ipimorpha*, *Litholomia*, *Lithomoia*, *Lithophane*, *Mesogona*,

Metaxaglaea, *Mniotype*, *Parastichtis*, *Platypolia*, *Properigea*, *Psectraglaea*, *Pseudanarta*, *Pseudobryomima*, *Pyreferra*, *Rhizagrotis*, *Sutyna*, *Ufeus*, *Xanthia*, *Xylena*, *Xylotype*, *Zothea*

Abundance: common, at lights.

Quick recognition: A very diverse group of usually stout noctuids, several genera make up the bulk of the overwintering noctuid fauna. Specific identification is challenging in some groups, but usually easy.

Diagnosis: HEAD: ocelli present; chaetosemata absent; head scales rough, rarely smooth on frons; proboscis naked, rarely reduced; labial palps ascending or porrect, usually short, usually tufted; antenna filiform, rarely pectinate, usually with long sensillae, two scale rows per segment, variable in length. THORAX: with metathoracic tympanum, sometimes with dorsal scale tuft; wings heteroneurous, forewing usually rectangular, pattern variable; hindwing variable in shape and pattern, usually drab; hind tibial spurs usually short, hind tibial spines sometimes present, hind tarsal spines present. ABDOMEN: usually hairy, rarely with dorsal scale tuft.

Similar taxa: Xylenini are difficult to characterize, it is easiest to eliminate less diverse tribes first.

Taxonomic references: Troubridge & Lafontaine 2004c, d (most spp.); Troubridge & Lafontaine 2007 (*Brachylomia*); Lafontaine & Troubridge 2003 (*Cosmia*); Schmidt 2010 (*Enargia*); Troubridge & Lafontaine 2004e (*Hyppa*); Troubridge 2006, Troubridge & Lafontaine 2003 (some *Lithophane*); Crabo & Hammond 1997 (*Mesogona*)

Noctuidae, Noctuinae, Orthosiini (Fig. 288)

Superfamily: Noctuoidea

Number of Canadian species: 32 spp. throughout Canada

Genera: *Acerra*, *Achatia*, *Admetovis*, *Crocigrapha*, *Egira*, *Himella*, *Morrisonia*, *Orthosia*, *Stretchia*

Abundance: common, at lights.

Quick recognition: Stout noctuids, usually with hairy eyes, relatively small abdomen, most species fly early in the year. Specific identification is usually fairly easy.

Diagnosis: HEAD: ocelli present; eyes usually hairy; chaetosemata absent; head scales rough; proboscis naked; labial palps usually porrect, short, tufted; antenna filiform, sometimes pectinate, often with long sensillae, two scale rows per segment, usually more than half forewing length. THORAX: with metathoracic tympanum, usually with dorsal scale tuft; wings heteroneurous, forewing fairly stout, sometimes with elongate apex, pattern variable; hindwing rounded to squared, usually drab; hind tibial spurs short, hind tarsal spines present. ABDOMEN: relatively short, hairy, rarely with dorsal scale tuft.

Similar taxa: Orthosiini can be separated from other noctuids with hairy eyes by wing pattern and the relatively short abdomen.

Taxonomic references: Troubridge & Lafontaine 2004c

(western spp.); Handfield 1999 (eastern spp.)

Noctuidae, Noctuinae, Tholerini (Fig. 289)

Superfamily: Noctuoidea

Number of Canadian species: 3 spp. throughout Canada

Genera: *Cerapteryx*, *Nephelodes*, *Tholera*

Abundance: common, at lights.

Quick recognition: Stout noctuids with hairy eyes and pectinate antennae, forewing either shiny bronze or greyish with pale streaks. Specific identification is easy.

Diagnosis: HEAD: ocelli present; eyes hairy; chaetosemata absent; head scales rough; proboscis naked; labial palps ascending, short, tufted; antenna pectinate, usually with long sensillae, two or more scale rows per segment, usually less than half forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing triangular with square apex, pattern either shiny bronze or grey with pale streaks; hindwing squared, with some subdued pattern; hind tibial spurs usually short, hind tarsal spines present. ABDOMEN: hairy.

Similar taxa: Tholerini can be separated from other noctuids with hairy eyes by wing pattern and having pectinate antennae.

Taxonomic references: Morris 1979 (*Cerapteryx*); Handfield 1999, Powell & Opler 2009 (*Nephelodes*); Troubridge & Lafontaine 2004c (*Tholera*)

Noctuidae, Noctuinae, Hadenini (Fig. 290)

Superfamily: Noctuoidea

Number of Canadian species: 69 spp. throughout Canada

Genera: *Afotella*, *Anarta*, *Coranarta*, *Dargida*, *Escaria*, *Hada*, *Hadena*, *Hadenella*, *Lacanobia*, *Mamestra*, *Melanchra*, *Papestra*, *Polia*, *Scotogramma*, *Sideridis*, *Spiramater*, *Trichordestra*

Abundance: common, at lights.

Quick recognition: Stout noctuids with hairy eyes, most species with a dorsal abdominal scale tuft. Specific identification is challenging in some genera.

Diagnosis: HEAD: ocelli present; eyes hairy; chaetosemata absent; head scales rough, rarely smooth on frons; proboscis naked; labial palps variable in orientation, short, usually tufted; antenna filiform, usually with long sensillae, two scale rows per segment, usually greater than half forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing usually rectangular, pattern variable; hindwing variable in shape and pattern; hind tibial spurs usually short, hind tarsal spines present. ABDOMEN: hairy, usually with dorsal scale tuft.

Similar taxa: Hadenini can be separated from other noctuids with hairy eyes by wing pattern and the usual presence of a dorsal abdominal scale tuft.

Taxonomic references: Lafontaine *et al.* 1987 (*Coranarta*); Troubridge & Crabo 2002 (*Hada*, *Hadena*); McCabe 1980 (*Lacanobia*, *Melanchra*, *Papestra*, *Polia*, *Spiramater*,

Trichordestra); Troubridge & Lafontaine 2004c (western spp.); Handfield 1999 (eastern spp.)

Noctuidae, Noctuinae, Leucaniini (Fig. 291)

Superfamily: Noctuoidea

Number of Canadian species: 18 spp. throughout Canada

Genera: *Leucania*, *Mythimna*

Abundance: common, at lights, usually in open habitats.

Quick recognition: Stout noctuids with hairy eyes, most species with pale yellow to grey streaky forewing pattern. Specific identification can be challenging in *Leucania*.

Diagnosis: HEAD: ocelli present; eyes hairy; chaetosemata absent; head scales rough; proboscis naked; labial palps porrect or ascending, short, tufted; antenna filiform, sometimes with long sensillae, two scale rows per segment, greater than half forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing usually somewhat elongate, pale yellow, brown or grey, pattern usually streaky, rarely without streaks and with dark dots forming postmedial and antemedial lines; hindwing variable in shape, usually drab with darker veins; hind tibial spurs short, hind tarsal spines present. ABDOMEN: hairy.

Similar taxa: Leucaniini can be separated from other noctuids with hairy eyes by wing pattern.

Taxonomic references: Troubridge & Lafontaine 2004c (most western spp.); Handfield 1999 (eastern spp.)

Noctuidae, Noctuinae, Eriopygini (Fig. 292)

Superfamily: Noctuoidea

Number of Canadian species: 86 spp. throughout Canada

Genera: *Anhimella*, *Homorthodes*, *Hydroeciodes*, *Lacinipolia*, *Lasionycta*, *Neleucania*, *Orthodes*, *Protorthodes*, *Pseudorthodes*, *Trichocerapoda*, *Tricholita*, *Ulolonche*, *Zosteropoda*

Abundance: common, at lights.

Quick recognition: Small stout noctuids usually with hairy eyes, pattern usually drab. Specific identification can be difficult.

Diagnosis: HEAD: ocelli usually present; eyes usually hairy; chaetosemata absent; head scales rough; proboscis naked; labial palps usually porrect or ascending, usually short, tufted; antenna filiform, sometimes pectinate, sometimes with long sensillae, two scale rows per segment, usually greater than half forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing usually stout with square apex, usually brown or grey, reniform and orbicular spots usually present, antemedial, postmedial, and subterminal lines usually present; hindwing squared, drab; hind tibial spurs short, hind tarsal spines present. ABDOMEN: hairy, dorsal scale tuft rarely present.

Similar taxa: Eriopygini can be separated from other noctuids with hairy eyes by wing pattern and by their smaller size.

Taxonomic references: Troubridge & Lafontaine 2004c

(most western spp.); Handfield 1999 (most eastern spp.); Crabo & Lafontaine 2009 (*Lasionycta*); McCabe 1980 (some *Orthodes*)

Noctuidae, Noctuinae, Noctuini (Fig. 293)

Superfamily: Noctuoidea

Number of Canadian species: 306 spp. throughout Canada, most diverse in the West

Genera: *Abagrotis*, *Actebia*, *Adelphagrotis*, *Agnorisma*, *Agrotis*, *Anaplectoides*, *Anicla*, *Aplectoides*, *Cerastis*, *Chersotis*, *Choephora*, *Coenophila*, *Copablepharon*, *Cryptocala*, *Diarsia*, *Dichagyris*, *Eucoptocnemis*, *Eueretagrotis*, *Eurois*, *Euxoa*, *Feltia*, *Graphiphora*, *Hemipachnobia*, *Lycophotia*, *Noctua*, *Ochropleura*, *Parabagrotis*, *Parabarrovia*, *Paradiarsia*, *Peridroma*, *Prognorisma*, *Pronoctua*, *Protogygia*, *Protogygia*, *Protolampra*, *Pseudohermonassa*, *Rhyacia*, *Setagrotis*, *Spaelotis*, *Tesagrotis*, *Xestia*

Abundance: common to abundant, at lights, especially in open areas.

