

MOTHS AND BUTTERFLIES (LEPIDOPTERA) *

J.D. Lafontaine

Biological Resources Program, Agriculture and Agri-food
Canada
Central Experimental Farm Ottawa, Ontario K1A 0C6

and

J.T. Troubridge

Pacific Agri-Food Research Centre (Agassiz)
Agriculture and Agri-Food Canada
Box 1000, Agassiz, B.C. V0M 1A0

ABSTRACT

The Montane Cordillera Ecozone of British Columbia and southwestern Alberta supports a diverse fauna with over 2,000 species of butterflies and moths (Order Lepidoptera) recorded to date. By far the best known group of Lepidoptera is the butterflies with 173 species in the Ecozone; the approximately 15,000 species locations of butterflies in the Ecozone makes it one of the best groups of insects to examine distribution patterns within the Ecozone. The Lepidoptera fauna of the Ecozone is reviewed in terms of diversity, state of knowledge of the major groups, origins of the fauna, post-glacial and relict patterns, recent changes in distribution, and endangered and threatened species.

INTRODUCTION

The Order Lepidoptera, the butterflies and moths, is among the more diverse insect groups in the Montane Cordillera Ecozone with more than 2,015 species recorded in 67 families, this representing about 43% of the Lepidoptera fauna of Canada. As was discussed in the analysis of the Lepidoptera fauna of the Mixedwood Plains Ecozone in southern Ontario and Quebec (Lafontaine, 1996), our knowledge of the Lepidoptera varies greatly from group to group, and only some groups are sufficiently well known to be used effectively in biodiversity studies.

LEPIDOPTERA DISTRIBUTION DATA SOURCES

Detailed distributional information has been published for only a few groups of Lepidoptera in western Canada. Scott (1986) gives good distribution maps for butterflies in North America but these are generalized shade maps that give no detail within the Montane Cordillera Ecozone. A series of memoirs on the Inchworms (family Geometridae) of Canada by McGuffin (1967, 1972, 1977, 1981, 1987) and Bolte (1990) cover about 3/4 of the Canadian fauna and include dot maps for most species. A long term project on the "Forest Lepidoptera of Canada" resulted in a four volume series on Lepidoptera that feed on trees in Canada and these also give dot maps for most species (McGugan, 1958; Prentice, 1962, 1963, 1965). Dot maps for three groups of Cutworm Moths (Family Noctuidae): the subfamily Plusiinae (Lafontaine and Poole, 1991), the subfamilies Cuculliinae and Psaphidinae (Poole, 1995), and the tribe Noctuini (subfamily Noctuinae) (Lafontaine, 1998) have also been published. Most fascicles in The Moths of America North of Mexico series (e.g. Ferguson, 1971-72, 1978; Franclemont, 1973; Hodges, 1971, 1986; Lafontaine, 1987; Munroe, 1972-74, 1976; Neunzig, 1986, 1990, 1997) are useful for identifying various moth groups but have little detailed distributional information. Check lists of the Macrolepidoptera of British Columbia (Jones, 1951) and the Lepidoptera of Alberta (Bowman, 1951) list most species but have limited distributional information. The recently published Butterflies of Canada (Layberry et al., 1998) is based on a distributional database on the butterflies of Canada maintained at the CNC which contains more than 90,000 records from public and private collections in Canada. The Butterflies of Canada includes dot maps for every species. In addition to these references, the vast amount of unpublished distributional information contained on the specimens in the Canadian National Collection (CNC) in Ottawa has been critical to the preparation of this analysis of Lepidoptera. These sources form the basis of the analysis of distribution patterns discussed below.

LEPIDOPTERA CLASSIFICATION AND HABITS

The terms "butterfly" and "moth" are often thought of as the two natural groups that make up the order Lepidoptera but in reality the butterflies are only one of many Lepidoptera lineages; butterflies are more closely related to the larger moths than either group is to the more primitive families of moths. The butterflies and the larger moths are often associated in a group called the "macrolepidoptera". The families of smaller moths are referred to as "microlepidoptera". While the macrolepidoptera probably represents a natural group, the microlepidoptera is more a grouping of convenience that lumps together many different families of small-sized, primitive moths. For convenience of discussion, we have arranged the 67 families of Lepidoptera into three groupings that represent different habits and different levels of knowledge.

*To be cited as:

J.D. Lafontaine and J.T. Troubridge. 1998. Moths and Butterflies (Lepidoptera). Chapter: Assessment of species diversity in the Montane Cordillera Ecozone *in* Smith, I.M., and G.G.E. Scudder, *eds.* Assessment of species diversity in the Montane Cordillera Ecozone. Burlington: Ecological Monitoring and Assessment Network, 1998.

The first group is the microlepidoptera (GROUP I), which includes 49 families of mostly small-sized moths with larvae that are concealed feeders. The microlepidoptera families can be arranged in four subgroups on the basis of larval habits. The first of these subgroups is 12 families (best illustrated by the large family Gracillariidae) that are the “leaf miners”. The larvae are called leaf miners because they feed on the chlorophyll between the upper and lower leaf surfaces; this results in a characteristic clear patch in the leaf where the green chlorophyll has been removed. Many species can be identified in the larval stage by considering both the shape and position of the mine on the host plant and the identity of the host. The adults have narrow wings like those of a mosquito (wing expanses of 5-10 mm are typical), usually with a wide hairlike fringe. The leaf mining microlepidoptera are generally rarely collected and poorly known, especially in western North America. The second subgroup of microlepidoptera are the “case-bearers”. Four families (Adelidae, Incurvariidae, Tineidae and Coleophoridae) are small, narrow-winged moths, like the leaf-miners, but the larvae conceal themselves in a case made from silk and debris; the larvae are often miners when small and build a case when they get larger. A fifth family of case-bearers, the Psychidae, or bagworms, are larger; the moths are broader winged, usually 10-12 mm in our species but up to 40 mm in the southern US; the females of most species are wingless and remain in the case to mate, lay their eggs and die. The third subgroup of families is the borers, in which the larvae may bore in the stems of plants, or in the flower heads and fruit. These are varied in size and appearance; the ghost moths (family Hepialidae) are large moths with 25 to 100 mm wingspans; the clear-winged moths (family Sesiidae) are wasp mimics; most other families (e.g. Carposinidae, Momphidae) are small, drably coloured moths similar to leaf-miners. The fourth and largest subgroup of the microlepidoptera are leaf-rollers. Most members of the large families Tortricidae, Gelechiidae, and Pyralidae fall into this category. The adults are generally larger than leaf-miners (wing expanses of 15-30 mm are typical) and the wings are more triangular in shape with only a narrow fringe. The larvae most commonly roll or fold a leaf and tie it with silk, or tie several leaves together, and feed in the protected enclosure. This group includes agricultural pests (e.g. European Corn Borer, *Ostrinia nubilalis*; Oblique-banded Leafroller, *Choristoneura rosaceana* (Figure 1); Codling Moth, *Cydia pomonella*), forest pests (e.g. Western Spruce Budworm, *Choristoneura occidentalis*), and household pests (e.g. Indian-Meal Moth, *Plodia interpunctella*). A total of 737 species of microlepidoptera are known from the Montane Cordillera Ecozone. The actual number of species in the Ecozone is probably at least double this number because of our poor knowledge of the leaf mining microlepidoptera. A significant portion of the recorded microlepidoptera are known from only one or two localities in the area so little can be said of range limits or distribution patterns.

The second major division of the Lepidoptera is the macrolepidoptera which contains the larger moths and the butterflies. For discussion purposes, we treat the macrolepidoptera in two groups, the “macromoths” (GROUP

II) and the butterflies (GROUP III). The 12 families of macromoths contain 1105 species in the Montane Cordillera Ecozone, this comprising 93% of the entire known macromoth fauna from British Columbia (see Table 1).



Figure 1. The Oblique-banded Leafroller (Tortricidae) is a pest of fruit in the Okanagan Valley.



Figure 2. Larvae of the Isabella Moth (Arctiidae) are commonly called Woollybears.



Figure 3. The larva of *Lithophane pertorrida* (Noctuidae) has cryptic colouration.



Figure 4. Larvae of the Brown Fruitworm (Noctuidae) hide in folded leaves during the day and emerge to feed at night.



Figure 7. Larvae of the Speckled Green Fruitworm (Noctuidae) blend with the foliage.



Figure 5. Larvae of the Western Tent Caterpillar (Lasiocampidae) are important forestry pests.



Figure 8. Larvae of the Old World Swallowtail (Papilionidae) are brightly coloured.



Figure 6. Larvae of the Gypsy Moth (Lymantriidae) are important forestry pests.



Figure 9. The larva of the Atlantis Fritillary (Nymphalidae) is protected by branching spines.

Two families, the inch-worms (Geometridae) and cutworms (Noctuidae) make up 90% of the Group III fauna. The cutworms alone, with 696 known species in the Ecozone, make up 33% of the entire Lepidoptera fauna. The larvae usually are exposed when feeding but are usually protected by spines (Saturniidae), tufts of hair (Arctiidae (Figure 2), Lymantriidae, Lasiocampidae, some Noctuidae), or cryptic colouration (Geometridae, Drepanidae, Notodontidae, most Noctuidae (Figure 3)).

Many noctuid larvae hide during the day in the soil and leaf litter and come out at night to feed (Figure 4). This group includes our largest Lepidoptera with the Ceanothus Silk Moth (*Hyalophora euryalis*) having a wingspan up to 13 cm. Typical wingspans of most macrolepidoptera are between 25 and 40 mm although some species may be as small as 12 mm (e.g. Noctuidae: *Hypenodes*). This group contains some very familiar pests such as Tent Caterpillars (Lasiocampidae: *Malacosoma*) (Figure 5), Tomato Hornworm (Sphingidae: *Manduca quinquemaculata*), introduced into the

Ecozone from farther south, Gypsy Moth (Lymantriidae: *Lymantria dispar*) (Figure 6), Armyworm (Noctuidae: *Pseudaletia unipuncta*) Speckled Green Fruitworm (Noctuidae: *Orthosia hibisci*) (Figure 7), and Corn Earworm (Noctuidae: *Helicoverpa zea*). Unfortunately, only a few groups of macrolepidoptera are popular with amateur collectors so distributional information on most families remains rather spotty. Popular groups are the Sphinx (Hawk Moth) family (Sphingidae), the Giant Silk Moths (Saturniidae), Tiger Moths (Arctiidae), and a group of cutworm moths called Underwing Moths (Noctuidae: genus *Catocala*).

The third group (GROUP III), a subset of the macrolepidoptera, is the butterflies. Six families of butterflies occur in the Montane Cordillera Ecozone and 173 species. The combination of colourful patterns, diurnal flight, and abundance of identification aids, has made butterflies the

most popular insect group with amateur entomologists. As a result, the distribution of the butterflies in Canada in general and the Montane Cordillera Ecozone in particular is well known so it is these patterns that form the primary basis for the analysis of distribution patterns given below. As in the macrolepidoptera, most butterfly larvae feed exposed and



Figure 12. The larva of the Mustard White (Pieridae) is covered by a dense layer of short hairs.



Figure 10. Larvae of the Silvery Blue (Lycaenidae) are covered with a dense layer of short hairs.



Figure 13. The larva of the White Veined Arctic (Nymphalidae) is covered by a dense layer of short hairs.



Figure 11. The larva of the Common Sooty Wing (Hesperiidae) is covered by a dense layer of short hairs.



Figure 14. The larva of Milbert's Tortoiseshell (Nymphalidae) is protected by spines.

rely on cryptic colouration, warning colouration (Figure 8), or spines (Figure 9) for protection. The majority of butterfly larvae are covered with a dense layer of short hair that gives them a fuzzy appearance (e.g. Lycaenidae (Figure 10), Hesperidae (Figure 11), Pieridae (Figure 12), and some Nymphalidae (Figure 13)) or are armed with impressive branching spines (e.g. most Nymphalidae (Figure 14)). Others, such as the Monarch (*Danaus plexippus*) (Figure 15) and some of the Swallowtails (Papilionidae) are toxic to predators and have a warning colouration. Many butterflies are powerful fliers and some are strongly migratory; however, only five butterfly species occur in the Ecozone as seasonal migrants.

“Lepidoptera classification and habits”. The four columns give the number of species known from the Montane Cordillera Ecozone, British Columbia, Canada, and North America (north of Mexico). The latter number is from Hodges et al. (1983).

LEPIDOPTERA DIVERSITY IN THE MONTANE CORDILLERA ECOZONE

The Montane Cordillera Ecozone supports a diverse fauna of butterflies and moths with 2,015 species recorded in 67 families. The impressive diversity of the Montane Cordillera Ecozone results from two factors: 1) the distinct ecological habitats within the Ecozone, and 2) the number of adjacent Ecozones that have small but diverse habitat extensions that extend into the Montane Cordillera Ecozone. The adjacent Ecozones that filter into the Montane Cordillera Ecozone are: 1) the Plains Ecozone, which extends into the Rocky Mountain foothills in southwestern Alberta and in a small area in British Columbia; 2) the Boreal Plains Ecozone, which extends through the Peace River district into the Fraser Basin and Fraser Plateau Ecoregions; 3) Boreal Cordillera Ecozone, which extends into the northern portion of the Montane Cordillera Ecozone and is probably best studied on Pink Mountain (Figure 16) at the extreme northern limit of the Montane Cordillera Ecozone; 4) the Pacific Maritime Ecozone with species from the Coastal Mountains occurring in the western portion of the Montane Cordillera Ecozone, particularly in the Lillooet area, and species from the Lower Mainland that extend along the Fraser River to Lytton and beyond.

Table 1 lists the 67 families of Lepidoptera known from the Ecozone in the three groups described above under



Figure 16. Pink Mountain is an eastern foothill of the Rocky Mountains.



Figure 17. Bunchgrass/Sage Steppe can be found in the Okanagan, Fraser, and Thompson River Valleys.