Quick recognition: Stout noctuids with a spiny hind tibia, forewings usually tightly overlapping and flat over the back at rest. Specific identification can be very difficult in some genera.

Diagnosis: HEAD: ocelli present; chaetosemata absent;

head scales rough, rarely smooth; proboscis naked; labial palps usually porrect or ascending, usually short, usually tufted; antenna filiform, rarely pectinate, often with long sensillae, two scale rows per segment, usually greater than half forewing length. THORAX: with metathoracic tympanum; wings heteroneurous, forewing usually elongate with square apex, usually with prominent reniform and orbicular spots, often with streaks; hindwing squared, usually drab, rarely boldly patterned with black and yellow; hind tibial spurs short, hind tibial spines present, rarely absent, hind tarsal spines present. ABDOMEN: hairy to smooth, dorsal scale tuft rarely present.

Similar taxa: Noctuini are easily separated from other noctuids by the spiny hind tibia.

Taxonomic references: Lafontaine 1998 (*Abagrotis*, *Adelphagrotis*, *Agnorisma*, *Anaplectoides*, *Aplectoides*, *Cerastis*, *Chersotis*, *Choephora*, *Coenophila*, *Cryptocala*, *Diarsia*, *Eueretagrotis*, *Eurois*, *Graphiphora*, *Hemipachnobia*, *Lycophotia*, *Noctua*, *Ochropleura*, *Parabagrotis*, *Parabarrovia*, *Paradiarsia*, *Prognorisma*, *Pronoctua*, *Protolampra*, *Pseudohermonassa*, *Rhyacia*, *Setagrotis*, *Spaelotis*, *Tesagrotis*, *Xestia*); Lafontaine 2004 (*Actebia*, *Agrotis*, *Anicla*, *Copablepharon*, *Eucoptocnemis*, *Feltia*, *Peridroma*, *Protogygia*); Lafontaine 1987 (most *Euxoa*); Lafontaine & Troubridge 2010 (some *Euxoa*)



Fig 1. Vertex of head.



Fig. 2. Roughly scaled head.



Fig. 3. Smoothly scaled head.



Fig. 4. Frons of head.



Fig. 5. Compound eye.



Fig. 6. Hairy compound eye.



Fig. 7. Ocellus.



Fig. 8. Eye cap.



Fig. 9. Antenna with no scales.



Fig. 10. Antenna with 1 scale row per antennal segment.



Fig. 11. Antenna with 2 scale rows per antennal segment.



Fig. 12. Antenna with scales not in rows.



Fig. 13. Antenna less than $\frac{1}{2}$ forewing length.



Fig. 14. Antenna greater than $\frac{1}{2}$ forewing length.



Fig. 15. Antenna greater than the forewing length.



Fig. 16. Antenna greater than twice the forewing length.



Fig. 17. Antennal sensillae.

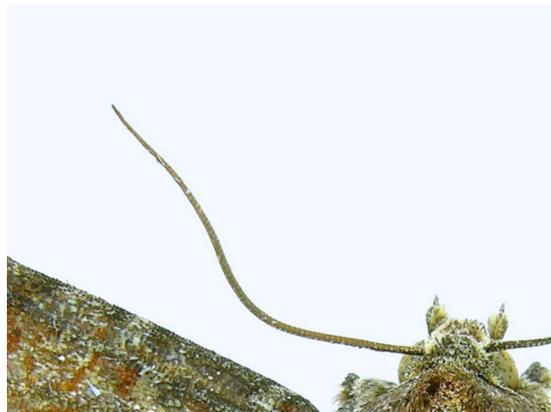


Fig. 18. Filiform antenna



Fig. 19. Pectinate antenna.



Fig. 20. Antenna with an elongate club.



Fig. 21. Hooked antennae.



Fig. 22. Antenna with an abrupt club.



Fig. 23. Ascending labial palps.



Fig. 24. Porrect labial palps.



Fig. 25. Descending labial palps.



Fig. 26. Un-tufted labial palps.



Fig. 27. Long maxillary palps.



Fig. 28. Short maxillary palps.



Fig. 29. Naked proboscis.



Fig. 30. Scaled proboscis.



Fig. 31. Proboscis absent.



Fig. 32. Dorsal thoracic scale tuft.



Fig. 33. Wings reduced.



Fig. 34. Wings normally-sized.



Fig. 35. Raised scales on the forewing.



Fig. 36. Costal fold.



Fig. 37. Notched wings.



Fig. 38. Forewing with a single colour.



Fig. 39. Forewing with more than one colour.



Fig. 40. Reniform spot.



Fig. 41. Orbicular spot.



Fig. 42. Claviform spot.



Fig. 43. Discal spot.



Fig. 44. Antemedian line.



Fig. 45. Median line.



Fig. 46. Postmedian line.



Fig. 47. Subterminal line.



Fig. 48. Forewing with streaks.



Fig. 49. Long hindwing fringe.



Fig. 50. Short hindwing fringe.



Fig. 51. Hindwing tail.



Fig. 52. Boldly marked hindwing of similar pattern to forewing.



Fig. 53. Drab hindwing of different pattern to forewing.



Fig. 54. Discal lunule.

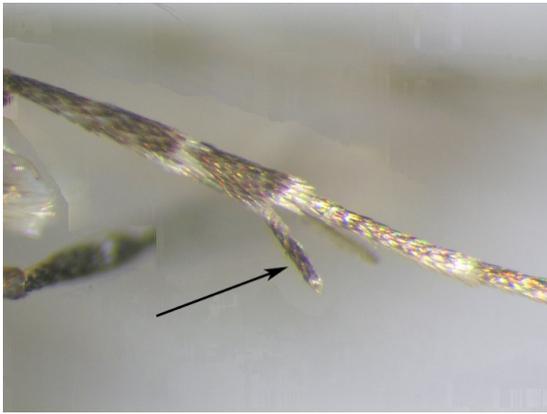


Fig. 55. Tibial spur.



Fig. 56. Tibial spines.



Fig. 57. Tarsal spines present.



Fig. 58. Tarsal spines absent.



Fig. 59. Thorax width.



Fig. 60. Forewing length.



Fig. 61. Forewing width.



Fig. 62. Hindwing width.



Fig. 63. Ratio forewing length : thorax width.



Fig. 64. Ratio forewing length : forewing width.



Fig. 65. Ratio forewing width : hindwing width.



Fig. 66. Sclerotized ovipositor.



Fig. 67. Dorsal abdominal scale tuft.



Fig. 68. Boldly patterned abdomen.



Fig. 69. Drab abdomen.



Fig. 70. Micropterigidae: *Epimartyria auricrinella*



Fig. 71. Eriocraniidae: *Eriocrania semipurpurella*



Fig. 72. Acanthopteroctetidae: *Acanthopteroctetes bimaculata*.



Fig. 73. Hepialidae: *Sthenopsis purpurascens*



Fig. 74. Nepticulidae: *Stigmella corylifoliella*



Fig. 75. Opostegidae: *Pseudopostega* sp.



Fig. 76. Heliozelidae: *Antispila freemani*



Fig. 77. Adelidae: *Adela ridingsella*



Fig. 78. Prodoxidae, Lamproniinae: *Lampronia russatella*



Fig. 79. Prodoxidae, Prodoxinae: *Prodoxus quinquepunctella*



Fig. 80. Incurvariidae: *Paraclemensia acerifoliella*



Fig. 81. Tischeriidae: *Coptotriche citrinipennella*



Fig. 82. Tineidae: *Haplotinea insectella*



Fig. 83. Acrolophidae: *Amydria effrentella*



Fig. 84. Psychidae: *Dahlica walshella*



Fig. 85. Douglasiidae: *Tinagma obscuropasciella*



Fig. 86. Bucculatricidae: *Bucculatrix canadensisella*



Fig. 87. Gracillariidae, Gracillariinae: *Parornix* sp.



Fig. 88. Gracillariidae, Lithocolletinae: *Cameraria aceriella*



Fig. 89. Gracillariidae, Phyllocnistinae: *Phyllocnistis populiella*



Fig. 90. Yponomeutidae, Attevinae: *Atteva aurea*



Fig. 91. Yponomeutidae, Yponomeutinae:
Swammerdamia sp.



Fig. 92. Yponomeutidae, Argyresthiidae:
Argyresthia pygmaeella



Fig. 93. Ypsolophidae, Ypsolophinae:
Ypsolopha canariella



Fig. 94. Ypsolophidae, Ochsenheimeriinae:
Ochsenheimeria vaculella



Fig. 95. Plutellidae: *Plutella xylostella*



Fig. 96. Acrolepiidae: *Acrolepiopsis assectella*



Fig. 97. Glyphipterigidae: *Glyphipterix haworthana*



Fig. 98. Heliodinidae: *Neoheliodines nyctaginella*



Fig. 99. Bedelliidae: *Bedellia somnulenta*



Fig. 100. Lyonetiidae: *Lyonetia prunifoliella*



Fig. 101. Elachistidae, Stenomatinae: *Antaeotricha leucillana*



Fig. 102. Elachistidae, Ethmiinae: *Ethmia monticola*



Fig. 103. Elachistidae, Depressariinae:
Agonopterix fusciterminella



Fig. 104. Elachistidae, Elachistinae:
Elachista sp.