Figure 15. Larvae of the monarch (Nymphalidae) have warning colouration.



Figure 18. Montane forests cover much of the Ecozone, here with a light trap for moth collecting.

TABLE 1. Diversity of Lepidoptera species by family

GROUP I Microlepidoptera

FAMILY	Montane Cordillera Ecozone	British Columbia	Canada	North America (N. of Mexico)
MICROPTERYGIDAE	0	1	2	3
ERIOCRANIIDAE	0	0	1	12
HEPIALIDAE	4	6	13	20
NEPTICULIDAE	3	6	34	82
OPOSTEGIDAE	0	0	3	7
TISCHERIIDAE	1	1	9	48
HELIOZELIDAE	0	1	13	31
ADELIDAE	5	8	13	18
INCURVARIIDAE	11	13	18	25
PRODOXIDAE	0	0	2	16
TINEIDAE	4	7	43	174
PSYCHIDAE	1	1	6	26
GRACILLARIIDAE	13	22	125	278
BUCCULATRICIDAE	9	10	31	99
DOUGLASIIDAE	0	0	2	5
YPONOMEUTIDAE	15	26	50	92
YPSOLOPHIDAE	8	10	11	35
HELIODINIDAE	0	0	1	17
LYONETIIDAE	4	6	10	25
GLYPHIPTERIGIDAE	3	3	9	15
BATRACHEDRIDAE	1	1	2	24
BLASTOBASIDAE	1	1	6	109
BLASTODACNIDAE	1	1	3	6
COLEOPHORIDAE	18	20	98	145
COSMOPTERIGIDAE	3	3	15	180
DEPRESSARIIDAE	23	25	55	108
ELACHISTIDAE	5	4	29	63
ETHMIIDAE	3	5	10	50
GELECHIIDAE	56	55	223	630
MOMPHIDAE	3	3	14	37
OECOPHORIDAE	5	10	16	38
SCYTHRIDIDAE	4	5	13	35
STATHMOPODIDAE	0	0	1	5
SYMMOCIDAE	0	0	4	12
COSSIDAE	4	4	5	45
TORTRICIDAE	276	310	730	1164
SESIIDAE	13	13	49	115
CHOREUTIDAE	10	10	18	29
URODIDAE	1	1	1	1
ZYGAENIDAE	0	0	1	22
LIMACODIDAE	1	1	16	52
CARPOSINIDAE	1	1	4	11
SCHRECKENSTEINIIDAE	1	1	2	3
COPROMORPHIDAE	1	1	1	1
EPERMENIIDAE	0	0	4	11
ALUCITIDAE	1	1	2	2
PTEROPHORIDAE	42	43	70	146
THYRIDIDAE	1	1	2	12
PYRALIDAE	181	189	451	1374
TOTAL	737	830	2241	5382

GROUP II Macro-moths

FAMILY	Montane Cordillera Ecozone	British Columbia	Canada	North America (N. of Mexico)
GEOMETRIDAE	299	329	502	1404
URANIIDAE	1	1	2	10
DREPANIDAE	10	11	12	21
MIMALLONIDAE	0	0	2	4
APATELODIDAE	0	0	2	5
LASIOCAMPIDAE	5	5	9	35
SATURNIIDAE	5	6	23	68
SPHINGIDAE	18	18	53	124
NOTODONTIDAE	22	22	59	136
ARCTIIDAE	43	47	91	264
LYMANTRIIDAE	6	7	16	32
NOCTUIDAE	696	738	1347	2925
TOTAL	1105	1184	2118	5026

GROUP III Butterflies

FAMILY	Montane Cordillera Ecozone	British Columbia	Canada	North America (N. of Mexico)
HESPERIIDAE	28	29	70	290
PAPILIONIDAE	10	10	18	33
PIERIDAE	25	27	40	68
LYCAENIDAE	39	39	63	142
RIODINIDAE	1	1	1	25
NYMPHALIDAE	70	71	101	217
TOTAL	173	177	293	750
TOTAL LEPIDOPTERA	2015	2191	4652	11158

DISTRIBUTION PATTERNS

This analysis of distribution patterns of Lepidoptera of the Montane Cordillera Ecozone relies heavily on the distributional data from butterflies but other examples are included from the moths. For reference, a check list of the macro-moths and butterflies known from the Montane Cordillera Ecozone is included in appendices 1 and 2.

There are three main terrestrial habitat types within the Ecozone: 1) arid bunchgrass habitat characteristic of the Great Basin (Figure 17); 2) montane forests (Figures 18, 19); and 3) alpine tundra habitat above treeline (Figures 20-22). We examine each of these habitat types, and give examples of distribution patterns associated with them.

Arid bunchgrass habitat characteristic of the Great Basin occurs in the Ecozone primarily in five disjunct areas. The richest areas in terms of habitat and species diversity, is the Okanagan Valley, and to a lesser extent along the Similkameen River (especially near Keremeos (Figure 23)). More disjunct, and therefore more depauperate habitats are along the Fraser and Thompson Rivers (mainly from Kamloops to Lillooet (Figure 24)), farther north along the Fraser River (especially near Williams Lake (Figure 25)), and in extreme southeastern British Columbia and Waterton Lakes National Park in adjacent Alberta. Table 2 lists 16 species of butterflies most closely associated with Great Basin habitats and in which of these five areas they occur.

TABLE 2: Distribution of aridland butterflies

Species	Okanagan Valley	Similkameen Valley	Thompson/ Fraser Rivers	Williams Lake	SE BC and SW Alberta
<i>Hesperian juba</i> Juba Skipper	X	X	X	X	X
<i>Hesperia colorado</i> Western Branded Skipper	X	X	X	X	X
<i>Polites sabuleti</i> Sandhill Skipper	X				
<i>Polites sonora</i> Sonoran Skipper		X			
<i>Pontia beckerii</i> Becker's White	X	X	X	X	X
<i>Euchloe lotta</i> Desert Marble	X	X	X		X
<i>Lycaena heteronea</i> Blue Copper	X	X	X	X	X
<i>Lycaena nivalis</i> Lilac-bordered Copper	X	X			
<i>Satyrrium behrii</i> Behr's Hairstreak	X				
<i>Satyrrium fuliginorum</i> Behr's Hairstreak	X	X			X
<i>Satyrrium californicum</i> California Hairstreak	X		X		
<i>Callophrys affinis</i> West. Green Hairstreak	X				
<i>Euphilotes battoides</i> Square-spotted Blue	X	X		X	X
<i>Apodemia mormo</i> Mormon Metalmark	X (extirpated)	X			
<i>Phyciodes pallidus</i> Pale Crescent	X	X	X	X	X
<i>Cercyonis sthenele</i> Great Basin Wood-Nymph	X	X	X	X	X
Total 16	15	12	8	7	9



Figure 19. Montane forests cover much of the Ecozone, here in the Kananaskis Valley.



Figure 22. Alpine tundra in the Purcells.



Figure 20. Acid soils in the alpine tundra of the Coast Range support many species of Ericaceae. The igneous rock has no buffering capacity.



Figure 23. Arid bunchgrass habitat in the Okanagan and Similkameen Valleys is being lost to orchards and vineyards (left) and destroyed by over-grazing (on the right).



Figure 21. Alpine tundra in the Rockies and Purcells is mostly on sedimentary rock. The neutral soils grow different plants (thus different insects) than the acid soils of the Coast Mountains and Cascades.

The diversity is greatest in the Okanagan Valley, drops off slightly in the nearby Similkameen Valley, and more abruptly moving farther north to the more disjunct areas near Kamloops and Williams Lake. The arid slopes east of the Kootenay River in southeastern BC and Waterton National Park in southeastern Alberta, are near the American border but are not as closely associated with Great Basin habitat farther south as are the Okanagan and Similkameen

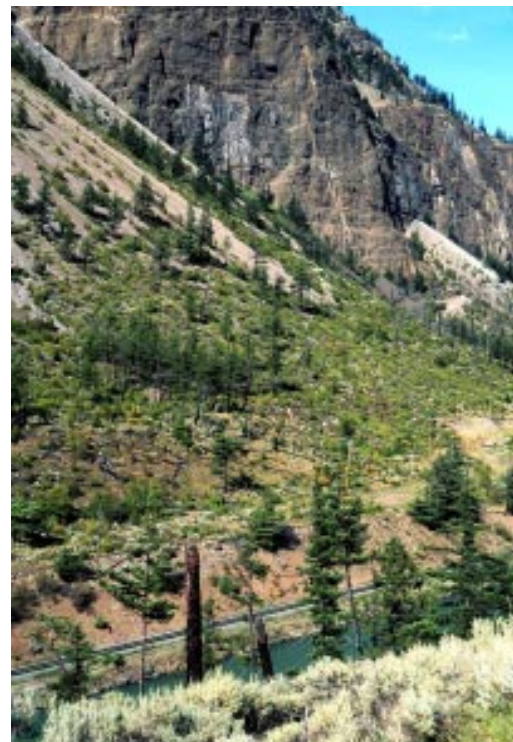


Figure 24. Arid bunchgrass/ponderosa pine habitat near Lillooet is home to a rich and diverse moth fauna.



Figure 25. Arid bunchgrass habitat near Williams Lake.

Valleys. No similar comparison is possible with the moth fauna because only the Okanagan Valley and the Kamloops area have been adequately collected and there is a great need for selective studies even there. Rich Okanagan habitats like the *Purshia tridentata* slopes east of Vaseaux Lake in the Bighorn Sheep preserve, the diverse habitats on Anarchist Mountain east of Osoyoos, and the extensive sagebrush areas at White Lake west of Penticton, have barely been studied for moths. Because of the loss of natural habitat in most of the Okanagan Valley, it is critical to determine the true nature of the diverse Lepidoptera fauna that survives there, which areas are critical, and which other arid habitats in British Columbia that they occur, in order to assess topics like threatened and endangered moths and habitats in British Columbia. Some species are widely distributed in both the Great Basin and Great Plains areas and occur throughout southern BC and Alberta wherever suitable habitat occurs. Some examples of this are Acmon Blue (*Icaricia acmon*), Boisduval's Blue (*Icaricia icarioides*), Arrowhead Blue (*Glaucopsyche piasus*), and Melissa Blue (*Lycaeides melissa*). Montane forests are probably the most dominant habitat in the Montane Cordillera Ecozone. These

tend to be dominated by Douglas-fir but support and impressive array of other conifer species, as well as areas of deciduous forests, especially poplars and cottonwoods. Montane forest distributions fall into two categories, with exceptions for host specific species limited to specific areas. The two range types are Boreomontane species and Montane Cordillera species. Typical ranges for Boreomontane species include both the boreal forest zone across most of central Canada and the comparable habitat in the western mountains. Most of these species occur in relatively mesic habitats like spruce forests. Some range as far south in BC as south-central BC (such as north and east of Kamloops), south to the higher areas of Manning Park and extreme north of Washington State, and some extend down the Rocky Mountain system to northern New Mexico and the White Mountains of eastern Arizona. Montane Cordillera species typically occur through most of the montane areas of western United States, often in more xeric habitats such as pine forests, and occur northward in BC to central BC and occasionally to southern Yukon. In some instances closely related species occupy these two general ranges and occasional hybrids may occur where their ranges come together near Kamloops. Examples of Boreal/Montane species pairs are the White Admiral (*Limenitis arthemis*) and Lorquin's Admiral (*Limenitis lorquini*), and the Canadian and Western Tiger Swallowtails (*Papilio canadensis* and *Papilio rutulus*). A more restricted type of montane distribution are species with ranges that extend northward in the Cascades Range from northern California into the southwestern part of the Ecozone in the Manning Park area (the Okanagan Range Ecoregion). The Indra Swallowtail (*Papilio indra*) and Hoffmann's Checkerspot (*Chlosyne hoffmanni*), are examples of this pattern. Arctic and alpine tundra habitat occurs above treeline throughout the Ecozone. This includes associations with mesic alpine habitat in most of the Ecozone that is characterized by species that occur in the mountains of western United States and Canada, and dry tundra habitat, mainly in the Rocky Mountain rain shadow in Alberta, where the ranges of many arctic species extend southward into the

Ecozone. Some species more commonly associated with arctic habitat extend into the northern portion of the Ecozone, and include Eversmann's Parnassian (*Parnassius eversmanni*) (Figure 26), Palaeno Sulphur (*Colias palaeno*) (Figure 27), and Polaris



Figure 26. Eversmann's Parnassian (Papilionidae) is an arctic species that enters the Ecozone in the north

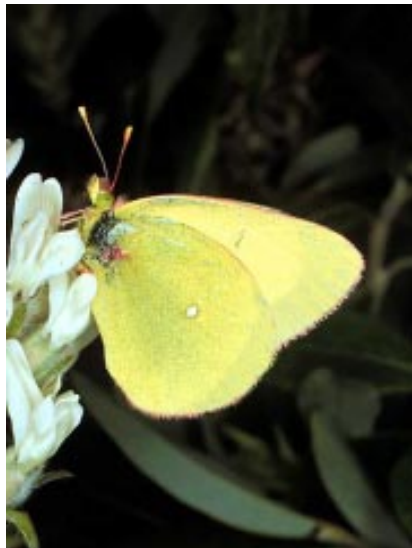


Figure 27. The Palaeno Sulphur (Pieridae) is an arctic species that enters the Ecozone in the north.



Figure 28. The Polaris Fritillary (Nymphalidae) is an arctic species that enters the Ecozone in the north.



Figure 29. The Dingy Fritillary (*Nymphalidae*) is an arctic species that follows the Rocky Mountains into the USA.



Figure 30. The Polixenes Arctic (*Nymphalidae*) is an arctic species that follows the Rocky Mountains into the USA.