Fig. 105. Elachistidae, Agonoxenidae:
Blastodacna curvilineella



Fig. 106. Xyloryctidae, Scythridinae: *Scythris eboracensis*



Fig. 107. Chimbachidae: *Dasytroma salicella* male



Fig. 108. Chimbachidae: *Dasytroma salicella* female



Fig. 109. Glyphidoceridae: *Glyphidocera lithodoxica*



Fig. 110. Oecophoridae: *Eido trimaculella*



Fig. 111. Batrachedridae: *Batrachedra praeangusta*



Fig. 112. Coleophoridae, Coleophorinae: *Coleophora trifolii*



Fig. 113. Coleophoridae, Momphinae: *Mompha eloisella*



Fig. 114. Coleophoridae, Blastobasinae: *Blastobasis glandulella*



Fig. 115. Coleophoridae, Pterolonchinae:
Pterolonche inspersa



Fig. 116. Autostichidae: *Oegoconia deauratella*



Fig. 117. Amphisbatidae: *Machimia tentoriferella*



Fig. 118. Cosmopterigidae: *Cosmopterix clemensella*



Fig. 119. Gelechiidae, Gelechiinae:
Chionodes lugubrella



Fig. 120. Gelechiidae, Dichomeridinae:
Dichomeris ?gnoma



Fig. 121. Limacodidae: *Tortricidia testacea*



Fig. 122. Zygaenidae: *Harrisina americana*



Fig. 123. Sesiidae, Tinthiinae: *Pennisetia marginata*



Fig. 124. Sesiidae, Sesiinae: *Sesia tibiale*



Fig. 125. Cossidae: *Acosus populi*



Fig. 126. Choreutidae: *Choreutis pariana*



Fig. 127. Tortricidae, Tortricinae, Tortricini:
Acleris brittania



Fig. 128. Tortricidae, Tortricinae,
Cnephasiini: *Eana argentana*



Fig. 129. Tortricidae, Tortricinae, Cochylini:
Cochylys voxcana



Fig. 130. Tortricidae, Tortricinae, Euliini:
Eulia ministrana



Fig. 131. Tortricidae, Tortricinae,
Sparganothini: *Sparganothis reticulatana*



Fig. 132. Tortricidae, Tortricinae, Archipini:
Archips myricanus



Fig. 133. Tortricidae, Chlidanotinae:
Thaumatotographa youngiella



Fig. 134. Tortricidae, Olethreutinae,
Endotheniini: *Endothenia affiliana*



Fig. 135. Tortricidae, Olethreutinae,
Bactrini: *Bactra verutana*



Fig. 136. Tortricidae, Olethreutinae,
Olethreutini: *Pseudosciaphila duplex*



Fig. 137. Tortricidae, Olethreutinae,
Enarmoniini: *Ancyllis burgessiana*



Fig. 138. Tortricidae, Olethreutinae,
Eucosmini: *Eucosma serpentana*



Fig. 139. Tortricidae, Olethreutinae, Grapholitini: *Cydia pomonella*



Fig. 140. Urodidae: *Wockia asperipunctella*



Fig. 141. Schreckensteiniidae: *Schreckensteinia festaliella*



Fig. 142. Epermeniidae: *Ochromolopis ramapoella*



Fig. 143. Alucitidae: *Alucita adriendenisi*



Fig. 144. Pterophoridae: *Oidaematophorus eupatorii*



Fig. 145. Copromorphidae: *Ellabella editha*



Fig. 146. Carposinidae: *Bondia crescentella*



Fig. 147. Pyralidae, Galleriinae: *Galleria mellonella*



Fig. 148. Pyralidae, Chrysauginae: *Galasa nigrinodis*



Fig. 149. Pyralidae, Pyralinae: *Hypsopygia costalis*



Fig. 150. Pyralidae, Epipaschiinae: *Pococera aplastella*



Fig. 151. Pyralidae, Phycitinae: *Dioryctria reniculelloides*



Fig. 152. Crambidae, Scopariinae: *Eudonia alpinus*



Fig. 153. Crambidae, Crambinae, Argyriini: *Urola nivalis*



Fig. 154. Crambidae, Crambinae, Crambini: *Crambus bidens*



Fig. 155. Crambidae, Crambinae, Haimbachiini: *Chilo plejadellus*



Fig. 156. Crambidae, Crambinae, Prionapterygini: *Pseudoschoenobius opalescalis*



Fig. 157. Crambidae, Schoenobiinae:
Donacaula amblyptepennis



Fig. 158. Crambidae, Acentropiinae:
Elophila icciusalis



Fig. 159. Crambidae, Odontiinae:
Mimoschinia rufofascialis



Fig. 160. Crambidae, Evergestinae:
Evergestis pallidata



Fig. 161. Crambidae, Glaphyriinae:
Xanthophysa psychialis



Fig. 162. Crambidae, Pyraustinae: *Anania coronata*



Fig. 163. Crambidae, Spilomelinae:
Choristostigma plumbosignalis



Fig. 164. Thyrididae: *Thyris maculata*



Fig. 165. Hesperiiidae, Eudaminae:
Epargyreus clarus



Fig. 166. Hesperiiidae, Pyrginae: *Erynnis icelus*



Fig. 167. Hesperiiidae, Heteropterinae:
Carterocephalus palaemon



Fig. 168. Hesperiiidae, Hesperinae: *Hesperia assiniboia*



Fig. 169. Hesperiiidae, Megathyminae: *Megathymus streckeri*



Fig. 170. Papilionidae, Parnassiinae: *Parnassius smintheus*



Fig. 171. Papilionidae, Papilioninae: *Papilio canadensis*



Fig. 172. Pieridae, Pierinae: *Pieris oleracea*



Fig. 173. Pieridae, Coliadinae: *Colias philodice*



Fig. 174. Lycaenidae, Miletinae: *Feniseca tarquinius*



Fig. 175. Lycaenidae, Lycaeninae: *Lycaena hyllus*



Fig. 176. Lycaenidae, Theclinae: *Callophrys polia*



Fig. 177. Lycaenidae, Polyommatainae: *Glaucopsyche lygdamus*



Fig. 178. Riodinidae: *Apodemia mormo*



Fig. 179. Nymphalidae, Libytheinae: *Libytheana carinenta*



Fig. 180. Nymphalidae, Danainae: *Danaus plexippus*



Fig. 181. Nymphalidae, Limenitidinae:
Limenitis arthemis



Fig. 182. Nymphalidae, Heliconiinae:
Argynnis aphrodite



Fig. 183. Nymphalidae, Apaturinae:
Asterocampa celtis



Fig. 184. Nymphalidae, Nymphalinae:
Aglais milberti



Fig. 185. Nymphalidae, Satyrinae: *Cercyonis pegala*



Fig. 186. Drepanidae, Thyatirinae:
Pseudothyatira cymatophoroides



Fig. 187. Drepanidae, Drepaninae: *Drepana arcuata*



Fig. 188. Uraniidae, Epipleminae: *Callizia amorata*



Fig. 189. Geometridae, Larentiinae, Cidariini: *Dysstroma hersiliata*



Fig. 190. Geometridae, Larentiinae, Hydriomenini: *Rheumaptera subhastata*



Fig. 191. Geometridae, Larentiinae, Stamnodini: *Stamnodes topazata*



Fig. 192. Geometridae, Larentiinae, Xanthorhoini: *Xanthorhoe ferrugata*



Fig. 193. Geometridae, Larentiinae, Asthenini: *Venusia cambrica*



Fig. 194. Geometridae, Larentiinae, Operophterini: *Operophtera bruceata*



Fig. 195. Geometridae, Larentiinae, Euduliini: *Eubaphe mendica*



Fig. 196. Geometridae, Larentiinae, Eupithecini: *Eupithecia annulata*



Fig. 197. Geometridae, Larentiinae, Lobophorini: *Lobophora nivigerata*



Fig. 198. Geometridae, Sterrhinae: *Cyclophora pendulinaria*



Fig. 199. Geometridae, Geometrinae:
Synchlora aerata



Fig. 200. Geometridae, Archiearinae:
Archiearis infans



Fig. 201. Geometridae, Ennominae,
Alsophilini: *Alsophila pometaria*



Fig. 202. Geometridae, Ennominae,
Cassymini: *Nematocampa resistaria*



Fig. 203. Geometridae, Ennominae,
Macariini: *Macaria sexmaculata*



Fig. 204. Geometridae, Ennominae, Boarmiini:
Ectropis crepuscularia



Fig. 205. Geometridae, Ennominae, Melanolophini: *Eufidonia convergaria*



Fig. 206. Geometridae, Ennominae, Bistonini: *Biston betularia*



Fig. 207. Geometridae, Ennominae, Baptini: *Lomographa semiclarata*



Fig. 208. Geometridae, Ennominae, Caberini: *Cabera exanthemata*



Fig. 209. Geometridae, Ennominae, Angeronini: *Xanthotype urticaria*



Fig. 210. Geometridae, Ennominae, Azelini: *Pero honestaria*



Fig. 211. Geometridae, Ennominae, Nacophorini: *Phaeoura quernaria*



Fig. 212. Geometridae, Ennominae, Campaeini: *Campaea perlata*



Fig. 213. Geometridae, Ennominae, Ennomini: *Ennomos magnaria*



Fig. 214. Geometridae, Ennominae, Epiranthidini: *Spodolepis substriataria*



Fig. 215. Geometridae, Ennominae, Lithinini: *Petrophora subaequaria*



Fig. 216. Geometridae, Ennominae, Anagogini: *Probole amicaria*



Fig. 217. Geometridae, Ennominae, Ourapterygini: *Caripeta angustiorata*



Fig. 218. Lasiocampidae, Macromphaliinae: *Tolype velleda*



Fig. 219. Lasiocampidae, Lasiocampinae: *Malacosoma disstria*



Fig. 220. Mimallonidae: *Cicinnus melsheimeri*



Fig. 221. Bombycidae, Apatelodinae: *Apatelodes torrefacta*



Fig. 222. Bombycidae, Bombycinae: *Bombyx mori*



Fig. 223. Saturniidae, Ceratocampinae:
Anisota virginiensis



Fig. 224. Saturniidae, Hemileucinae:
Hemileuca nevadensis



Fig. 225. Saturniidae, Saturniinae:
Callosamia promethea



Fig. 226. Sphingidae, Sphinginae: *Ceratomia amyntor*



Fig. 227. Sphingidae, Smerinthinae:
Smerinthus jamaicensis



Fig. 228. Sphingidae, Macroglossinae:
Amphion floridensis



Fig. 229. Notodontidae, Pygaerinae: *Clostera strigosa*



Fig. 230. Notodontidae, Notodontinae: *Gluphisia lintneri*



Fig. 231. Notodontidae, Phalerinae: *Datana ministra*



Fig. 232. Notodontidae, Heterocampinae: *Schizura ipomoea*



Fig. 233. Notodontidae, Nystaleinae: *Symmerista leucitys*



Fig. 234. Erebidae, Lymantriinae: *Orgyia antiqua* male



Fig. 235. Erebidae, Lymantriinae: *Orgyia antiqua* female



Fig. 236. Erebidae, Arctiinae, Lithosiini: *Hypoprepia miniata*



Fig. 237. Erebidae, Arctiinae, Arctiini: *Grammia parthenice*



Fig. 238. Erebidae, Herminiinae: *Phalaenostola hanhami*



Fig. 239. Erebidae, Pangraptinae: *Pangrapta decoralis*



Fig. 240. Erebidae, Hypeninae: *Hypena bijugalis*



Fig. 241. Erebidae, Rivulinae: *Rivula propinqualis*



Fig. 242. Erebidae, Scoliopteryginae: *Scoliopteryx libatrix*



Fig. 243. Erebidae, Calpinae: *Calyptra canadensis*



Fig. 244. Erebidae, Hypocalinae: *Hypocala andremona*



Fig. 245. Erebidae, Scolecocampinae: *Phobolusia anfracta*



Fig. 246. Erebidae, Hypenodinae: *Hypenodes palustris*



Fig. 247. Erebidae, Boletobiinae: *Metalectra discalis*



Fig. 248. Erebidae, Phytometrinae: *Spargaloma sexpunctata*



Fig. 249. Erebidae, Erebinae, Toxocampini: *Lygephila victoria*



Fig. 250. Erebidae, Erebinae, Thermesiini: *Ascalapha odorata*



Fig. 251. Erebidae, Erebinae, Catocalini: *Catocala concumbens*



Fig. 252. Erebidae, Erebinae, Melipotini: *Drasteria adumbrata*



Fig. 253. Erebidae, Erebinae, Euclidiini: *Caenurgina erectea*



Fig. 254. Erebidae, Erebinae, Poaphilini: *Parallelia bistriaris*



Fig. 255. Erebidae, Erebinae, Ophiusini: *Zale lunata*



Fig. 256. Erebidae, Eulepidotinae: *Panopoda rufimargo*



Fig. 257. Euteliidae: *Marathyssa inficita*



Fig. 258. Nolidae: *Baileya dormitans*



Fig. 259. Noctuidae, Plusiinae: *Autographa mappa*



Fig. 260. Noctuidae, Bagisarinae: *Bagisara rectifascia*



Fig. 261. Noctuidae, Eustrotiinae: *Maliattha concinnimacula*



Fig. 262. Noctuidae, Acontiinae: *Pometia candefacta*



Fig. 263. Noctuidae, Pantheinae: *Panthea furcilla*



Fig. 264. Noctuidae, Dilobinae: *Raphia frater*



Fig. 265. Noctuidae, Balsinae: *Balsa tristrigella*



Fig. 266. Noctuidae, Acronictinae: *Acronicta superans*



Fig. 267. Noctuidae, Cuculliinae: *Cucullia convexipennis*



Fig. 268. Noctuidae, Amphipyrinae, Amphipyriini: *Amphipyra pyramidoides*



Fig. 269. Noctuidae, Amphipyrinae, Psaphidini: *Feralia jocosa*



Fig. 270. Noctuidae, Amphipyrinae, Striini: *Stiria rugifrons*



Fig. 271. Noctuidae, Oncocnemidinae: *Sympistis piffardi*



Fig. 272. Noctuidae, Agaristinae: *Alypia langtoni*



Fig. 273. Noctuidae, Condicinae: *Leuconycta lepidula*



Fig. 274. Noctuidae, Heliiothinae: *Schinia florida*



Fig. 275. Noctuidae, Eriopinae: *Callopietria cordata*



Fig. 276. Noctuidae, Bryophilinae: *Cryphia cuerva*



Fig. 277. Noctuidae, Noctuinae, Pseudeustrotiini: *Pseudeustrotia carneola*



Fig. 278. Noctuidae, Noctuinae, Phosphilini: *Phosphila miselioides*



Fig. 279. Noctuidae, Noctuinae, Prodenini: *Spodoptera frugiperda*



Fig. 280. Noctuidae, Noctuinae, Elaphriini: *Elaphria alapallida*



Fig. 281. Noctuidae, Noctuinae, Caradrinini: *Protoperigea posticata*



Fig. 282. Noctuidae, Noctuinae, Dypterygini: *Trachea delicata*



Fig. 283. Noctuidae, Noctuinae, Actinotini:
Nedra ramosula



Fig. 284. Noctuidae, Noctuinae,
Phlogophorini: *Phlogophora periculosa*



Fig. 285. Noctuidae, Noctuinae, Apameini:
Apamea amputatrix



Fig. 286. Noctuidae, Noctuinae, Arzamini:
Bellura obliqua



Fig. 287. Noctuidae, Noctuinae, Xylenini:
Xylena thoracica



Fig. 288. Noctuidae, Noctuinae, Orthosiini:
Orthosia revicta



Fig. 289. Noctuidae, Noctuinae, Tholerini:
Nephelodes minians



Fig. 290. Noctuidae, Noctuinae, Hadenini:
Polia propodea



Fig. 291. Noctuidae, Noctuinae, Leucaniini:
Leucania lapidaria



Fig. 292. Noctuidae, Noctuinae, Eriopygini:
Ulolonche modesta



Fig. 293. Noctuidae, Noctuinae, Noctuinae:
Feltia herilis

REFERENCES FOR TAXON DIAGNOSES

- Adamski D. 2000. A new species of *Glyphidocera* from south-central Colorado (Lepidoptera: Gelechioidea: Glyphidoceridae). *Faberies* 25: 69-76.
- Adamski D., and T. M. Peters. 1986. Review of nearctic *Apotomis* Hübner (Lepidoptera: Tortricidae: Olethreutini). *The Canadian Entomologist* 118: 649-689.
- Anweiler G. G. 2009. Revision of the New World *Panthea* Hübner (Lepidoptera, Noctuidae) with descriptions of 5 new species and 2 new subspecies. *Zookeys* 9: 97-134.
- Aurelian M. 2008. *Ypsolopha* species pages. University of Alberta, Strickland Museum, Edmonton. http://www.entomology.ualberta.ca/searching_species_results.php?fsn=ypsolopha&fts=. Accessed: 20 vii 2009.
- Baraniak E. 2007. Taxonomic revision of the genus *Plutella* Schrank, 1802 (Lepidoptera: Plutellidae) from the Palaearctic region with notes on its phylogeny. *Polskie Pismo Entomologiczne Supplement* 76: 1-222.
- Barnes W., and F. H. Benjamin. 1925. The *hyperboreus* group of *Hepialus* (Lepidoptera: Hepialidae). *Pan-Pacific Entomologist* 2: 81-84.
- Barnes W., and A. W. Lindsey. 1921. The Pterophoridae of America, North of Mexico. *Contributions to the Natural History of the Lepidoptera of North America* 4: 281-483.
- Bird C. D. 2003. *Catoptria* species pages. University of Alberta, Strickland Museum, Edmonton. http://www.entomology.ualberta.ca/searching_species_results.php?fsn=catoptria&fts=. Accessed: 28 viii 2009.
- Bird C. D. 2003-2006. *Agriphila* species pages. University of Alberta, Strickland Museum, Edmonton. http://www.entomology.ualberta.ca/searching_species_results.php?fsn=agriphila&fts=. Accessed: 28 viii 2009.
- Bird C. D. 2003-2009. *Pediasia* species pages. University of Alberta, Strickland Museum, Edmonton. http://www.entomology.ualberta.ca/searching_species_results.php?fsn=pediasia&fts=. Accessed: 28 viii 2009.
- Bolte K. B. 1990. Guide to the Geometridae of Canada (Lepidoptera), VI. subfamily Larentiinae, 1. Revision of the genus *Eupithecia*. *Memoirs of the Entomological Society of Canada* 151: 1-253.
- Braun A. F. 1908. Revision of the North American species of the genus *Lithocolletis* Hübner. *Transactions of the American Entomological Society* 34: 269-357.
- Braun A. F. 1940. Notes and new species in the yponomeutid group (Microlepidoptera). *Transactions of the American Entomological Society* 66: 273-282.
- Braun A. F. 1963. The Genus *Bucculatrix* in America North of Mexico (Microlepidoptera). *Memoirs of the American Entomological Society* 18: 1-208.
- Braun A. F. 1972. Tischeriidae of America North of Mexico (Microlepidoptera). *Memoirs of the American Entomological Society* 28: 1-148.
- Brock J. P., and K. Kaufman. 2006. *Kaufman Field Guide to Butterflies of North America*. Houghton Mifflin Harcourt, Boston.
- Brown J. W., and J. A. Powell. 2000. Systematics of *Anopina* Obraztsov (Lepidoptera: Tortricidae: Euliini). University of California Press, Berkeley.
- Brown R. L. 1980. A new species of *Epinotia* Hübner (Lepidoptera: Tortricidae). *Proceedings of the Entomological Society of Washington* 82: 504-509.
- Brown R. L. 1984. Review of *Corticivora* (Lepidoptera: Tortricidae) with analysis of its tribal relationships and description of new species. *Proceedings of the Entomological Society of Washington* 86: 278-286.