Fritillary (*Boloria polaris*) (Figure 28), while others like the Dingy Fritillary (*Boloria improba*) (Figure 29) and the Polixenes Arctic (*Oeneis polixenes*) (Figure 30) extend down the drier east slopes of the Rocky Mountains to southern Alberta. Many other species are less specific and occur in alpine habitats throughout the Ecozone; these include moths such as *Merolonche lupini* (Figure 31), *Lasionycta poca* (Figure 32), and *Lasionycta luteola* (Figure 33).



Figure 31. *Merolonche lupini* (*Noctuidae*) is a subalpine species that occurs throughout the Ecozone.



Figure 32. *Lasionycta poca* (*Noctuidae*) is an alpine species that occurs throughout the Ecozone.



Figure 33. *Lasionycta luteola* (*Noctuidae*) is an alpine species that occurs throughout the Ecozone.

LEPIDOPTERA MIGRANTS/VAGRANTS

Only about 20 species of Lepidoptera occur in the Ecozone as seasonal migrants. Five of these are butterfly species (3 % of the butterfly fauna); this compares with 100 species of Lepidoptera and 30 species of butterflies (21 % of the fauna) in the Mixedwood Plains Ecozone in southeastern Canada (Lafontaine, 1996). The number of tropical and subtropical moths and butterflies that migrate northward each summer is much greater in eastern North America than in the west. The Atlantic Coast and Mississippi Valley form natural flyways for migrants, whereas the complex patterns of mountain ranges, desert areas, and diverse habitats in western United States and Canada seem to limit the northward movement of species. The most famous of the migrants is the Monarch (*Danaus plexippus*) (Figure 34); the population in the Montane Cordillera Ecozone overwinters in California, whereas those that occur in central and eastern Canada overwinter in Mexico. The Painted Lady (*Vanessa cardui*) (Figure 35) is another regular migrant. Three others, the Sachem (*Atalopedes campestris*), the American Lady (*Vanessa virginiensis*) (Figure 36), and the Variegated Fritillary (*Eupoietia claudia*) (Figure 37), are infrequent



Figure 34. The Monarch (Nymphalidae) overwinters in California and is becoming less common in the Ecozone.

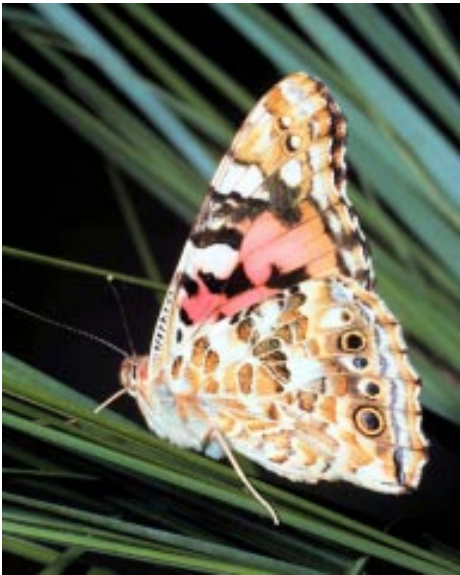


Figure 35. The Painted Lady (Nymphalidae) is a regular visitor to the Ecozone.



Figure 37. The Variegated Fritillary (Nymphalidae) is an occasional visitor to the Ecozone.



Figure 36. The American Lady (Nymphalidae) is an infrequent visitor to the Ecozone.



Figure 38. The White Lined Sphinx (Sphingidae) regularly visits the Ecozone.

migrants in the Ecozone. Another group of powerful fliers, the Sphinx Moths (Sphingidae), includes only two migrants (*Agrius cingulata* and *Hyles lineata* (Figure 38)) in the Ecozone compared with 9 migrant species in the Mixedwood Plains Ecozone. Two other families of Lepidoptera show a fair proportion of vagrant species: the Noctuidae and Pyralidae. Among pest species of Noctuidae that migrate regularly into the Montane Cordilleran Ecozone are the Corn Earworm (*Helicoverpa zea*), Variegated Cutworm (*Peridroma saucia*), and Black Cutworm (*Agrotis ipsilon*). Among the Pyralidae, two pest species are migrants: the Alfalfa Webworm (*Loxostege cerealis*) and Beet Webworm (*Loxostege sticticalis*). Only a few species of microlepidoptera other than Pyralidae are migratory, the most famous one being the Diamond-back Moth (*Plutella xylostella*) which sometimes migrates in huge swarms numbering many millions of moths and has even reached Greenland. Some authors (e.g. Smith, 1994) believe that the spread of this species has been greatly aided by man and list it as an introduced species in British Columbia.

RECENT CHANGES IN DISTRIBUTION

Recent changes in Lepidoptera distribution involve both expanding ranges and contracting ranges. Natural changes in distribution can be difficult to detect because they tend to be slower and more subtle than the dramatic changes caused by man. Unfortunately, most expanding ranges involve introduced species and most contracting ranges relate to the destruction of natural habitats.

INTRODUCED SPECIES

British Columbia has a disproportionately high number of introduced species. A list of 67 exotic species in British Columbia was given by Smith (1994) and this list is discussed and expanded in appendix four, bringing the current total to 90. A significant proportion of these species were first introduced into North America in the Vancouver area, and others that were introduced eastern North America have been introduced into the west independently from Eastern Asia, or secondarily from eastern North America, through the Vancouver area. This number is more than double the number of introduced species found in the Mixedwood Plains Ecozone. Most of the introduced Lepidoptera species in British Columbia are restricted to the Pacific Maritime Ecozone, mainly the greater Vancouver area, and have not been able to spread over the mountains into the interior. The exceptions to this generality are agricultural pests, especially those associated with fruit trees and grapes, that have been transported to into the interior, probably with nursery stock.

Native Species

Changes in distribution among native species is much more difficult to document because it requires the use of negative evidence. For example, if a species has moved into an area, or has withdrawn from an area, these can only be demonstrated if the lack of collections can be taken as valid evidence that the species is, or was, absent. Although several species of butterflies are believed to have been extirpated from the Pacific Maritime Ecozone (Guppy et al., 1994), none is known to have disappeared from the Montane Cordilleran Ecozone. One species, the Mormon Metalmark (*Apodemia mormo*) (Figure 39), considered endangered in British Columbia (Guppy et al., 1994), was previously known from the Okanagan and Similkameen Valleys. It has disappeared from the Okanagan Valley, but is expanding its range in the Similkameen Valley along 50 km of roadside near the US border where its larval food plant, Snow Buckwheat (*Eriogonum niveum*), is spreading (Layberry et al., 1998). The Sandhill Skipper (*Polites sabuleti*) was first found in British Columbia in 1975 when a number of colonies were discovered in abandoned lots in and around Penticton (Garland, 1977). The species continues to abound in these areas and has now been found elsewhere in the Okanagan as well. The fact that this species was not previously collected in the Okanagan, despite relatively heavy butterfly

collecting, and the disturbed habitats that it frequents, suggests that this species may have moved into the area recently from northern Washington where it has been known to occur for many years.

ENDANGERED AND THREATENED SPECIES

Other than butterflies, most species of Lepidoptera are not well enough collected or regularly monitored in the Montane Cordillera Ecozone to determine whether or not they are endangered or threatened. Many species of moths, especially among the microlepidoptera, have only been collected once or twice in the Ecozone, and may well turn out to quite common in the right habitat. Since so much of the original bunch-grass habitat of the Okanagan Valley has been eliminated, it is possible that some of the many moths known only from this area in Canada might be endangered but there has been so little moth study in the area that it not possible to determine this for any species. It is quite possible that some species of moths disappeared from Canada before we ever knew that they occurred here and that some species previously recorded in Canada may no longer occur. Many species occur in this type of habitat in northern Washington but are unknown in Canada. Some of these may yet be found here, others may already have been extirpated. The only moth species in the Montane Cordillera Ecozone that is either endangered or extirpated is the cutworm *Copablepharon hopfingeri*. This species was historically known only from a few small dune areas in Washington and one near Robson, BC. Efforts to rediscover the species at the known and other sites have been unsuccessful. In BC, the dunes at the previously known sites have been so altered that it is unlikely the species still occurs at them, although it still survives near the type locality in Washington State.

Two reports on butterflies of conservation concern in British Columbia (Guppy and Shepard, 1994 and Guppy et al., 1994) identified 52 species and subspecies of concern in British Columbia. Of these, 17 occur in the Montane Cordillera Ecozone. One (Egleis Fritillary, *Speyeria egleis*) was reported from Canada in error (Layberry et al., 1998) and a second, the Viceroy (*Limenitis archippus*) has been extirpated from British Columbia. The Viceroy is primarily a butterfly of eastern United States and southern Canada east of the Rocky Mountains but a thriving population existed in central Washington and the southern interior of British Columbia until 1916, but the population declined rapidly between 1916 and 1920 with only occasional reports of the species in BC until 1930 and in Washington until 1940 (Guppy et al., 1994). The reason for the decline of the western population of the Viceroy is unknown since its habitat, roadside and streamside willow and poplar areas are abundant. Of the 15 species of concern remaining, four are classified as "endangered", two as "threatened", six as "vulnerable", and three as unknown. The four endangered species are: Mormon Metalmark (*Apodemia mormo*), Behr's Hairstreak (*Satyrrium behrii*), Sooty Hairstreak (*Satyrrium*

fuliginosum), and Grey Copper (*Lycaena dione*). The Mormon Metalmark, known at present only from the Similkameen Valley and discussed above under species with expanding ranges, should probably now be considered as vulnerable rather than endangered but the status of the species needs to be monitored. Behr 's Hairstreak is known only from the southern Okanagan Valley where it is closely associated with remaining stands of its larval host plant Antelope Brush (*Purshia tridentata*). Sooty Hairstreak is known from the Similkameen Valley, Anarchist Mountain in the southern Okanagan, and Waterton National Park in southwestern Alberta; it occurs on dry brushy slopes where lupines, the larval host plant, occurs. The Grey Copper is primarily a Great Plains species occurring from western Ontario to western Alberta with a single colony known in British Columbia at Elizabeth Lake near Cranbrook. The larva feeds on Dock (*Rumex*spp.). The two "threatened" species are the Sonoran Skipper (*Polites sonora*), restricted to the Similkameen Valley, and the California Hairstreak (*Satyrium californicum*), which occurs mainly in the Similkameen and Okanagan Valleys.

to southwestern Alberta and one location in adjacent BC. The Magdalena Alpine occurs locally in the Rocky Mountain region of the United States from Montana to New Mexico; in Canada it has been recorded only at four locations, two in the Wilmore Wilderness Area in Alberta, one near McBride and one in Stone Mountain Provincial Park in British Columbia. The remote nature of the habitat of these three species in the Ecozone is the reason for the "unknown" status, but known colonies should be monitored and additional colonies reported.



Figure 39. The Mormon Metalmark (Riodinidae).

The six "vulnerable" species are: Nevada Skipper (*Hesperia nevada*, Similkameen and Okanagan Valleys), Indra Swallowtail (*Papilio indra*, Manning Provincial Park near Allison Pass), Lilac-bordered Copper (*Lycaena nivalis*, Okanagan Valley), Western Green Hairstreak (*Callophrys affinis*, Okanagan Valley), Eastern Tailed Blue (*Everes comyntas*, south-eastern Kootenays), and Gillette's Checkerspot (*Euphydryas gillettii*, East Kootenays). Of these the Eastern Tailed Blue tends to be sporadic and invasive at the northern edge of its range, being common only in southern Ontario, so its continued existence in BC needs to be monitored. Finally three species are listed by Guppy et al. (1994) as "unknown" (Alberta Fritillary, *Boloria alberta*, Magdalena Alpine, *Erebia magdalena* (Figure 40), and White-veined Arctic, *Oeneis bore* (Figure 41)). All three belong to the group of species associated with dry alpine tundra in western Alberta and have only rarely been recorded in the Montane Cordillera Ecozone in British Columbia. The Alberta Fritillary has an extremely small range in southwestern Alberta with two locations in adjacent BC. The White-veined Arctic is widespread in northern Canada and northern BC with its range extending southward in the Rocky Mountains



Figure 40. The Magdalena Alpine (Nymphalidae) occurs on scree slopes in the Rocky Mountains.



Figure 41. The White Veined Arctic (Nymphalidae).

It is clear that the most critical areas in the Montane Cordillera Ecozone, in terms of habitat frailty, habitat loss, and threatened and endangered species are the Okanagan and Similkameen Valleys. This is obvious from the butterflies and we can only speculate that the same would be true of the moths, which outnumber butterflies in diversity by a 10:1 ratio in the Ecozone, and probably outnumber them by 20:1 according to the expected moth/butterfly ratio given by Lafontaine and Wood (1997).

CONCLUSIONS

The Montane Cordillera Ecozone supports a diverse fauna of butterflies and moths with 2,015 species recorded, 43% of the entire Lepidoptera fauna of Canada.

Our knowledge of the Lepidoptera fauna of the Ecozone in terms of distribution, abundance, habitat requirements, and life history, varies greatly from group to group. These data are well known only for a few groups such as the butterflies and some families of large moths (e.g. Giant Silk Moths (Saturniidae) and Sphinx Moths (Sphingidae). Other groups, such as Cutworm Moths (Noctuidae), Tiger Moths (Arctiidae), Geometer Moths (Geometridae), and Prominent Moths (Notodontidae), are moderately well known, at least in terms of general distribution and abundance. Most of the 49 families of Microlepidoptera are poorly known in the Ecozone; although the species diversity of families such as Pyralidae, Tortricidae, Hepialidae, Limnacididae, and Hepialidae are probably about 80% known.

The impressive diversity of the Montane Cordillera Ecozone results from two factors: 1) the distinct ecological habitats within the Ecozone, and 2) the number of adjacent Ecozones that spill over the geographical borders into the Montane Cordilleran Ecozone. The adjacent Ecozones that filter into the Montane Cordillera Ecozone are: 1) the Plains Ecozone, which extends into the Rocky Mountain foothills in southeastern Alberta and in a small area in southwestern British Columbia; 2) the Boreal Plains Ecozone, which extends through the Peace River district into the Fraser Basin and Fraser Plateau Ecoregions; 3) Boreal Cordillera Ecozone, which extends into the northern portion of the Montane Cordillera Ecozone and is probably best studied on Pink Mountain; 4) the Pacific Maritime Ecozone with species from the Coastal Mountains occurring in the western portion of the Montane Cordillera Ecozone, particularly in the Lillooet area, and species from the Lower Mainland that extend along the Fraser River to Lytton and beyond.