- Brown R. L. 1992. Six new species of *Catastega* (Lepidoptera: Tortricidae: Eucosmini) from Mexico and southwestern United States. *Journal of the New York Entomological Society* 100: 209-227.
- Busck A. 1903. A revision of the American moths of the family Gelechiidae, with descriptions of new species. *Proceedings of the United States National Museum* 25: 767-938.
- Busck A. 1907. Revision of the American moths of the genus *Argyresthia*. *Proceedings of the United States National Museum* 32: 5-24.
- Capps H. W. 1965. A review of the genus *Haimbachia* Dyar with descriptions of new species (Lepidoptera: Crambidae). *Proceedings of the United States National Museum* 117: 629-654.
- Capps H. W. 1966. Review of New World moths of the genus *Euchromius* Guenée, with descriptions of two new species (Lepidoptera: Crambidae). *Proceedings of the United States National Museum* 119: 1-10.
- Cashatt E. D. 1968. Revision of the Chrysauginae of North America. Catholic University of America, Washington D. C.
- Cashatt E. D. 1972. Notes on the *balanotes* (Meyrick) group of *Oidaematophorus* Wallengren, with descriptions of a new species. *Journal of the Lepidopterists' Society* 26: 1-13.
- Clarke J. F. G. 1941. Revision of the North American moths of the family Oecophoridae, with descriptions of new genera and species. *Proceedings of the United States National Museum* 90: 33-286.
- Clarke J. F. G., and F. H. Benjamin. 1938. A study of some North American moths allied to the thyatirid genus *Bombycia* Hübner. *Bulletin of the Southern California Academy of Science* 37: 55-73.
- Covell C. V. 1984. *A Field Guide to the Moths of Eastern North America*. Houghton Mifflin, Boston.
- Crabo L. G., and P. C. Hammond. 1997. A revision of *Mesogona* Boisduval (Lepidoptera: Noctuidae) for North America with descriptions of two new species. *Journal of Research on the Lepidoptera* 34: 83-98.
- Crabo L. G., and J. D. Lafontaine. 2009. A Revision of *Lasionycta* Aurivillius (Lepidoptera: Noctuidae) for North America and notes on Eurasian species, with descriptions of 17 new species, 6 new subspecies, a new genus, and two new species of *Tricholita* Grote. *ZooKeys* 30: 1-155.
- Davis D. R. 1964. Bagworm moths of the western hemisphere. *Bulletin of the United States National Museum* 244: 1-233.
- Davis D. R. 1968. A revision of the American moths of the family Carposinidae (Lepidoptera: Carposinoidea). *Bulletin of the United States National Museum* 289: 1-105.
- Davis D. R. 1978. A revision of the North American moths of the superfamily Eriocranioidea with the proposal of a new family, Acanthopteroctetidae (Lepidoptera). *Smithsonian Contributions to Zoology* 251: 1-131.
- Davis D. R., O. Pellmyr, and J. N. Thompson. 1992. Biology and systematics of *Greya* Busck and *Tetragma*, new genus (Lepidoptera: Prodoxidae). *Smithsonian Contributions to Zoology* 524: 1-88.
- Davis D. R., and J. R. Stonis. 2007. A revision of the New World plant-mining moths of the family Opostegidae (Lepidoptera: Nepticuloidea). *Smithsonian Contributions to Zoology* 625: 1-212.
- Dietz W. G. 1905. Revision of the genera and species of the tineid subfamilies Amydriinae and Tineinae inhabiting North America. *Transactions of the American Entomological Society* 31: 1-96.
- Dombroskie J. J. 2003. The metalmark moths (Lepidoptera: Choreutidae) of Ontario. Pp. 59-70 in C. D. Jones and J. P. Crolla, eds. *Ontario Lepidoptera 2002*. Toronto Entomologists' Association, Toronto.
- Duckworth W. D. 1964. North American Stenomidae (Lepidoptera: Gelechioidea). *Proceedings of the United States National Museum* 116: 23-71.

- Duckworth W. D. 1965. North American Moths of the Genus *Swammerdamia* (Lepidoptera: Yponomeutidae). Proceedings of the United States National Museum 116: 549-555.
- Eichlin T. D., and W. D. Duckworth. 1988. The Moths of America North of Mexico, fascicle 5.1; Sesiioidea: Sesiidae. The Wedge Entomological Research Foundation, Washington.
- Englert W. D. 1974. Revision der Gattung *Metzneria* Zeller (Lepidoptera: Gelechiidae) mit Beiträgen zur Biologie der Arten. Zeitschrift fuer Angewandte Entomologie 75: 381-421.
- Ferguson D. C. 1954. A revision of the genus *Hypenodes* Doubleday with descriptions of new species (Lepidoptera, Phalaenidae). The Canadian Entomologist 86: 289-298.
- Ferguson D. C. 1985. The Moths of America North of Mexico, Fascicle 18.1, Geometroidea, Geometridae, Geometrinae. Wedge Entomological Research Foundation, Washington.
- Ferguson D. C. 2008. The Moths of America North of Mexico, Fascicle 17.2, Geometroidea, Geometridae, Ennominae (part: Abraxini, Cassymini, Macariini). Wedge Entomological Research Foundation, Washington.
- Fernald C. H. 1896. The Crambidae of North America. Massachusetts Agricultural College, Amherst, MA.
- Forbes W. T. M. 1923. The Lepidoptera of New York and Neighboring States: Primitive Forms, Microlepidoptera, Pyralids, Bombyces. Cornell University Agricultural Experimental Station, New York, Ithaca, New York.
- Franclemont J. G. 1973. The Moths of America North of Mexico, Fascicle 20.1, Mimallonoidea, Mimallonidae and Bombycoidea, Apatelodidae, Bombycidae, Lasiocampidae. E. W. Classey Ltd., London.
- Freeman T. N. 1958. The Archipinae of North America (Lepidoptera: Tortricidae). The Canadian Entomologist Supplement 7.
- Freeman T. N. 1960. Needle-mining Lepidoptera of pine in North America. The Canadian Entomologist Supplement 16: 1-51.
- Freeman T. N. 1965. New Canadian species of leaf-mining Lepidoptera of conifers. Journal of Research on the Lepidoptera 4: 209-220.
- Freeman T. N. 1972. The Coniferous feeding species of *Argyresthia* in Canada (Lepidoptera: Yponomeutidae). The Canadian Entomologist 104: 687-697.
- Gaedike R. 1990. Revision der Nearktischen Douglesiidae (Lepidoptera). Beiträge zur Entomologie Berlin 40: 287-300.
- Gaedike R. 2008. New species and records of the Nearctic Epermeniidae (Lepidoptera). Tijdschrift voor Entomologie 151: 57-64.
- Gilligan T. M., D. J. Wright, and L. D. Gibson. 2008. Olethreutine Moths of the Midwestern United States, An Identification Guide. Ohio Biological Survey, Columbus, Ohio.
- Handfield D., and L. Handfield. 2006. A new species of *Phusia* (Lepidoptera: Noctuidae) from North America. The Canadian Entomologist 138: 853-859.
- Handfield L. 1999. Le Guide des Papillons du Quebec. Version populaire. Broquet, Boucherville, QC.
- Handfield L., and D. Handfield. 2006. A new species of *Capis* (Lepidoptera: Noctuidae) from Québec, Canada. The Canadian Entomologist 138: 333-338.
- Handfield L., and D. Handfield. 2010. *Cucullia umbratica* (Lepidoptera, Noctuidae), a new European noctuid in North America. ZooKeys 39: 183-186.
- Hasbrouck F. F. 1964. Moths of the family Acrolophidae in America North of Mexico. Proceedings of the United States National Museum 114: 487-706.
- Heinrich C. 1923a. Revision of the North American Moths of the Subfamily Eucosminae of the Family Olethreutidae. Bulletin of the United States National Museum 123: 1-298.