There are three main terrestrial habitat types within the Ecozone: 1) arid bunchgrass habitat characteristic of the Great Basin, which occurs in the Ecozone primarily in the Okanagan Valley, and to a lesser extent along the Similkameen River (especially near Keremeos), along the Thompson River (mainly near Kamloops), and along the Fraser River (especially near Williams Lake); 2) montane conifer forests, mainly those of the Rocky Mountain system, which extends from Colorado to Yukon, and the Cascades Range that extends from northern California into the southwestern part of the Ecozone in the Manning Park area (the Okanagan Range Ecoregion); and 3) alpine tundra habitat above treeline throughout the Ecozone, which includes both mesic alpine habitat in most of the Ecozone that is characterized by species that occur in the mountains of western United States and Canada, and dry tundra habitat, mainly in the Rocky Mountain rain shadow in Alberta, where the ranges of many arctic species extends southward into the Ecozone.

Most of the threatened and endangered species in the Ecozone are associated with Great Basin bunchgrass habitat, especially those restricted to the Okanagan Valley where much of the original habitat has been converted to agricultural use.

REFERENCES

- Bolte, K.B. 1990. Guide to the Geometridae of Canada (Lepidoptera). VI. Subfamily Larentiinae. 1. Revision of the genus *Eupithecia*. Mem. Ent. Soc. Can., 151: 1-253.
- Cannings, R.A. and C. S. Guppy, 1989. Glover's silkmoth, *Hyalophora gloveri* (Strecker) (Lepidoptera: Saturniidae), new to British Columbia. Jour. Ent. Soc. British Columbia, 86: 89-90.
- Ferguson, D.C. 1971-72. Bombycoidea, Saturniidae. In: Dominick, R.B. et al., The Moths of America North of Mexico, fascicle 20.2: 1-275 + i-xxi, 22 colour plates. E.W. Classey Ltd., London, England.
- Ferguson, D.C. 1978. Noctuoidea, Lymantriidae. In: Dominick, R.B. et al., The Moths of America North of Mexico, fascicle 22.2: 1-110 + i-x, text figures 1-23, monochrome plate A, colour plates 1-8. E.W. Classey Ltd., London, England.
- Franclemont, J.G. 1973. Noctuoidea, Mimallonoidea, Mimallonidae, and Bombycoidea, Apatelodidae, Bombycidae, Lasiocampidae. In: Dominick, R.B. et al., The Moths of America North of Mexico, fascicle 20.1: 1-86 + i-viii, text figures 1-22, colour plates 1-11. E.W. Classey Ltd., London, England.
- Garland, J.A. 1977. An ecological note on *Polites sabuleti* at the northern limit of its range (Hesperiidae). Jour. Lepidopterist's Soc., 31: 70-71.
- Guppy, C. and J. Shepard 1994. British Columbia's butterflies and moths. pp. 53-56. In: Harding, L.E. and E. McCullum (Eds.). Biodiversity in British Columbia. Our changing environment. 1-426. Environment Canada and The Canadian Wildlife Service. Distributed by UBC Press, Vancouver.
- Guppy, C.S., J.H. Shepard, and N.G. Kondla. 1994. Butterflies and Skippers of conservation concern in British Columbia. Can. Field-Nat., 108: 31-40.
- Hodges, R.W. 1971. Sphingoidea. In: Dominick, R.B. et al., The Moths of America North of Mexico, fascicle 21: 1-158 + i-xii, 14 colour plates. E.W. Classey Ltd., London, England.
- Hodges, R.W. 1986. Gelechioidea, Gelechiidae (part). In: Dominick, R.B. et al., The Moths of America North of Mexico, fascicle 7.1: 1-195 + i-xiii, text figures 1-31, monochrome plates A-HH, colour plates 1-4. The Wedge Entomological Research Foundation, Washington, D.C.

- Hodges, R.W., T. Dominick, D.R. Davis, D.C. Ferguson, J.G. Franclemont, E.G. Munroe, and J.A. Powell. 1983. Check list of the Lepidoptera of America north of Mexico. E.W. Classey Ltd., London. 1-284.
- Lafontaine, J.D. 1987. Noctuoidea, Noctuidae (Part- Euxoa). In Dominick, R.B. et al., *The Moths of America North of Mexico*, fascicle 27.2: 1-237, text figures 1-2, monochrome plates A-FF, colour plates 1-8. The Wedge Entomological Research Foundation, Washington, D.C.
- Lafontaine, J.D. 1996. Butterflies and Moths (Lepidoptera). In Smith, I.M. (Ed.). *Species diversity in the Mixedwood Plains Ecozone EMAN web site* (www.cciw.ca/eman-temp/reports/publication/Mixedwood/lep/intro.htm). 13 pp. + species list.
- Lafontaine, J.D. and D.M Wood. 1997. Butterflies and moths (Lepidoptera) of the Yukon. pp. 723-785. In: Danks, H.V. and J.A. Downes (Eds.). *Insects of the Yukon. Biological Survey of Canada (Terrestrial Arthropods)*. Ottawa. 1034 pp.
- Lafontaine, J.D. 1998. Noctuoidea, Noctuidae (part): Noctuini. In Dominick, R.B. et al., *The Moths of America North of Mexico*, fascicle 27.3: 1-000, text figures 1-130, monochrome plates A-JJ, colour plates 1-8. The Wedge Entomological Research Foundation, Washington, D.C..
- Lafontaine, J.D., and R.W. Poole, 1991. Noctuoidea, Noctuidae (part) Plusiinae. In Dominick, R.B. et al., *The Moths of America North of Mexico*, fascicle 25.1: 1-182, text figures 1-68, monochrome plates A-Q, colour plates 1-4. The Wedge Entomological Research Foundation, Washington, D.C.
- Layberry, R.A., P.W. Hall, and J.D. Lafontaine. 1998. *The Butterflies of Canada*. 276 pp. 32 colour pls. University of Toronto Press.
- McGuffin, W.C. 1967. Guide to the Geometridae of Canada (Lepidoptera). I. Subfamily Sterrhinae. *Mem. Ent. Soc. Can.* 50: 1-67.
- McGuffin, W.C. 1972. Guide to the Geometridae of Canada (Lepidoptera). II. Subfamily Ennominae. 1. *Mem. Ent. Soc. Can.* 86: 1-159.
- McGuffin, W.C. 1977. Guide to the Geometridae of Canada (Lepidoptera). III. Subfamily Ennominae. 2. *Mem. Ent. Soc. Can.* 101: 1-191.
- McGuffin, W.C. 1981. Guide to the Geometridae of Canada (Lepidoptera). IV. Subfamily Ennominae. 3. *Mem. Ent. Soc. Can.* 117: 1-153.
- McGuffin, W.C. 1987. Guide to the Geometridae of Canada (Lepidoptera). V. Subfamily Ennominae. 4. *Mem. Ent. Soc. Can.* 138: 1-182.
- McGugan, B.M. (compiler). 1958. *Forest Lepidoptera of Canada. Volume 1 Papilionidae to Arctiidae*. Canada Department of Forestry Publication, 1034: 1-76.
- Munroe, E. 1972-74. Pyraloidea, Pyralidae (Part). In: Dominick, R.B. et al., *The Moths of America North of Mexico*, fascicle 13.1: 1-304 + i-xx, monochrome plates A-K, colour plates 1-13. E.W. Classey Ltd., London, England.
- Munroe, E. 1976. Pyraloidea, Pyralidae (Part). In: Dominick, R.B. et al., *The Moths of America North of Mexico*, fascicle 13.2: 1-150 + i-xvii, monochrome plates A-U, colour plates 1-9. E.W. Classey Ltd., London, England.
- Neunzig, H.H. 1986. Pyraloidea, Pyralidae (part), Phycitinae (Part). In Dominick, R.B. et al., *The Moths of America North of Mexico*, fascicle 15.2: 1-113 + i-xii, text figures 1-23, monochrome plates A-D, colour plates 1-6. The Wedge Entomological Research Foundation, Washington, D.C.
- Neunzig, H.H. 1990. Pyraloidea, Pyralidae (part), Phycitinae (Part). In Dominick, R.B. et al., *The Moths of America North of Mexico*, fascicle 15.3: 1-165, text figures 1-70, monochrome plates A-B, colour plates 1-5. The Wedge Entomological Research Foundation, Washington, D.C.
- Neunzig, H.H. 1997. Pyraloidea, Pyralidae (part), Phycitinae (Part). In Dominick, R.B. et al., *The Moths of America North of Mexico*, fascicle 15.4: 1-157, text figures 1-59, monochrome plates A-D, colour plates 1-4. The Wedge Entomological Research Foundation, Washington, D.C.
- Poole, R.W. 1995. Noctuoidea, Noctuidae (part) Cuculliinae, Stiriinae, Psaphidinae (part). In Dominick, R.B. et al., *The Moths of America North of Mexico*, fascicle 26.1: 1-249, text figures 1-147, monochrome plates A-V, colour plates 1-5. The Wedge Entomological Research Foundation, Washington, D.C.
- Prentice, R.M. (compiler). 1962. *Forest Lepidoptera of Canada. Volume 2 Nycteolidae Noctuidae Notodontidae Liparidae*. Canada Department of Forestry Bulletin, 128: 75- 281.
- Prentice, R.M. (compiler). 1963. *Forest Lepidoptera of Canada. Volume 3 Lasiocampidae Thyatiridae Drepanidae Geometridae*. Canada Department of Forestry Publication, 1013: 281-543.
- Prentice, R.M. (compiler). 1965. *Forest Lepidoptera of Canada. Volume 4 Microlepidoptera*. Canada Department of Forestry Publication, 1142: 543-840.

Scott, J.A. 1986. The butterflies of North America. Stanford University Press, Stanford, California. i-xiii + 1-583; 64 plates.

Smith, R. 1994. Effects of alien insects and microorganisms on the biodiversity of British Columbia's insect fauna. pp. 190-219. In: Harding, L.E. and E. McCullum (Eds.). Biodiversity in British Columbia. Our changing environment. 1-426. Environment Canada and The Canadian Wildlife Service. Distributed by UBC Press, Vancouver.

APPENDIX 1

Appendices 1 and 2 list the macro-moths and butterflies of British Columbia. The species that do not occur in the Montane Cordillera Ecozone are preceded by an asterisk, followed by a number code indicating which Ecozone from which they are recorded (1= Boreal Plains Ecozone, mainly the Peace River area; 2 = Northern BC, mainly the Boreal Cordillera Ecozone but with a few records from the Taiga Plains Ecozone; 3 = Pacific Maritime Ecozone). Species believed to have been introduced into the Ecozone by man are preceded by "Intro.". The number preceding each species is the check list (MONA) number in the Check list of the Lepidoptera of America north of Mexico (Hodges et al., 1983). After the main lists, there is a list of 13 (plus 1 undescribed) additional macro-moths and 7 butterflies that occur in the Ecozone in the Alberta Rockies but have not yet been reported from the Ecozone in British Columbia. Most species listed are supported by voucher specimens in the Canadian National Collection in Ottawa. A literature citation is given for 29 macro-moths and 11 butterflies that we believe to be validly recorded but there is no voucher material in the CNC; most of these species are in the collections of the Royal British Columbia Museum, Victoria, the University of British Columbia, or the National Museum of Natural History, Washington, DC. Included in the totals are 20 additional undescribed noctuids, which we recognize as occurring in British Columbia.

MACRO-MOTHS OF BRITISH COLUMBIA - 1185

DREPANOIDEA

DREPANIDAE - 11

Thyatirinae - 7

- 6235 *Habrosyne scripta* (Gosse)
- 6237 *Pseudothyatira cymatophoroides* (Gn.)
- 6240 *Euthyatira pudens* (Gn.)
- 6241 *Euthyatira semicircularis* (Grt.)
- *³ 6242 *Ceranemota improvisa* (Hy. Edw.)

- 6243 *Ceranemota fasciata* (B. & McD)
- 6248 *Ceranemota albertae* Clarke

Drepaninae - 4

- 6251 *Drepana arcuata* Wik.
- 6252 *Drepana bilineata* (Pack.)
- 6253 *Eudeilinia herminiata* (Gn.)
- 6255 *Oreta rosea* (Wik.)

GEOMETROIDEA

GEOMETRIDAE - 329

Archierinae - 2

- 6256 *Archieris infans* (Moesch.)
- 6257 *Leucobrephe brephoides* (Wik.) (McGuffin, 1988)

Ennominae - 134

- 6265 *Protitame matilda* (Dyar)
- 6270 *Protitame virginalis* (Hulst)
- 6272 *Eumacaria latiferrugata* (Wik.)
- 6279 *Itame occiduaria* (Pack.)
- 6280 *Itame andersoni* (Swett)
- 6283 *Itame sulphurea* (Pack.)
- 6286 *Itame brunneata* (Thunb.)
- 6287 *Itame anataria* (Swett)
- 6288 *Itame quadrilineararia* (Pack.)
- 6290 *Itame loricaria* (Evers.)
- 6292 *Itame exauspicata* (Wik.)
- 6296 *Itame plumosata* B. & McD.
- 6304 *Itame bitactata* (Wik.)
- 6306 *Itame decorata* (Hulst)
- 6308 *Itame colata* (Grt.)
- 6321 *Epelis truncataria* (Wik.)
- 6324 *Elpiste lorquinaria* (Gn.)
- 6327 *Semiothisa perplexata* (Pears.)
- 6330 *Semiothisa ulsterata* (Pears.)
- 6338 *Semiothisa adonis* (B. & McD.)
- 6341 *Semiothisa bicolorata* (F.) (Jones, 1951)
- 6343 *Semiothisa sexmaculata* (Pack.)
- 6344 *Semiothisa signaria* (Hbn.)
- 6346 *Semiothisa unipunctaria* (Wright)
- 6349 *Semiothisa banksianae* Fgn.
- 6364 *Semiothisa setonana* (McD.)
- 6370 *Semiothisa curvata* (Grt.)
- 6371 *Semiothisa nubiculata* (Pack.)
- 6373 *Semiothisa denticulata* Grt.
- 6374 *Semiothisa delectata* Hulst
- 6378 *Semiothisa respersata* (Hulst)
- *³ 6379 *Semiothisa teucaria* (Stkr.)
- 6380 *Semiothisa californiaria* (Pack.)
- 6385 *Semiothisa triviata* (B. & McD.)
- 6389 *Semiothisa arubescens* McD.

6394 *Semiothisa hebetata* (Hulst)
 6395 *Semiothisa irrorata* (Pack.)
 6396 *Semiothisa neptaria* (Gn.)
 6399 *Semiothisa subminiata* (Pack.)
 6426 *Dasyfidonia avuncularia* (Gn.)
 6429 *Orthofidonia exornata* (Wlk.)
 6431 *Hesperumia sulphuraria* Pack.
 6433 *Hesperumia latipennis* (Hulst)
 *³ 6435 *Neoalcis californiaria* (Pack.)
 6448 *Glena nigricaria* (B. & McD.)
 6463 *Stenoporpia pulmonaria* (Grt.)
 6473 *Stenoporpia separataria* (Grt.)
 6474 *Stenoporpia excelsaria* (Stkr.)
 6570 *Aethalura intertexta* (Wlk.)
 6575 *Anacamptodes clivinaria* (Gn.)
 6588 *Iridopsis larvaria* (Gn.)
 6590 *Anavitrinella pampinaria* (Gn.)
 6592 *Anavitrinella addendaria* (Grossb.)
 *² 6596 *Gnophos macguffini* Smiles
 6597 *Ectropis crepuscularia* ([D. & S.])
 6598 *Protoarmia porcelaria* (Gn.)
 6618 *Melanophia imitata* (Wlk.)
 *¹ 6637 *Eufidonia convergaria* (Wlk.) (In Zone in AB)
 6639 *Eufidonia discospilata* (Wlk.)
 6640 *Biston betularia* (L.)
 6651 *Lycia ursaria* (Wlk.)
 6653 *Lycia rachelae* (Hulst)
 6654 *Hypagyrtis unipunctata* (Haw.)
 6656 *Hypagyrtis piniata* (Pack.)
 6661 *Phigalia plumogeraria* (Hulst)
 6665 *Erannis vancouverensis* Hulst
 6666 *Lomographa semiclarata* (Wlk.)
 6672 *Sericosema juturnaria* (Gn.)
 6674 *Sericosema wilsonensis* C. & S.
 6676 *Cabera exanthemata* (Scop.)
 6677 *Cabera erythemaria* Gn.
 6678 *Cabera variolaria* Gn.
 6679 *Cabera borealis* (Hulst)
 6681 *Eudrepanulatrix rectifascia* (Hulst)
 6682 *Drepanulatrix unicalcararia* (Gn.)
 6685 *Drepanulatrix quadraria* (Grt.)
 6686 *Drepanulatrix foeminaria* (Gn.)
 6688 *Drepanulatrix carnearia* Hulst
 6689 *Drepanulatrix falcataria* (Pack.)
 6690 *Drepanulatrix secundaria* B. & McD.
 6694 *Apodrepanulatrix litaria* Hulst
 6695 *Ixala desperaria* (Hulst)
 6729 *Euchlaena johnsonaria* (Fitch)
 6731 *Euchlaena madusaria* (Wlk.)
 6734 *Euchlaena marginaria* (Minot.)
 6737 *Euchlaena tigrinaria* (Gn.)
 6743 *Xanthotype sospeta* (Drury)
 6753 *Pero honestaria* (Wlk.)
 6755 *Pero morrisonaria* (Hy Edw.)
 6757 *Pero mizon* (Rindge)
 6760 *Pero behrensaria* (Pack.)
 6761 *Pero occidentalis* (Hulst)
 6766 *Nacophora mexicanaria* (Grt.)
 6781 *Gabriola dyari* Tayl.
 6796 *Campaea perlata* (Gn.)

6797 *Ennomos magnaria* Gn.
 *Intr. ³ 6797.1 *Ennomos alniaria* (L.)
 6799 *Epirranthis substriataria* (Hulst)
 6802 *Philedia punctomacularia* (Hulst)
 6808 *Thallopaga taylorata* (Hulst)
 6809 *Thallopaga hyperborea* (Hulst)
 6817 *Selenia alcipheararia* Wlk.
 6818 *Selenia kentaria* (Grt. & Rob.)
 6819 *Metanema inatomaria* Gn.
 6820 *Metanema determinata* Wlk.
 6822 *Metarranthis duaria* (Gn.)
 6836 *Anagoga occiduaria* (Wlk.)
 6837 *Probole alienaria* H.-S.
 6838 *Probole amicaria* (H.-S.)
 6842 *Plagodis phlogosaria* (Gn.)
 6860 *Neoterpes triangulifera* (Pack.)
 6863 *Caripeta divisata* Wlk.
 6865 *Caripeta aequaliaria* Grt.
 6867 *Caripeta angustiorata* Wlk.
 6878 *Meris suffusaria* McD.
 6885 *Besma quercivoraria* (Gn.)
 6888 *Lambdina fiscellaria* (Gn.)
 6899 *Nepytia umbrosaria* (Pack.)
 6907 *Nepytia phantasmaria* (Stkr.)
 6910 *Nepytia freemani* Mun.
 6912 *Sicya macularia* (Harr.)
 6926 *Plataea trilinearia* (Pack.)
 6954 *Synaxis jubararia* (Hulst)
 6955 *Synaxis pallulata* (Hulst)
 6956 *Synaxis cervinaria* (Pack.)
 6958 *Synaxis formosa* (Hulst)
 6964 *Tetracis cachexiata* Gn.
 6978 *Prochoerodes amplicineraria* (Pears.)
 6981 *Prochoerodes forficaria* (Gn.)
 7004 *Sabulodes edwardsata* (Hulst)
 7005 *Enypia venata* (Grt.)
 7006 *Enypia griseata* Grossb.
 7007 *Enypia packardata* Tayl.
 7009 *Nematocampa limbata* (Haw.)

Geometrinae - 10

7012 *Chlorosea nevadaria* Pack.
 *³ 7013 *Chlorosea banksaria* Sperry
 7018 *Nemoria unitaria* (Pack.)
 7035 *Nemoria darwiniata* (Dyar)
 7049 *Nemoria glaucomarginaria* (B. & McD.)
 7058 *Synchlora aerata* (F.)
 7065 *Cheteoscellis bistrinaria* (Pack.)
 7072 *Chlorochlamys triangularis* Prout
 *Intr. ³ 7083 *Hemithea aestivaria* (Hbn.)
 7085 *Mesothea incertata* (Wlk.)

Sterrhinae - 15

7096 *Lobocleta quaesitata* Hulst
 7114 *Idaea demissaria* (Hbn.)
 7125 *Idaea rotundopennata* (Pack.)
 *³ 7126 *Idaea dimidiata* (Hufn.)
 *³ 7135 *Cyclophora dataria* (Hulst)

7139 *Cyclophora pedulinaria* (Gn.)
7162 *Scopula ancillata* (Hulst)
7163 *Scopula fuscata* (Hulst)
7164 *Scopula junctaria* (Wlk.)
7166 *Scopula frigidaria* (Moesch.)
7167 *Scopula siccata* McD.
7170 *Scopula luteolata* (Hulst)
7171 *Scopula sideraria* (Gn.)
7172 *Scopula sentinaria* (Gey.)
7179 *Leptostales rubromarginaria* (Pack.)

Larentiinae - 168

7182 *Dysstroma citrata* (L.)
*3 7184 *Dysstroma sobria* Swett
7187 *Dysstroma truncata* (Hufn.)
7188 *Dysstroma walkerata* (Pears.)
7189 *Dysstroma hersiliata* (Gn.)
7191 *Dysstroma formosa* Hulst
*3 7192 *Dysstroma colvillei* Blkmre.
7194 *Dysstroma brunneata* (Pack.)
*3 7195 *Dysstroma mancipata* (Gn.)
7199 *Eulithis propulsata* (Wlk.)
7201 *Eulithis testata* (L.)
7204 *Eulithis destinata* (Moesch.)
7205 *Eulithis flavibrunneata* (McD.)
7207 *Eulithis xylina* (Hulst)
7209 *Eurhinosea flavaria* Pack.
7210 *Eustroma semiatrata* (Hulst)
7211 *Eustroma fasciata* B. & McD.
7212 *Eustroma atrifasciata* (Hulst)
7213 *Elipoptera silacea* ([D. & S.])
*2 7215 *Colostigia turbata* Hbn. (In Zone in AB)
7216 *Plemyria georgii* Hulst
7219 *Thera otisi* (Dyar)
7221 *Ceratodalia gueneata* Pack.
7223 *Hydriomena exculpata* B. & McD.
7224 *Hydriomena expurgata* B. & McD.
7228 *Hydriomena irata* Swett
7229 *Hydriomena perfracta* Swett
7231 *Hydriomena marinata* B. & McD.
7232 *Hydriomena edenata* Swett
7235 *Hydriomena divisaria* (Wlk.)
7236 *Hydriomena renunciata* (Wlk.)
7243 *Hydriomena albimontanata* McD.
7245 *Hydriomena nevadae* B. & McD.
7246 *Hydriomena californiata* Pack.
7247 *Hydriomena crokeri* Swett
7254 *Hydriomena ruberata* (Frey.)
7255 *Hydriomena macdunnoughi* Swett
7257 *Hydriomena furcata* (Thun.)
7258 *Hydriomena quinquefasciata* (Pack.)
*3 7261 *Hydriomena albifasciata* (Pack.)
*3 7263 *Hydriomena speciosata* (Pack.)
*3 7276 *Hydriomena nubilofasciata* (Pack.)
*3 7277 *Hydriomena manzanita* Tayl.
7285 *Triphosa haesitata* (Gn.)
7290 *Coryphista meadi* (Pack.)
7291 *Hydria undulata* (L.)
7293 *Rheumaptera hastata* (L.)

7294 *Rheumaptera subhastata* (Nolcken)
7301 *Entephria multivagata* (Hulst)
7302 *Entephria takuata* (Tayl.)
7303 *Entephria lagganata* (Tayl.)
7304.3 *Entephria kidluitata* (Mun.)
7307 *Mesoleuca ruficillata* (Gn.)
7308 *Mesoleuca gratulata* (Wlk.)
7312 *Spargania magnoliata* Gn.
7313 *Spargania luctuata* ([D. & S.])
7316 *Perizoma basaliata* (Wlk.)
7324 *Perizoma curvilinea* (Hulst)
7325 *Perizoma costiguttata* (Hulst)
7328 *Perizoma custodiata* (Gn.)
7329 *Anticlea vasiliata* Gn.
7330 *Anticlea multiferata* (Wlk.)
7334 *Stamnodes blackmorei* Swett
*3 7349 *Stamnodes topazata* (Stkr.) (In Zone in AB)
7356 *Stannoctenis morrisata* (Hulst)
7357 *Stannoctenis pearsalli* (Swett)
7363 *Marmopteryx marmorata* (Pack.)
7368 *Xanthorhoe labradorensis* (Pack.)
7369 *Xanthorhoe packardata* McD.
7370 *Xanthorhoe abrasaria* (H.-S.)
7371 *Xanthorhoe iduata* (Gn.)
*3 7372 *Xanthorhoe macdunnoughi* Swett
*2 7373 *Xanthorhoe ramaria* S. & C. (In Zone in AB)
7374 *Xanthorhoe incursata* (Hbn.)
*2 7376 *Xanthorhoe baffinensis* McD.
7379 *Xanthorhoe pontiaria* Tayl.
7380 *Xanthorhoe fosaria* Tayl.
7384 *Xanthorhoe munitata* (Hbn.)
7386 *Xanthorhoe defensaria* (Gn.)
7388 *Xanthorhoe ferrugata* (Clerck)
*3 7389 *Xanthorhoe borealis* Hulst
*1 7390 *Xanthorhoe lacustrata* (Gn.) (Jones, 1951)
*3 7393.1 *Xanthorhoe clarkeata* Fgn.
7394 *Epirrhoe alternata* (Mull.)
7395 *Epirrhoe plebeculata* (Gn.)
7396 *Epirrhoe sperryi* Herbulot
7399 *Euphyia unangulata* (Haw.)
*3 7403 *Enchoria lacteata* (Pack.)
7406 *Zenopheps lignicolorata* (Pack.)
7408 *Zenopheps alpinata* Cass.
7411 *Psychophora phocata* (Moesch.)
7416 *Orthonama centrostrigaria* (Woll.)
7423 *Hydrelia albifera* (Wlk.)
7424 *Hydrelia brunneifasciata* (Pack.)
7425 *Venusia cambrica* Curt.
7426 *Venusia duodecemlineata* (Pack.) (Jones, 1951)
7427 *Venusia obsoleta* (Swett)
7429 *Venusia pearsalli* (Dyar)
7430 *Trichodezia albovittata* (Gn.)
7433 *Epirrita autumnata* (Bkh.)
7435 *Epirrita pulchraria* (Taylor)
*Intr. 3 7436 *Operophtera brumata* (L.)
7437 *Operophtera bruceata* (Hulst)
*3 7439 *Operophtera danbyi* (Hulst)
7440 *Eubaphe mendica* (Wlk.)
7444 *Eubaphe unicolor* (Rob.) (Jones, 1951)
7445 *Horsime intestinata* (Gn.)