- Heinrich C. 1923b. New Olethreutidae from Eastern United States (Lepidoptera). Proceedings of the Entomological Society of Washington 25: 105-122.
- Heinrich C. 1924. North American eucosminae, notes and new species (Lepidoptera). Bulletin of the United States National Museum 14: 385-393.
- Heinrich C. 1926. Revision of the North American Moths of the Subfamilies Laspeyresiinae and Olethreutinae. Bulletin of the United States National Museum 132: 1-216.
- Heinrich C. 1929. Notes on some North American moths of the subfamily Eucosminae. Proceedings of the United States National Museum 75: 1-23.
- Heinrich C. 1956. American moths of the subfamily Phycitinae. Bulletin of the United States National Museum 207: 1-581.
- Heppner J. B. 1984. Revision of the Oriental and Nearctic Genus *Ellabella* (Lepidoptera: Copromorphidae). Journal of Research on the Lepidoptera 23: 50-73.
- Heppner J. B. 1985. The Sedge Moths of North America (Lepidoptera: Glyphipterigidae). Flora and Fauna Publications, Gainesville, Florida.
- Heppner J. B. 1986. Revision of the New World genus *Lotisma* (Lepidoptera: Copromorphidae). Pan-Pacific Entomologist 62: 273-288.
- Hodges R. W. 1966a. Review of New World species of *Batrachedra*, with description of three new genera (Lepidoptera: Gelechioidea). Transactions of the American Entomological Society 92: 585-651.
- Hodges R. W. 1966b. Revision of Nearctic Gelechiidae, I. The *Lita* group (Lepidoptera: Gelechioidea). Proceedings of the United States National Museum 119: 1-66.
- Hodges R. W. 1974. The Moths of America North of Mexico, fascicle 6.2; Gelechioidea: Oecophoridae. E. W. Classey Ltd. & R. B. D. Publications Inc., London.
- Hodges R. W. 1978. The Moths of America North of Mexico, fascicle 6.1; Gelechioidea: Cosmopterigidae. E. W. Classey Ltd. & Wedge Entomological Research Foundation, London.
- Hodges R. W. 1986. The Moths of America North of Mexico, fascicle 7.1; Gelechioidea: Gelechiidae (part): Dichomeridinae. Wedge Entomological Research Foundation, Washington.
- Hodges R. W. 1999. The Moths of America North of Mexico, fascicle 7.6; Gelechioidea: Gelechiidae (part): Gelechiinae (part - Chionodes). E. W. Classey Ltd. & Wedge Entomological Research Foundation, Washington.
- Holland W. J., and W. Schaus. 1925. The Epipaschiinae of the western hemisphere; a synonymic catalog of the spp. hitherto described. Annals of the Carnegie Museum 16: 49-130.
- Huemer P. 1988. A taxonomic revision of *Caryocolum* (Lepidoptera: Gelechiidae). Bulletin of the American Museum of Natural History 57: 439-571.
- Huemer P. 1998. Neue Erkenntnisse zur Identität und Verbreitung europäischer *Oegoconia*-Arten (Lepidoptera: Autostichidae). Mitteilungen Münchener Entomologischen Gesellschaft 88: 88-117.
- Jalava J., and W. E. Miller. 1998. Boreal Olethreutini 1. (Lepidoptera: Tortricidae): new synonymies and holarctic records. Entomologica Fennica 9: 137-142.
- Kaila L. 1995a. A Review of *Coelopoeta* (Elachistidae), with Descriptions of Two New Species. Journal of the Lepidopterists' Society 49: 171-178.
- Kaila L. 1995b. A revision of the North American *Perittia* (= *Onceroptila*), with First Nearctic Records of the Genus *Mendesia* (Elachistidae). Journal of the Lepidopterists' Society 49: 208-222.

- Kaila L. 1996. Revision of the Nearctic Species of *Elachista* I. The *tetragonella* Group (Lepidoptera: Elachistidae). *Entomologica Scandinavia* 27: 217-238.
- Kaila L. 1997. A Revision of the Nearctic Species of *Elachista* s.l. II. The *argentella* Group (Lepidoptera: Elachistidae). *Acta Zoologica Fennica* 206: 1-93.
- Kaila L. 1999. A Revision of the Nearctic Species of the Genus *Elachista* s.l. III The *bifasciella*, *praelineata*, *saccharella* and *freyerella* Groups (Lepidoptera, Elachistidae). *Acta Zoologica Fennica* 211: 1-235.
- Kearfott W. D. 1908. Descriptions of new species of North American Crambid moths. *Proceedings of the United States National Museum* 35: 367-393.
- Klots A. B. 1940. North American *Crambus* I. The silvery striped species of California (Pylalidae). *Bulletin of the Southern California Academy of Sciences* 39: 53-70.
- Klots A. B. 1942. North American *Crambus* II. New species. *American Museum Novitates* 119: 1-17.
- Klots A. B. 1968. The North American *Microcrambus* (Lepidoptera: Pylalidae). *Journal of the New York Entomological Society* 76: 9-21.
- Klots A. B. 1970. North American Crambinae: notes on the tribe Chiloini and a revision of the genera *Eoreuma* Ely and *Xubida* Schaus (Lepidoptera: Pylalidae). *Journal of the New York Entomological Society* 78: 100-120.
- Kyrki J. 1988. Reassessment of the genus *Rhigognostis* Zeller, with descriptions of two new and notes on further seven Palearctic species (Lepidoptera: Plutellidae). *Insect Systematics and Evolution* 19: 437-453.
- Lafontaine J. D. 1973. Eastern North American species of *Antispila* (Lepidoptera: Heliozelidae) Feeding on *Nyssa* and *Cornus*. *The Canadian Entomologist* 105: 991-994.
- Lafontaine J. D. 1987. The Moths of America North of Mexico, Fasc. 27.2; Noctuoidea: Noctuidae: Noctuinae (part) *Euxoa*. Wedge Entomological Research Foundation, Washington, D. C.
- Lafontaine J. D. 1998. The Moths of America North of Mexico, Fasc. 27.3; Noctuoidea: Noctuidae: Noctuini. Wedge Entomological Research Foundation, Washington, D. C.
- Lafontaine J. D. 2004. The Moths of America North of Mexico, Fasc. 27.1; Noctuoidea: Noctuidae (part): Noctuinae (part - Agrotini). Wedge Entomological Research Foundation, Washington, D. C.
- Lafontaine J. D., K. Mikkola, and V. S. Kononenko. 1987. *Anarta cordigera* (Thunberg) (Lepidoptera: Noctuidae: Hadeninae), a species complex. *The Canadian Entomologist* 119: 931-940.
- Lafontaine J. D., and R. W. Poole. 1991. The Moths of America North of Mexico, Fasc. 25.1; Noctuoidea: Noctuidae: Plusiinae. Wedge Entomological Research Foundation, Washington, D. C.
- Lafontaine J. D., and R. W. Poole. 2010. Review of the New World genera of the subfamily Acontiinae (Lepidoptera, Noctuidae). *ZooKeys* 39: 137-160.
- Lafontaine J. D., and J. T. Troubridge. 2003. Review of the genus *Cosmia* (Lepidoptera: Noctuidae) in North America, with description of a new species. *The Canadian Entomologist* 135: 325-336.
- Lafontaine J. D., and J. T. Troubridge. 2004. Description of a new genus and two new species of cutworm moths (Lepidoptera: Noctuidae). *The Canadian Entomologist* 136: 823-834.
- Lafontaine J. D., and J. T. Troubridge. 2010. Two new species of the *Euxoa westermanni* species-group from Canada (Lepidoptera, Noctuidae, Noctuinae). *ZooKeys* 39: 255-262.
- Lambert R. L. 1950. Revision of the moths of the subfamily Sparganothidinae (Lepidoptera: Tortricidae). Cornell University, Ithaca, NY.

- Landry B. 1987. A synopsis of the plume-moths of the subfamily Platyptiliinae (Lepidoptera: Pterophoridae) of eastern Canada. McGill University, Montreal.
- Landry B. 1995. A Phylogenetic Analysis of the Major Lineages of the Crambinae and the Genera of the Crambini of North America (Lepidoptera: Pyralidae). Associated Publishers, Gainesville, Florida.
- Landry B., and C. Gielis. 2008. Systematics and morphology-Key to the *Paraplatyptilia* species of eastern Canada with description of a new species (Lepidoptera: Pterophoridae). The Canadian Entomologist 140: 143-148.
- Landry B., and J. F. Landry. 2004. The genus *Alucita* in North America, with description of two new species (Lepidoptera: Alucitidae). The Canadian Entomologist 136: 553-579.
- Landry J. F. 1991. Systematics of Nearctic Scythrididae (Lepidoptera: Gelechioidea): phylogeny and classification of supraspecific taxa, with a review of described species. Memoirs of the Entomological Society of Canada 160: 1-341.
- Landry J. F. 1998a. Répartition géographique, plantes nourricières et notes taxonomiques sur 29 espèces de *Coleophora* (Lepidoptera: Coleophoridae) au Québec. Fabriques 23: 25-104.
- Landry J. F. 1998b. Additional Nearctic records of *Wockia asperipunctella*, with notes on its distribution and structural variation (Lepidoptera: Urodidae). Holarctic Lepidoptera 5: 9-13.
- Landry J. F. 2007. Taxonomic review of the leek moth genus *Acrolepiopsis* (Lepidoptera: Acrolepiidae) in North America. The Canadian Entomologist 139: 319-353.
- Landry J. F., and B. Wright. 1993. Systematics of the Nearctic species of metallic-green *Coleophora* (Lepidoptera: Coleophoridae). The Canadian Entomologist 125: 549-618.
- Lange W. H. 1950. Biology and systematics of plume moths of the genus *Platyptilia* in California. Hilgardia 19: 561-652.
- Layberry R. A., P. W. Hall, and J. D. Lafontaine. 1998. The Butterflies of Canada. University of Toronto Press Inc., Toronto.
- Lee, S., and R. L. Brown. 2008. Revision of Holarctic Teleiodini (Lepidoptera: Gelechiidae). Zootaxa 1818: 1-55.
- Lee S., and R. L. Brown. 2010. Review of Symmocinae (Lepidoptera: Autostichidae) in North America with the description of a new genus and species. Journal of the Lepidopterists' Society 64: 177-187.
- Martinez E. L., and R. L. Brown. 2007. Argyriini (Lepidoptera: Crambidae) of Mississippi and Alabama with a redescription of *Argyria rufisignella* (Zeller). Journal of the Lepidopterists' Society 61: 78-83.
- McCabe T. L. 1980. A reclassification of the *Polia* complex for North America (Lepidoptera: Noctuidae). New York State Museum Bulletin 432: 1-141.
- McDunnough J. H. 1921. Two new Canadian Crambid moths (Lepidoptera). The Canadian Entomologist 53: 161.
- McDunnough J. H. 1923. Notes on Pterophoridae with descriptions of new species. The Canadian Entomologist 55: 85-87.
- McDunnough J. H. 1925. New Canadian Eucosminae (Lepidoptera). The Canadian Entomologist 57: 115-116.
- McDunnough J. H. 1927. Contribution toward a knowledge of our Canadian plume-moths. Transactions of the Royal Society of Canada 21: 175-188.
- McDunnough J. H. 1929. Some apparently new Microlepidoptera. The Canadian Entomologist 61: 266-271.
- McDunnough J. H. 1935. New Canadian Eucosmids with notes. The Canadian Entomologist 67: 140-149.
- McDunnough J. H. 1938a. Some apparently new Eucosmidae (Lepid.). The Canadian Entomologist 70: 90-100.
- McDunnough J. H. 1938b. Notes on certain of Walsingham's species of *Oidaematophorus* with descriptions of new species. The Canadian Entomologist 70: 128-132.