7446 *Horsime incana* Swett
 7449 *Eupithecia palpata* Pack.
 7449.1 *Eupithecia lafontaineata* Bolte
 7449.2 *Eupithecia sharronata* Bolte
 7455 *Eupithecia ornata* (Hulst)
 7459 *Eupithecia columbiata* (Dyar)
 7460 *Eupithecia maestosa* (Hulst)
 *3 7468 *Eupithecia longipalpata* Pack.
 7471 *Eupithecia placidata* Tayl.
 *3 7472 *Eupithecia unicolor* (Hulst)
 7473 *Eupithecia pseudotsugata* MacKay
 7476 *Eupithecia misturata* (Hulst)
 *3 7479 *Eupithecia pygmaeata* (Hulst)
 7480 *Eupithecia bryanti* Tayl.
 7483 *Eupithecia regina* Tayl.
 7485 *Eupithecia borealis* (Hulst)
 7487 *Eupithecia subfuscata* (Haw.)
 7488 *Eupithecia tripunctaria* H.-S.
 7489 *Eupithecia lariciata* (Freyer)
 *3 7490 *Eupithecia harrisonata* MacKay
 7492 *Eupithecia casloata* Dyar
 *3 7496 *Eupithecia rotundopuncta* Pack.
 7518 *Eupithecia intricata* (Zett.)
 7520 *Eupithecia satyrata* (Hbn.)
 7522 *Eupithecia nimbicolor* (Hulst)
 7528 *Eupithecia assimilata* Dbldy.
 7529 *Eupithecia absinthiata* (Clerck)
 7533 *Eupithecia cretaciata* (Pack.)
 7535 *Eupithecia behrensata* Pack.
 7538 *Eupithecia gelidata* Moesch.
 7539 *Eupithecia multistrigata* (Hulst)
 7540 *Eupithecia perfusca* (Hulst)
 7543 *Eupithecia annulata* (Hulst)
 7546 *Eupithecia olivacea* Tayl.
 7548 *Eupithecia lachrymosa* (Hulst)
 7551.1 *Eupithecia interruptofascia* Pack.
 7552 *Eupithecia niphadophilata* (Dyar)
 7559 *Eupithecia tenuata* Hulst
 7561 *Eupithecia agnesata* Tayl.
 7566 *Eupithecia niveifascia* (Hulst)
 7574 *Eupithecia albicapitata* Pack.
 7575 *Eupithecia mutata* Pears.
 *3 7578 *Eupithecia spermaphaga* (Dyar)
 *3 7581 *Eupithecia gilvipennata* C. & S.
 7594 *Eupithecia anticaria* Wlk.
 7600 *Eupithecia graefii* (Hulst)
 7601 *Eupithecia nevadata* Pack.
 7605 *Eupithecia ravocostaliata* Pack.
 7613 *Prorella leucata* (Hulst)
 7621 *Prorella mellisa* (Grossb.)
 *Intr. 3 7625 *Chloroclytis rectangularata* (L.)
 7626 *Carsia sororiata* (Hbn.)
 *Intr. 3 7627 *Aplocera plagiata* (L.)
 7635 *Acasis viridata* (Pack.)
 7637 *Cladera limitaria* (Wlk.)
 7639 *Cladera atroliturata* (Wlk.)
 7640 *Lobophora nivigerata* Wlk.
 7641 *Lobophora montanata* Pack. (Jones, 1951)
 *3 7642 *Lobophora simsata* Swett
 7643 *Lobophora magnoliatoidata* (Dyar)

7644 *Lobophora canavestita* (Pears.) (Jones, 1951)

EIPLEMIDAE - 1

7650 *Callizzia amorata* Pack.

BOMBYCOIDEA

LASIOCAMPIDAE - 5

7673 *Tolype laricis* (Fitch) (Jones, 1951)

7679 *Tolype dayi* Blkmre.

7687 *Phyllodesma americanum* (Harr.)

7698 *Malacasoma distria* Hbn.

7702 *Malacasoma californicum* (Pack.)

SATURNIIDAE - 6

7741 *Hemileuca hera* (Harr.)

7743 *Hemileuca nuttalli* (Stkr.)

7744 *Hemileuca eglanterina* (Bdv.)

7757 *Antheraea polyphemus* (Cram.)

*1 7769 *Hyalophora gloveri* (Stkr.) (Cannings & Guppy, 1989)

7770 *Hyalophora euryalis* (Bdv.)

SPHINGIDAE - 18

7771 *Agrilus cingulata* (Fabr.) (Jones, 1951)

*Intr. 7776 *Manduca quinquemaculata* (Haw.)

7802 *Sphinx chersis* (Hbn.) (Jones, 1951)

7803 *Sphinx vashti* Stkr.

7805 *Sphinx perelegans* Hy. Edw.

7812 *Sphinx drupiferarum* J.E. Smith

7821 *Smerinthus jamaicensis* (Drury)

7822 *Smerinthus cerisyi* Kby.

7824 *Paonias exaecatus* (J.E. Smith)

7825 *Paonias myops* (J.E. Smith)

7828 *Pachysphinx modesta* (Harr.)

7853 *Hemaris thysbe* (F.)

7855 *Hemaris diffinis* (Bdv.)

7856 *Hemaris senta* (Stkr.)

7876 *Proserpinus clarkiae* (Bdv.)

7877 *Proserpinus flavofasciata* (Wlk.)

7893 *Hyles galli* (Rott.)

7894 *Hyles lineata* (Fabr.)

NOCTUOIDEA

NOTODONTIDAE - 22

7895 *Clostera albosigma* Fitch

7898 *Clostera strigosa* (Grt.)

7900 *Clostera brucei* (Hy. Edw.)

7901 *Clostera apicalis* (Wlk.)

7902 *Datana ministra* (Drury)

7915 *Nadata gibbosa* (J.E. Smith)

7922 *Pheosia rimosa* Pack.
 7923 *Pheosia portlandia* Hy. Edw.
 7924 *Odontosia elegans* (Stkr.)
 7927 *Notodonta pacifica* Behr
 7928 *Notodonta simplaria* Graef
 7931 *Gluphisia septentrionis* Wlk.
 7935 *Gluphisia severa* Hy. Edw.
 7937 *Furcula cinerea* (Wlk.)
 7939 *Furcula occidentalis* (Lint.)
 7940 *Furcula scolopendrina* (Bdv.)
 7941 *Furcula modesta* (Hudson)
 8005 *Schizura ipimoeae* Dbldy.
 8007 *Schizura unicornis* (J.E. Smith)
 8010 *Schizura concinna* (J.E. Smith)
 8012 *Oligocentria semirufescens* (Wlk.)
 8014 *Oligocentria pallida* (Stkr.)

ARCTIIDAE - 47

8037 *Gnophaela vermiculata* (Grt.)
 8043 *Eilema bicolor* (Grt.)
 *1,2 8050 *Crambidia impura* B. & McD.
 8051 *Crambidia casta* (Pack.)
 8089 *Hypoprepia miniata* (Kby.)
 8094 *Bruceia pulverina* Neum.
 8098 *Clemensia albata* Pack.
 *Intr. 8113 *Tyria jacobaeae* (L.)
 *1 8123 *Holomelina ferruginosa* (Wlk.) (In Zone in AB)
 8125 *Holomelina fragilis* (Stkr.)
 8126 *Leptarctia californiae* (Wlk.)
 8127 *Parasemia plantaginis* (L.)
 8129 *Pyrrharctia isabella* (J.E. Smith)
 8131 *Estigmene acrea* (Drury)
 8134 *Spilosoma congrua* Wlk.
 8137 *Spilosoma virginica* (F.)
 8138 *Spilosoma vagans* (Bdv.)
 8139 *Spilosoma pteridis* Hy. Edw.
 8140 *Hyphantria cunea* (Drury)
 8144 *Turuptiana permaculata* (Pack.)
 8156 *Phragmatobia fuliginosa* (L.)
 8158 *Phragmatobia assimilans* Wlk.
 8159 *Neoarctia brucei* (Hy. Edw.)
 8160 *Neoarctia beanii* (Neum.)
 8161 *Holoarctia sordida* (McD.)
 8162 *Platarctia parthenos* (Harr.)
 8163 *Platyrepia virginalis* (Bdv.)
 8165.2 *Pararctia yarrowi* (Stretch)
 8166 *Arctia caja* (L.)
 *2 8166.1 *Arctia opulenta* (Hy. Edw.)
 *2 8172 *Grammia quenseli* (Paykull)
 8177 *Grammia ornata* (Pack.)
 *3 8177.1 *Grammia complicata* (Wlk.)
 8179 *Grammia nevadensis* (Grt. & Rob.)
 8180.1 *Grammia superba* (Stretch)
 8184 *Grammia elongata* (Stretch)
 8187 *Grammia celia* (Saund.)
 8196 *Grammia parthenice* (W. Kirby)
 8197 *Grammia virgo* (L.)
 8198 *Grammia doris* (Bdv.)

*3 8206 *Lophocampa roseata* (Wlk.)
 8209 *Lophocampa argentata* (Pack.)
 8214 *Lophocampa maculata* Harr.
 8230 *Cycnia tenera* Hbn.
 8231 *Cycnia oregonensis* (Stretch)
 *1 8262 *Ctenucha virginica* (Esp.)
 8267 *Cisseps fulvicollis* (Hbn.)

LYMANTRIIDAE - 7

8294 *Dasychira vagans* (B. & McD.)
 *1 8304 *Dasychira plagiata* (Wlk.) (Jones, 1951)
 8306 *Dasychira griseifacta* (Dyar)
 8308 *Orgyia antiqua* (L.)
 8312 *Orgyia pseudotsugata* (McD.)
 *Intr. 8318 *Lymantria dispar* (L.)
 *Intr. 8319 *Leucoma salicis* (L.)

NOCTUIDAE - 738

(includes 20 undescribed species)

Herminiinae - 13

8322 *Idia americalis* (Gn.)
 8323 *Idia aemula* Hbn.
 8323.1 *Idia sp. nr. aemula*
 8334 *Idia lubricalis* (Gey.)
 8334.1 *Idia occidentalis* (Sm.) **stat. rev.**
 8352 *Zanclognatha jacchusalis* (Wlk.)
 8354 *Zanclognatha lotalba* (Sm.)
 8355 *Chytolita morbidalis* (Gn.)
 8356 *Chytolita petrealis* Grt.
 8362 *Phalaenostola metonalis* (Wlk.)
 8367 *Tetanolita palligera* (Sm.)
 8370 *Bleptina caradrinalis* Gn.
 8397 *Palthis angulalis* (Hbn.)

Rivulinae - 2

8404 *Rivula propinqualis* Gn.
 8415 *Mycterophora longipalpata* Hulst

Hypenodinae - 1

8439 *Phobolusia anfracta* (Hy. Edw.)

Hypeninae - 10

8443 *Bomolocha bijugalis* (Wlk.)
 8444 *Bomolocha palparia* (Wlk.)
 *3 8445 *Bomolocha abalienalis* (Wlk.)
 8450 *Bomolocha atomaria* Sm. (Jones, 1951)
 *1 8452 *Bomolocha edictalis* (Wlk.)
 8461 *Hypena humuli* Harr.
 8462 *Hypena californica* Behr
 8463 *Hypena decorata* Sm.
 8464 *Hypena modesta* Sm.
 8479 *Spargaloma sexpunctata* Grt.

Catocalinae - 33

- 8555 *Scoliopteryx libatrix* (L.)
8563 *Asticta victoria* (Grt.)
*3 8594 *Cissusa indiscreta* (Hy. Edw.)
8607 *Melipotis jucunda* Hbn.
8614 *Bulia deducta* (Morr.) (Jones, 1951)
8616 *Drasteria mirifica* (Hy. Edw.)
8623 *Drasteria sabulosa* (Hy. Edw.) = *nichollae* (Hamp.)

syn. n.

- 8626 *Drasteria ochracea* (Behr)
8630 *Drasteria divergens* (Behr)
8631 *Drasteria petricola* (Wlk.)
8632 *Drasteria hudsonica* (Grt. & Rob.)
8636 *Drasteria adumbrata* (Behr)
8639 *Drasteria howlandi* (Grt.)
8649 *Ascalapha odorata* (L.)
*3 8689 *Zale lunata* (Drury)
8697 *Zale minerea* (Gn.)
8703 *Zale duplicata* (Bethune)
*1 8732 *Euclida cuspidata* (Hbn.)
8732 *Euclida arditata* Franci.
8735 *Caenurgina annexa* (Hy. Edw.)
8736 *Caenurgina caerulea* (Grt.)
8738 *Caenurgina crassiuscula* (Haw.)
8739 *Caenurgina erechtea* (Cram.)
8800 *Catocala aholibah* Stkr.
8803 *Catocala relicta* Wlk.
8805 *Catocala unijuga* Wlk.
*3 8809 *Catocala allusa* Hulst
8811 *Catocala faustina* Stkr.
8814 *Catocala californica* Edw.
8817 *Catocala briseis* Edw.
8821 *Catocala semirelicta* Grt.
8828 *Catocala junctura* Wlk.
8857 *Catocala ultronia* (Hbn.)

Plusiinae - 41

- 8881 *Abrostola urentis* Gn.
8887 *Trichoplusia ni* (Hbn.)
8896 *Diachrysia aereoides* (Grt.)
8900 *Pseudeva palligera* (Grt.)
8901 *Polychrysia esmeralda* (Oberth.)
8902.1 *Euchalcia borealis* Laf. & Poole
8905 *Eosphoropteryx thyatyroides* (Gn.)
*3 8907 *Megalographa biloba* (Steph.)
8909 *Autographa rubida* Ottol.
8910 *Autographa sansoni* Dod
8911 *Autographa bimaculata* Steph.
8912 *Autographa mappa* (G. & R.)
8913 *Autographa pseudogamma* (Grt.)
*2 8913.1 *Autographa buraetica* (Stgr.)
8914 *Autographa californica* (Speyer)
8916 *Autographa flagellum* (Wlk.)
8917 *Autographa metallica* (Grt.)
8918 *Autographa corusca* (Stkr.)
*3 8919 *Autographa speciosa* Ottol.
8921 *Autographa v-alba* Ottol.

- 8923 *Autographa ampla* (Wlk.)
8924 *Anagrapha falcifera* (Kby.)
8926 *Syngrapha octoscripta* (Grt.)
8927 *Syngrapha epigaea* (Grt.)
8929 *Syngrapha viridisigma* (Grt.)
8930 *Syngrapha orophila* (Hamp.)
8934 *Syngrapha borea* (Auriv.)
8935 *Syngrapha diasema* (Bdv.)
*2 8937 *Syngrapha interrogationis* (L.) (In Zone in AB)
8939 *Syngrapha alias* (Ottol.)
8940 *Syngrapha abstrusa* Eichlin & Cunningham
8942 *Syngrapha rectangula* (Kby.)
8943 *Syngrapha angulidens* (Sm.)
8944 *Syngrapha celsa* (Hy. Edw.)
8946 *Syngrapha microgamma* (Hbn.)
8947 *Syngrapha alticola* (Wlk.)
8948 *Syngrapha parilis* (Hbn.)
8949 *Syngrapha ignea* (Grt.)
8950 *Plusia putnami* Grt.
8951 *Plusia nichollae* (Hamp.)
8953 *Plusia venusta* Wlk.

Euteliinae - 1

- 8955 *Marathyssa inficita* (Wlk.)

Sarrothripinae - 3

- 8975 *Nycteola frigidana* (Wlk.)
*3 8976 *Nycteola columbiana* (Hy. Edw.)
8977 *Nycteola cinereana* N. & D.

Nolinae - 3

- *3 8983 *Meganola minuscula* (Zell.)
8990 *Nola cilicoides* (Grt.)
8993 *Nola minna* Butler

Acontiinae - 7

- 9048 *Lithacodia albidula* (Gn.)
9085 *Tarachidia semiflava* (Gn.)
9101 *Tarachidea tortricina* (Zell.)
9110 *Conochares arizonae* (Hy. Edw.)
9111 *Therasea augustipennis* (Grt.)
9152 *Acontia major* Sm. (Jones, 1951)
9159 *Acontia areli* Stkr.

Pantheinae - 6

- 9178 *Panthea virginaria* (Grt.)
9179 *Panthea portlandia* Grt.
9181 *Panthea gigantea* (French)
*1 9183 *Panthea pallescens* McD.
9193 *Raphia frater* Grt.
9195 *Raphia coloradensis* Put.-Cr.

Acronictinae - 24

- 9203 *Acronicta dactylina* Grt.

9205.1 *Acronicta cyanescens* Hamp.
 9206 *Acronicta vulpina* (Grt.) = *Ieporina* of authors
 9207 *Acronicta innotata* Gn.
 9209 *Acronicta radcliffei* (Harv.)
 9212 *Acronicta grisea* Wlk.
 9218 *Acronicta mansueta* Sm.
 9221 *Acronicta funeralis* Grt. & Rob.
 *1 9224 *Acronicta quadrata* Grt.
 *1 9228 *Acronicta furcifera* Gn.
 9229 *Acronicta hasta* Gn.
 9231 *Acronicta strigulata* Sm.
 9241 *Acronicta fragilis* (Gn.)
 *3 9256 *Acronicta marmorata* Sm.
 9257 *Acronicta impleta* Wlk.
 9261 *Acronicta impressa* Wlk.
 9268 *Acronicta perdita* Grt.
 9272 *Acronicta oblinita* (J.E. Sm.)
 9274 *Acronicta lanceolaria* (Grt.) (Jones, 1951)
 9275 *Merolonche lupini* (Grt.)
 *2 9278 *Merolonche atlinensis* B. & Benj.
 9280 *Simyra henrici* (Grt.)
 9287 *Cryphia olivacea* (Sm.)
 9292 *Cryphia cuerva* (Barnes)

Agaristinae - 3

9318 *Alypia langtoni* Couper
 9319 *Alypia ridingsii* Grt.
 9321 *Androloma maccullochii* (Kby.)

Amphipyriinae - 103

9325 *Apamea cuculliformis* (Grt.)
 9333 *Apamea lignicolora* (Gn.) (Jones, 1951)
 *3 9333.1 *Apamea atriclava* (B. & McD.)
 9334 *Apamea antennata* (Sm.)
 *3 9337 *Apamea maxima* (Dyar)
 9338 *Apamea acera* (Sm.)
 9339.1 *Apamea sora* (Sm.)
 9341 *Apamea vultuosa* (Grt.)
 9344 *Apamea plutonia* (Grt.)
 9346 *Apamea occidens* (Grt.)
 9348 *Apamea amputatrix* (Fitch)
 9351 *Apamea alia* (Gn.)
 9353 *Apamea inordinata* (Morr.)
 9354 *Apamea centralis* (Sm.)
 9356 *Apamea spaldingi* (Sm.)
 *3 9357 *Apamea cinefacta* (Grt.)
 9359 *Apamea commoda* (Wlk.)
 9360 *Apamea impulsa* (Gn.)
 9362 *Apamea remissa* (Hbn.)
 9364 *Apamea finitima* Gn.
 *Intr. 3 9364.1 *Apamea ophiogramma* (Esper)
 9365 *Apamea sp. nr. laterita* (Hufn.)
 9367.1 *Apamea cogitata* (Sm.)
 9369 *Apamea inficita* (Wlk.)
 9372 *Apamea lutosa* (Andrews)
 9374 *Apamea niveivenosa* (Grt.)
 9382 *Apamea devastator* (Brace)
 9383 *Apamea longula* (Grt.)

9385 *Apamea zeta* (Treitschke)
 *3 9388 *Luperina venosa* (Sm.)
 9391 *Luperina passer* (Gn.)
 9396 *Eremobina claudens* (Wlk.)
 9401 *Oligia indirecta* (Grt.)
 *3 9405 *Oligia tusa* (Grt.)
 9413 *Oligia tonsa* (Grt.) = *laevigata* (Sm.) **syn. n.**
 9414 *Oligia violacea* (Grt.)
 9418 *Oligia obtusa* (Sm.)
 9419 *Oligia mactata* (Gn.)
 9420 *Oligia illocata* (Wlk.)
 9431 *Parastichtis suspecta* (Hbn.)
 9437 *Chortodes inquinata* (Gn.)
 9439 *Chortodes basistriga* (McD.)
 9440 *Chortodes rufostriata* (Pack.)
 9443 *Chortodes defecta* (Grt.)
 9445 *Benjaminsia colorada* (Sm.)
 9449 *Archanara oblonga* (Grt.)
 9450 *Archanara subflava* (Grt.)
 *Intr. 3 9452 *Macronoctua onusta* Grt.
 9453 *Celaena reniformis* (Grt.)
 9457 *Amphipoea americana* (Speyer)
 *3 9488 *Papaipema insulidens* (Bird)
 9510 *Hydraecia pallescens* Sm.
 9515 *Hydraecia perobliqua* Harv.
 9525 *Bellura obliqua* (Wlk.)
 9527 *Aseptis fumosa* (Grt.)
 9532 *Aseptis binotata* (Wlk.)
 9533 *Aseptis adnixa* (Grt.)
 9543 *Aseptis characta* (Grt.)
 9545 *Euplexia benesimilis* McD.
 9547 *Phlogophora periculosa* Gn.
 9549 *Enargia decolor* (Wlk.)
 9550 *Enargia infumata* (Grt.)
 *3 9552 *Ipimorpha nanaimo* Barnes
 9553 *Ipimorpha viridipallida* B. & McD.
 9555 *Ipimorpha pleonectusa* Grt.
 *1 9556 *Chytonix palliatricula* (Gn.)
 9559 *Chytonix divesta* (Grt.)
 9563 *Andropolia diversilineata* (Grt.)
 9564 *Andropolia contacta* (Wlk.)
 9570 *Andropolia aedon* (Grt.)
 9571 *Andropolia theodori* (Grt.)
 9578.1 *Hyppa sp. near xylinoides* (Gn.)
 9580 *Hyppa brunneicrista* Sm.
 9581 *Hyppa indistincta* Sm.
 9588 *Properigea albimacula* (B. & McD.)
 *3 9596 *Properigea niveirena* (Harv.)
 9599 *Pseudobryomima muscosa* (Hamp.)
 9605 *Pseudanarta crocea* (Hy. Edw.)
 9606 *Pseudanarta flava* (Grt.)
 9638 *Amphipyra pyramidoides* Gn.
 9639 *Amphipyra tragopoginis* (Cl.)
 9640 *Amphipyra glabella* (Morr.) (Jones, 1951)
 9642 *Protoperigea anotha* (Dyar)
 9643 *Protoperigea posticata* (Harv.)
 9647 *Proxenus miranda* (Grt.)
 9648 *Proxenus mindara* B. & McD.
 9649 *Proxenus mendosa* McD.
 9653 *Caradrina morpheus* (Hufn.)

9654 *Platyperigea meralis*(Morr.)
 9655 *Platyperigea camina*Sm.
 9656 *Platyperigea montana* (Bremer)= *extima* (Wlk.)
 9657 *Platyperigea multifera* (Wlk.)
 9665 *Spodoptera exigua*(Hbn.)
 9667 *Spodoptera praefica*(Grt.)
 9681 *Elaphria festivooides*(Gn.)
 9688 *Galgula partita*Gn. (Jones, 1951)
 9692 *Condica discistriga* (Sm.)
 9720 *Ogdoconta cinereola*(Gn.) (Jones, 1951)
 9814 *Achytonix praeacuta*(Sm.)
 9816 *Zotheca tranquilla*Grt.
 9850 *Annaphila danistica* Grt.
 *³ 9868 *Annaphila decia*Grt.
 *³ 9869 *Annaphila diva*Grt.

Cuculliinae = 116

9873 *Xylena nupera*(Lint.)
 9874 *Xylena curvimacula*(Morr.)
 9875 *Xylena thoracica*(Putnam-Cramer)
 9876 *Xylena cinerita* (Grt.)
 9877 *Xylena brucei* (Sm.)
 9878 *Lithomoia germana*(Morr.) = *solidaginis* of authors
 *³ 9880 *Homoglaea californica*(Sm.)
 9881 *Homoglaea hircina*Morr.
 9882 *Homoglaea dives* Sm.
 9883 *Homoglaea carbonaria*(Harv.)
 9884 *Litholomia napaea*(Morr.)
 9886 *Lithophane patefacta*(Wlk.) (Jones, 1951)
 9888 *Lithophane innominata*(Sm.)
 9889 *Lithophane petulca*Grt.
 9891 *Lithophane amanda*(Sm.)
 *³ 9901 *Lithophane contenta*Grt.
 9903 *Lithophane vivida*(Dyar)
 9909 *Lithophane tepida*Grt.
 9912 *Lithophane pertorrída*(McD.)
 9913 *Lithophane georgii*Grt.
 9917 *Lithophane fagina*Morr.
 9920 *Lithophane itata* (Sm.)
 9922 *Lithophane pexata*Grt.
 9923 *Lithophane dilatocula*(Sm.)
 9924 *Lithophane atara*(Sm.)
 9927 *Lithophane sp. nr. vanduzeei*(Barnes)
 9928 *Lithophane thaxteri*Grt.
 9935 *Eupsilia tristigmata* (Grt.)
 9938 *Eupsilia fringata* (B. & McD.)
 9939 *Eupsilia devia* (Grt.)
 9952 *Eucirroedia pampina*(Gn.)
 9953 *Pseudoglaea olivata*(Harv.)
 9954 *Agrochola purpurea*(Grt.)
 9955 *Agrochola pulchella*(Sm.)
 9957 *Sunira bicolorago*(Gn.) (Jones, 1951)
 9958 *Sunira decipiens*(Grt.)
 9960 *Sunira verberata*(Sm.)
 9962 *Anathix puta* (Grt. & Rob.)
 9963 *Anathix aggressa* (Sm.)
 9965 *Xanthia sp. neartogata* (Esper)
 9966 *Hillia maida*(Dyar)

9967 *Hillia iris*(Zett.)
 9970 *Fishia discors* (Grt.)
 9972 *Fishia yosemitae*(Grt.)
 9976 *Platypolia anceps*(Steph.)
 9977 *Platypolia contadina*(Sm.)
 9978 *Platypolia loda* (Stkr.)
 9980 *Xylotype acadia* B. & Benj.
 *³ 9981 *Dryotype opina*(Grt.)
 9987 *Mniotype ducta*(Grt.) = *versuta* (Sm.)
 9988 *Mniotype tenera* (Sm.) = *miniota* (Sm.)
 9990 *Sutyna profunda*(Sm.)
 9993 *Brachylomia populi*(Stkr.)
 9995 *Brachylomia rectifascia* (Sm.)
 9997 *Brachylomia thula*(Stkr.)
 9998 *Brachylomia algens*(Grt.)
 9999 *Brachylomia discinigra*(Wlk.)
 10003 *Epidemas obscura* Sm.
 10004 *Epidemas melanographa*Hamp.
 10005 *Feralia jocosa* (Gn.)
 10006 *Feralia deceptiva*McD.
 10008 *Feralia comstocki* (Grt.)
 10027 *Pleromelloida conserta*(Grt.) = *obliquata*(Sm.) **syn. n.**
 10029 *Pleromelloida bonuscula* (Sm.)
 10031 *Pleromelloida cinerea*(Sm.)
 10055 *Apharetra dentata*(Grt.) = *pyralis* (Sm.)
 10062 *Homohadena stabilis*Sm.
 10065 *Homohadena infixa*(Wlk.)
 10066 *Homohadena fifia*Dyar
 10076 *Oncocnemis albifasciata* Hamp.
 10078 *Oncocnemis sandaraca* Buckett & Bauer
 10079 *Oncocnemis pudorata* Sm.
 10080 *Oncocnemis mus*Troubr. & Crabo
 10081 *Oncocnemis parvanigra*Blkmre.
 10083 *Oncocnemis glennyi*Grt.
 10084 *Oncocnemis phairi*McD.
 10085.1 *Oncocnemis coprocolor*Troubr. & Crabo
 10093 *Oncocnemis levis* Grt.
 10096 *Oncocnemis augustus*Harv.
 10101 *Oncocnemis occata* (Grt.)
 10104 *Oncocnemis homogena*Grt.
 10113 *Oncocnemis extremis* (Sm.)
 10116 *Oncocnemis youngi*McD.
 10118 *Oncocnemis columbia* McD.
 10121 *Oncocnemis barnesii* Sm.
 10122 *Oncocnemis umbrifascia* Sm.
 10123.1 *Oncocnemis chalybdis*Troubr. & Crabo
 10124 *Oncocnemis cibalis* Grt.
 10126 *Oncocnemis lacticollis* Sm.
 10130 *Oncocnemis figurata*(Harv.)
 10130.1 *Oncocnemis greyi*Troubr. & Crabo
 10133 *Oncocnemis semicollaris* Sm.
 10135 *Oncocnemis riparia*Morr.
 10135.1 *Oncocnemis major*(Grt.)
 10140.1 *Oncocnemis poliochroa*Hamp. = *chandleri*of authors
 10151 *Oncocnemis dunbari*(Harv.)
 *² 10157 *Sympistis lapponica*(Thunb.) (Jones, 1951)
 10158 *Sympistis wilsoni* B. & Benj.
 10159 *Sympistis zetterstedti* (Stgr.)
 10162 *Sympistis funesta* (Paykull)
 *^{Intr.} 10177 *Calophasia lunula*(Hufn.)