- McDunnough J. H. 1939. Pterophorid descriptions and notes. *The Canadian Entomologist* 71: 109-112.
- McDunnough J. H. 1942. Tortricid notes and descriptions. *The Canadian Entomologist* 74: 63-71.
- McDunnough J. H. 1955. Critical remarks on the synonymy of certain *Anchylopera* species, with descriptions of new species (Lepidoptera, Eucosmidae). *American Museum Novitates* 1725: 1-16.
- McGuffin W. C. 1977. Guide to the Geometridae of Canada (Lepidoptera), II. subfamily Ennominae, 2. *Memoirs of the Entomological Society of Canada* 101: 1-191.
- McGuffin W. C. 1981. Guide to the Geometridae of Canada (Lepidoptera), II. Subfamily Ennominae. 3. *Memoirs of the Entomological Society of Canada* 117: 1-153.
- McGuffin W. C. 1987. Guide to the Geometridae of Canada (Lepidoptera), II. Subfamily Ennominae. 4. *Memoirs of the Entomological Society of Canada* 138: 1-182.
- McGuffin W. C. 1988. Guide to the Geometridae of Canada (Lepidoptera), III, IV, and V. subfamilies Archiearinae, Oenochrominae, and Geometrinae. *Memoirs of the Entomological Society of Canada* 145: 1-56.
- Mikkola K., J. D. Lafontaine, and J. Gill. 2009. The Moths of America North of Mexico, Fasc. 26.9; Noctuoidea: Noctuidae (part): Xyleninae (part): Apameini (part - *Apamea* group of genera). *Wedge Entomological Research Foundation*, Washington, D. C.
- Miller W. E. 1974. Identities of taxonomically confused moths of the *Eucosma agricolana* group and description of a new species (Lepidoptera, Tortricidae). *Annals of the Entomological Society of America* 67: 601-604.
- Miller W. E. 1985. Nearctic *Olethreutes*: five new synonymies, two revised statuses, and notes (Lepidoptera: Tortricidae). *Proceedings of the Entomological Society of Washington* 87: 408-417.
- Miller W. E. 1986. The species of *Pseudexentera* (Tortricidae). *Journal of the Lepidopterists' Society* 40: 218-237.
- Miller W. E. 1987. Guide to the Olethreutine Moths of Midland North America (Tortricidae). *United States Department of Agriculture, Forest Service, Agriculture Handbook* 660, Washington.
- Miller W. E. 2000. A Comparative Taxonomic-Natural History Study of Eight Nearctic Species of *Gnorimoschema* that Induce Stem Galls on Asteraceae, Including Descriptions of Three New Species (Lepidoptera: Gelechiidae). *Entomological Society of America*, Lanham, MD.
- Morris R. F. 1979. A review of the life history, population levels, and spread of the Antler Moth, *Cerapteryx graminis* (Lepidoptera: Noctuidae), in Newfoundland. *The Canadian Entomologist* 136: 299-311.
- Munroe E. 1952. The *Illibalis* group of the genus *Palpita* Hübner (Lepidoptera: Pyralidae). *The Canadian Entomologist* 84: 43-55.
- Munroe E. 1956a. *Geshna primordialis* Dyar, with descriptions of two new genera and two new subspecies (Lepidoptera: Pyralidae). *The Canadian Entomologist* 88: 126-128.
- Munroe E. 1956b. Restriction and revision of the genus *Diastictis* Hübner (Lepidoptera: Pyralidae). *The Canadian Entomologist* 88: 208-228.
- Munroe E. 1956c. The North American species of *Diathrausta* Lederer (Lepidoptera: Pyralidae). *The Canadian Entomologist* 88: 579-583.
- Munroe E. 1966. Revision of North American species of *Udea* Guenée (Lepidoptera: Pyralidae). *Memoirs of the Entomological Society of Canada* 49: 1-57.
- Munroe E. 1972a. The Moths of America North of Mexico, Fascicle 13.1A, Pyraloidea, Pyralidae (Part). E. W. Classey Limited, London.

- Munroe E. 1972b. The Moths of America North of Mexico, Fascicle 13.1B, Pyraloidea, Pyralidae (Part). E. W. Classey Limited, London.
- Munroe E. 1973. The Moths of America North of Mexico, Fascicle 13.1C, Pyraloidea, Pyralidae (Part). E. W. Classey Limited, London.
- Munroe E. 1976a. The Moths of America North of Mexico, Fascicle 13.2A, Pyraloidea, Pyralidae (Part). E. W. Classey Limited, London.
- Munroe E. 1976b. The Moths of America North of Mexico, Fascicle 13.2B, Pyraloidea, Pyralidae (Part). E. W. Classey Limited, London.
- Mutuura A. 1978. A new genus of coniferophagous Tortricidae, and two new species (Lepidoptera: Tortricidae). The Canadian Entomologist 110: 569-574.
- Mutuura A. 1980. Two *Pandemis* species introduced into British Columbia, with a comparison of native North American Species (Lepidoptera: Tortricidae). The Canadian Entomologist 112: 549-554.
- Mutuura A. 1982. *Cnephasia stephensiana*, a species newly recorded from Canada and compared with the previously recorded *C. interjectana* (Lepidoptera: Tortricidae). The Canadian Entomologist 114: 667-671.
- Mutuura A., and T. N. Freeman. 1966. The North American species of the genus *Zeiraphera*, Treitschke (Olethreutidae). Journal of Research on the Lepidoptera 5: 153-176.
- Neunzig H. H. 1986. The Moths of America North of Mexico, Fascicle 15.2, Pyraloidea, Pyralidae (Part). The Wedge Entomological Research Foundation, Washington.
- Neunzig H. H. 1990. The Moths of America North of Mexico, Fascicle 15.3, Pyraloidea, Pyralidae (Part). The Wedge Entomological Research Foundation, Washington.
- Neunzig H. H. 1997. The Moths of America North of Mexico, Fascicle 15.4, Pyraloidea, Pyralidae (Part). The Wedge Entomological Research Foundation, Washington.
- Neunzig H. H. 2003. The Moths of America North of Mexico, Fascicle 15.5, Pyraloidea, Pyralidae (Part). The Wedge Entomological Research Foundation, Washington.
- Obraztsov N. S. 1962. North American species of the genus *Eana*. with a general review of the genus, and descriptions of two new species (Tortricidae). Journal of the Lepidopterists' Society 16: 175-192.
- Pellmyr O. 1999. Systematic revision of the yucca moths in the *Tegeticula yuccasella* complex (Lepidoptera: Prodoxidae) north of Mexico. Systematic Entomology 24: 243-271.
- Phillips-Rodriguez E., and J. A. Powell. 2007. Phylogenetic relationships, systematics, and biology of the species of *Amorbia* Clemens (Lepidoptera: Tortricidae: Sparganothini). Zootaxa 1670: 1-109.
- Poole R. W. 1995. The Moths of America North of Mexico, Fasc. 26.1; Noctuoidea: Noctuidae: Cuculliinae, Stiriinae, Psaphidinae (part). Wedge Entomological Research Foundation, Washington, D. C.
- Povolny D. F. 1967. Genitalia of some Nearctic and Neotropical members of the tribe Gnorimoschemini, Lepidoptera, Gelechiidae. Acta Entomologica Musei Nationalis Pragae 97: 51-67.
- Povolny D. F. 1998. New taxa and faunistic records of the tribe Gnorimoschemini from the Nearctic Region (Lepidoptera, Gelechiidae). Stapfia 55: 327-347.
- Povolny D. F. 2003. Description of twenty five new Nearctic species of the genus *Gnorimoschema* Busck, 1900 (Lepidoptera: Gelechiidae). SHILAP Revista de Lepidopterologica 31: 285-315.
- Powell J. A. 1968. Host associations and taxonomy of Nearctic conifer cone moths in the genus *Eucosma* (Lepidoptera: Tortricidae). Hilgardia 39: 1-36.

- Powell J. A. 1969. A synopsis of nearctic adelid moths, with descriptions of new species (Incurvariidae). *Journal of the Lepidopterists' Society* 23: 211-240.
- Powell J. A. 1973. A systematic monograph of New World ethmiid moths (Lepidoptera: Gelechioidea). *Smithsonian Contributions to Zoology* 120: 1-302.
- Powell J. A. 1980. A synopsis of *Decodes*, with descriptions of new species and a related new genus in Mexico (Lepidoptera: Tortricidae). *Pacific Insects* 22: 78-114.
- Powell J. A. 1986. Synopsis of the classification of Neotropical Tortricinae, with descriptions of new genera and species (Lepidoptera: Tortricidae). *Pan-Pacific Entomologist* 62: 372-398.
- Powell J. A., and W. E. Miller. 1978. Nearctic pine tip moths of the genus *Rhyacionia*: biosystematic review (Lepidoptera: Tortricidae, Olethreutinae). United States Department of Agriculture, Washington, D. C.
- Powell J. A., and P. A. Opler. 2009. *Moths of Western North America*. University of California Press, Berkeley, California.
- Puplesis R., and A. Diskus. 2003. The Nepticuloidea and Tischerioidea (Lepidoptera)—a global review, with strategic regional revisions. Lutulė Publishers, Kaunas, Lithuania.
- Razowski J. 1966. World Fauna of the *Tortricini* (Lepidoptera, Tortricidae). Państwowe Wydawnictwo Naukowe, Krakow, Poland.
- Razowski J. 1977. Monograph of the genus *Archips* Hübner (Lepidoptera, Tortricidae). *Acta Zoologica Cracoviensia* 22: 55-206.
- Razowski J. 1979a. Revision of the genus *Clepsis* Guenée (Lepidoptera, Tortricidae). Part I. *Acta Zoologica Cracoviensia* 23: 101-198.
- Razowski J. 1979b. Revision of the *Clepsis* Guenée (Lepidoptera, Tortricidae). Part II. *Acta Zoologica Cracoviensia* 24: 113-152.
- Razowski J. 1997. Cochylini (Lepidoptera: Tortricidae) of Canada. *Acta Zoologica Cracoviensia* 40: 107-163.
- Razowski J. 2002. Tortricidae (Lepidoptera) of Europe, Volume 1, *Tortricinae* and *Chlidanotinae*. Frantisek Slamka, Bratislava.
- Robinson G. S. 1986. Fungus moths: a review of the Scardiinae (Lepidoptera: Tineidae). *Bulletin of the British Museum of Natural History (Entomology)* 52: 37-181.
- Rutten T., and O. Karsholt. 2004. Review of the Nearctic species of *Bryotropha* Heinemann (Lepidoptera: Gelechiidae). *Zootaxa* 740: 1-42.
- Sabourin M., W. E. Miller, E. H. Metzler, and J. T. Vargo. 2002. Revised identities and new species of *Aethes* from midwestern North America (Tortricidae). *Journal of the Lepidopterists' Society* 56: 216-233.
- Sattler K. 1979. A taxonomic revision of the genus *Deltophora* Janse, 1950 (Lepidoptera: Gelechiidae). *Bulletin of the American Museum of Natural History* 38: 263-322.
- Schmidt B. C. 2009a. *Hemaris thetis* (Boisduval, 1855) (Sphingidae) is a distinct species. *Journal of the Lepidopterists' Society* 63: 100-109.
- Schmidt B. C. 2009b. Taxonomic revision of the genus *Grammia* Rambur (Lepidoptera: Noctuidae: Arctiinae). *Biological Journal of the Linnean Society* 156: 507-597.
- Schmidt B. C. 2010. Review of the Nearctic species of *Enargia* Hübner, [1821] (Noctuidae, Noctuinae, Xylenini). *ZooKeys* 39: 205-223.

- Scholten B. G., and G. J. Balogh. 1996. Spread of *Acentria ephemerella* (Lepidoptera: Pyralidae) in central North America. *Great Lakes Entomologist* 29: 21-24.
- Shaffer J. C. 1968. A revision of the Peoriinae and Anerastiinae (auctorum) of America North of Mexico (Lepidoptera: Pyralidae). *Bulletin of the United States National Museum* 280: 1-124.
- Solis M. A. 1991. Revision and phylogenetic analysis of the new world genus *Oneida* Hulst (Lepidoptera: Pyralidae: Epipaschiinae), description of a new genus. *Proceedings of the Entomological Society of Washington* 93: 808-827.
- Solis M. A. 1993. A phylogenetic analysis and reclassification of the genera of the *Pococera* complex (Lepidoptera: Pyralidae: Epipaschiinae). *Journal of the New York Entomological Society* 101: 1-83.
- Solis M. A., and M. A. Metz. 2008. Species of *Aphomia* Hübner and *Paralipsa* Butler (Pyralidae: Galleriinae) known to occur in the United States and Canada and their associations with stored products and social Hymenoptera. *Proceedings of the Entomological Society of Washington* 110: 679-692.
- Sperling F. A. H., J. F. Landry, and D. A. Hickey. 1995. DNA-based identification of introduced ermine moth species in North America (Lepidoptera: Yponomeutidae). *Annals of the Entomological Society of America* 88: 155-162.
- Troubridge J. T. 2006. Three new species of *Lithophane* Hübner (Lepidoptera: Noctuidae: Xyleninae). *Zootaxa* 1284: 61-68.
- Troubridge J. T. 2008. A generic realignment of the Oncocnemidini sensu Hodges (1983) (Lepidoptera: Noctuidae: Oncocnemidinae), with description of a new genus and 50 new species. *Zootaxa* 1903: 1-95.
- Troubridge J. T., and L. Crabo. 2002. A review of the Nearctic species of *Hadena* Schrank, 1802 (Lepidoptera: Noctuidae) with descriptions of six new species. *Faberies* 27: 109-154.
- Troubridge J. T., and J. D. Lafontaine. 2002. Revision of species of the “*Oligia*” *semicana* group (Lepidoptera: Noctuidae) with descriptions of a new genus and 12 new species. *The Canadian Entomologist* 134: 157-191.
- Troubridge J. T., and J. D. Lafontaine. 2003. A review of the pine-feeding *Lithophane lepida* species group (Lepidoptera: Noctuidae), with descriptions of two new species. *The Canadian Entomologist* 135: 53-62.
- Troubridge J. T., and J. D. Lafontaine. 2004a. Bombycoidea, Drepanoidea, Lasiocampoidea, and Mimallonoidea of Canada. Government of Canada, Ottawa. http://www.cbif.gc.ca/spp_pages/misc_moths/phps/macroindex_e.php Accessed: 28 ix 2009.
- Troubridge J. T., and J. D. Lafontaine. 2004b. The Geometroidea of Canada. Government of Canada, Ottawa. http://www.cbif.gc.ca/spp_pages/geometroidea/phps/geoindex_e.php Accessed: 28 ix 2009.
- Troubridge J. T., and J. D. Lafontaine. 2004c. The Noctuoidea of Western Canada. Government of Canada, Ottawa. http://www.cbif.gc.ca/spp_pages/noctuoidea/index_e.php Accessed: 12 xi 2009.
- Troubridge J. T., and J. D. Lafontaine. 2004d. The Noctuoidea of Eastern Canada. Government of Canada, Ottawa. http://www.cbif.gc.ca/spp_pages/noctuoidea/eastindex_e.php Accessed: 12 xi 2009.
- Troubridge J. T., and J. D. Lafontaine. 2004e. Revision of the genus *Hyppa* (Lepidoptera: Noctuidae) with description of a new species. *The Canadian Entomologist* 136: 299-311.
- Troubridge J. T., and J. D. Lafontaine. 2007. A revision of the North American species of *Brachylomia* (Lepidoptera: Noctuidae: Xyleninae) with descriptions of four new species. *The Canadian Entomologist* 139: 209-227.
- Tuskes P. M., J. P. Tuttle, and M. M. Collins. 1996. *The Wild Silk Moths of North America: a Natural History of the Saturniidae of the United States and Canada*. Cornell University Press, Ithaca, NY.
- Tuttle J. P. 2007. *The Hawk Moths of North America, A Natural History Study of the Sphingidae of the United States and Canada*. Allen Press, Lawrence, Kansas.
- Wilkinson C. 1981. A supplement to the genus *Ectoedemia* Busck (Nepticulidae: Lepidoptera) in North America, dealing with some difficult species and also some new ones. *Tijdschrift voor Entomologie* 124: 93-110.

- Wilkinson C., and P. J. Newton. 1981. The micro-lepidopteran genus *Ectoedemia* Busck (Nepticulidae) in North America. Tijdschrift voor Entomologie 124: 27-92.
- Wilkinson C., and M. J. Scoble. 1979. The Nepticulidae of Canada. Memoirs of the Entomological Society of Canada 107: 1-130.
- Wilson J. J., J. F. Landry, D. H. Janzen, W. Hallwachs, V. Nazari, M. Hajibabaei, and P. D. N. Hebert. 2010. Identity of the Ailanthus Webworm Moth (Lepidoptera, Yponomeutidae), a complex of two species: evidence from DNA barcoding, morphology and ecology. ZooKeys 46: 41-60.
- Wright D. J. 2002. A new species of *Epiblema* previously confused with *E. tripartitana* (Zeller) and *E. infelix* Heinrich (Tortricidae). Journal of the Lepidopterists' Society 56: 277-285.
- Wright D. J. 2005. Some Eucosmini (Tortricidae) associated with *Eucosma emaciatana* (Walsingham) and *Eucosma totana* Kearfott; four new species, a new combination, and a new synonymy. Journal of the Lepidopterists' Society 59: 121-133.
- Wright D. J. 2006. A new species of *Eucosma* Hübner (Tortricidae: Olethreutinae) from the Tall Grass Prairie Region of midwestern North America. Journal of the Lepidopterists' Society 60: 161-164.
- Wright D. J. 2007a. Notes on Nearctic *Eucosma* Hübner: a new species, a resurrected species, and three new synonymies (Tortricidae). Journal of the Lepidopterists' Society 61: 38-49.
- Wright D. J. 2007b. Taxonomy of four species of Eucosmini (Tortricidae) associated with *Pelochrista corosana* (Walsingham) including a new synonymy and description of a new species. Journal of the Lepidopterists' Society 61: 117-124.
- Wright D. J. 2008. Nearctic Eucosmini (Tortricidae) associated with *Pelochrista occipitana* (Zeller) and *Eucosma biquadrana* (Walsingham): two new synonymies and four new species. Journal of the Lepidopterists' Society 62: 216-231.
- Zaspel J. M., S. J. Weller, and R. T. Cardé. 2008. A review of *Virbia* (formerly *Holomelina*) of America north of Mexico (Arctiidae: Arctiinae: Arctiini). Bulletin of the Florida Museum of Natural History 48: 59-118.