10178 *Behrensia conchiformis* Grt.
10180 *Cucullia pulla* (Grt.)
10183 *Cucullia strigata* (Sm.)
10187.1 *Cucullia albida* Sm.
10190 *Cucullia speyeri* Lint.
10194 *Cucullia intermedia* Speyer
10195 *Cucullia similaris* Sm.
10197 *Cucullia florea* Gn.
10198 *Cucullia postera* Gn.
10199 *Cucullia omissa* Dod
10201 *Cucullia montanae* Grt.
10206 *Cucullia antipoda* Stkr.
10208 *Cucullia mcdunnoughi* (Henne)
10209 *Cucullia eulepis* (Grt.)

Hadeninae - 140

10223 *Discestra trifolii* (Hufn.)
10224 *Discestra mutata* (Dod)
10227 *Discestra hamata* (McD.)
10228 *Discestra oregonica* (Grt.)
10229 *Discestra alta* (B. & Benj.)
10232 *Discestra farnhami* (Grt.)
10233 *Discestra crotchi* (Grt.)
10254 *Trichoclea postica* Sm.
*3 10255 *Trichoclea edwardsii* Sm.
10256 *Trichoclea fuscolutea* (Sm.)
10261 *Trichoclea uscripta* (Sm.)
10265 *Sideridis rosea* (Harv.)
10268 *Sideridis maryx* (Gn.)
10269 *Admetovis oxymorus* Grt.
10270 *Admetovis similaris* Barnes
10271 *Mamestra configurata* Wlk.
10272 *Mamestra curialis* (Sm.) (Jones, 1951)
10273 *Polia discalis* (Grt.)
10274 *Polia piniae* Buckett & Bauer
10275 *Polia nimbosea* (Gn.)
10276 *Polia imbrifera* (Gn.)
10277 *Polia rogenhoferi* (Mösch)
10277.1 *Polia propodea* McCabe
10279 *Polia richardsoni* (Curt.)
10280 *Polia purpurissata* (Grt.)
10281 *Polia nugatis* (Sm.)
10284 *Polia delecta* B. & McD.
10288 *Polia detracta* (Wlk.)
10289 *Polia goodelli* (Grt.)
10290 *Polia obscura* (Sm.)
10292 *Melanchra adjuncta* (Bdv.)
10293 *Melanchra picta* (Harr.)
10294 *Melanchra pulverulenta* (Sm.)
*1 10295 *Melanchra assimilis* (Morr.)
10296 *Lacanobia nevadae* (Grt.)
*1 10297 *Lacanobia atlantica* (Grt.)
10298 *Lacanobia radix* (Wlk.)
10299 *Lacanobia subjuncta* (Grt. & Rob.)
10300 *Spiramater grandis* (Gn.)
10301 *Spiramater lutra* (Gn.)
10303 *Trichordestra tacoma* (Stkr.)
10305 *Trichordestra dodii* (Sm.)
10307 *Trichordestra lilacina* (Harv.)

10308 *Trichordestra liquida* (Grt.)
10310 *Papestra quadrata* (Sm.)
10311 *Papestra biren* (Goeze)
10312 *Papestra cristifera* (Wlk.)
10313 *Papestra brenda* (B. & McD.)
10314 *Papestra invalida* (Sm.)
10315 *Anartomima secedens* (Wlk.)
10317 *Hadena capsularis* (Gn.)
10321 *Hadena ectrapela* (Sm.)
10324 *Hada sutrina* (Grt.)
10326 *Hadena variolata* (Sm.)
10327 *Anarta melanopa* (Thunb.)
10332 *Anarta luteola* Grt. & Rob.
10332.1 *Anarta macrostigma* Laf. & Mikkola
*2 10335 *Lasionycta quadrilunata* (Grt.)
10336.1 *Lasionycta poca* (B. & Benj.)
10336.2 *Lasionycta albertensis* (McD.)
10338 *Lasionycta lagganata* (B. & Benj.)
10339 *Lasionycta impingens* (Wlk.)
10340 *Lasionycta discolor* (Sm.)
10342 *Lasionycta luteola* (Sm.)
10345 *Lasionycta macleani* (McD.)
10346 *Lasionycta uniformis* (Sm.)
10347 *Lasionycta infuscata* (Sm.)
10352 *Lasionycta perplexa* (Sm.)
10358 *Lasionycta subfuscula* (Grt.)
10360 *Lasionycta mutilata* (Sm.)
10362 *Lasionycta conjugata* (Sm.)
*1 10362.1 *Lasionycta taigata* Laf. (In Zone in AB)
*3 10365 *Lasionycta wyatti* (B. & Benj.)
10368 *Lacinipolia meditata* (Grt.) (Jones, 1951)
10370 *Lacinipolia lustralis* (Grt.)
*3 10371 *Lacinipolia cuneata* (Grt.)
10372 *Lacinipolia anguina* (Grt.)
10374 *Lacinipolia longiclava* (Sm.)
10380 *Lacinipolia vittula* (Grt.) = *stenotis* (Hamp.) **syn. n.**
10394 *Lacinipolia vicina* (Grt.)
10395 *Lacinipolia pensilis* (Grt.)
10397 *Lacinipolia renigera* (Steph.)
10398 *Lacinipolia stricta* (Wlk.)
10405 *Lacinipolia lorea* (Gn.)
10406 *Lacinipolia olivacea* (Morr.)
10407 *Lacinipolia davena* (Sm.)
10408 *Lacinipolia comis* (Grt.)
10409 *Lacinipolia rectilinea* (Sm.)
10415 *Lacinipolia strigicollis* (Wallgr.) = *illaudabilis* (Grt.)
syn. n.
*3 10423 *Lacinipolia patalis* (Grt.)
10427 *Trichocerapoda oblita* (Grt.)
10428 *Dargida procincta* (Grt.)
10431 *Faronta diffusa* (Wlk.)
10432 *Faronta terrapictalis* Buckett
10436 *Aletia oxygala* (Grt.)
*2 10437 *Aletia yukonensis* (Hamp.)
10438 *Pseudaletia unipuncta* (Haw.)
10441 *Leucania farcta* (Grt.)
*3 10441.1 *Leucania oregona* Sm. **stat. rev.**
10442 *Leucania anteoclara* Sm.
10446 *Leucania multilinea* Wlk.
10447 *Leucania commoides* Gn.

- 10449 *Leucania insueta* Gn.
10470 *Acerra normalis* Grt.
10471 *Stretchia plusiaformis* Hy. Edw.
10473 *Stretchia muricina* (Grt.)
10478 *Orthosia pulchella* (Harv.)
*3 10479 *Orthosia transparens* (Grt.)
*3 10480 *Orthosia praeses* (Grt.)
*3 10481 *Orthosia mys* (Dyar)
*3 10482 *Orthosia ferrigera* (Sm.)
10490 *Orthosia revicta* (Morr.)
10493 *Orthosia segregata* (Sm.)
10494 *Orthosia pacifica* (Harv.)
10495 *Orthosia hibisci* (Gn.)
10504 *Egira variabilis* (Sm.)
10505 *Egira hiemalis* (Grt.)
10506 *Egira simplex* (Wlk.)
10508 *Egira crucialis* (Harv.)
*3 10509 *Egira cognata* (Sm.)
10511 *Egira curialis* (Grt.) = *candida* (Sm.) **syn. n.**
10513 *Egira dolosa* (Grt.)
10514 *Egira rubrica* (Harv.)
10515 *Egira perlubens* (Grt.)
10523 *Tholera americana* (Sm.)
10524 *Nephelodes minians* Gn.
10529 *Anhimella perbrunnea* (Grt.)
10530 *Anhimella contrahens* (Wlk.)
10531 *Anhimella pacifica* McD.
10532 *Homorthodes furfurata* (Grt.)
10533 *Homorthodes communis* (Dyar)
10534 *Homorthodes fractura* (Sm.)
10535 *Homorthodes discreta* (B. & McD.)
*3 10539 *Homorthodes hanhami* (B. & McD.)
10540 *Homorthodes carneola* McD.
10546 *Protorthodes curtica* (Sm.)
10557 *Protorthodes rufula* (Grt.)
10563 *Protorthodes oviduca* (Gn.)
10582 *Pseudorthodes irrorata* (Sm.)
10607 *Zosteropoda hirtipes* Grt.
- Noctuinae - 196**
- 10641 *Agrotis vetusta* Wlk.
10651 *Agrotis venerabilis* Wlk.
10652 *Agrotis vancouverensis* Grt.
*3 10653 *Agrotis gravis* Grt.
10660 *Agrotis obliqua* (Sm.)
10663 *Agrotis ipsilon* (Hufn.)
10670 *Feltia jaculifera* (Gn.)
10676 *Feltia herilis* (Grt.)
10688 *Copablepharon hopfingeri* Francl.
10690 *Copablepharon absidum* (Harv.)
*3 10692.2 *Copablepharon fuscum* Troubr. & Crabo
10698.1 *Trichosilia nigrata* (Graes.)
10698.2 *Trichosilia mollis* (Wlk.)
10702 *Euxoa divergens* (Wlk.)
10704 *Euxoa edictalis* (Sm.)
10705 *Euxoa messoria* (Harr.)
10707 *Euxoa westermanni* (Stgr.)
10708 *Euxoa extranea* (Sm.) (Jones, 1951)
10709 *Euxoa vallus* (Sm.)
- 10712 *Euxoa macleani* McD.
10714 *Euxoa quebecensis* (Sm.)
10718 *Euxoa lewisi* (Grt.)
10720 *Euxoa altens* McD.
10723 *Euxoa tristicula* (Morr.)
*3 10724 *Euxoa vetusta* (Wlk.)
10726 *Euxoa atomaris* (Sm.)
10727 *Euxoa pleuritica* (Grt.)
10729 *Euxoa simona* McD.
10730.1 *Euxoa adumbrata* (Ev.) = *lidia* of authors
10731 *Euxoa auxiliaris* (Grt.)
10735 *Euxoa shasta* Laf.
10736 *Euxoa biformata* Sm.
10737 *Euxoa intermontana* Laf.
10738 *Euxoa mimallonis* (Grt.)
10739 *Euxoa septentrionalis* (Wlk.)
10741 *Euxoa olivia* (Morr.)
10742 *Euxoa terrena* (Sm.)
10746 *Euxoa scotogrammoides* McD.
10749 *Euxoa intrita* (Morr.)
10750 *Euxoa rufula* (Sm.)
10751 *Euxoa silens* (Grt.)
10754 *Euxoa simulata* McD.
10755 *Euxoa declarata* (Wlk.)
10756 *Euxoa campestris* (Grt.)
10757 *Euxoa rockburnei* Hdwk.
10759 *Euxoa punctigera* (Wlk.)
10765 *Euxoa pallipennis* (Sm.)
10768 *Euxoa atristrigata* (Sm.)
10769 *Euxoa nevada* (Sm.)
10770 *Euxoa cinereopallida* (Sm.)
10774 *Euxoa mitis* (Sm.)
10777 *Euxoa aequalis* (Harv.)
10780 *Euxoa comosa* (Morr.)
10781.1 *Euxoa occidentalis* Laf.
10785 *Euxoa infausta* (Wlk.)
10785.1 *Euxoa brunneigera* (Grt.)
10786 *Euxoa satis* (Harv.)
10787.1 *Euxoa excogita* (Sm.) **stat.rev.**
10788 *Euxoa bicollaris* (Grt.)
10792 *Euxoa satiens* (Sm.)
10794 *Euxoa setonia* McD.
10794.1 *Euxoa pallidimacula* Laf.
10795 *Euxoa pluralis* (Grt.)
10800 *Euxoa nostra* (Sm.)
10801 *Euxoa ochrogaster* (Gn.)
10804 *Euxoa plagigera* (Morr.)
10805 *Euxoa tessellata* (Harr.)
10807 *Euxoa albipennis* (Grt.)
10808 *Euxoa lillooet* McD.
10809 *Euxoa catenula* (Grt.)
10816 *Euxoa perexcellens* (Grt.)
10817 *Euxoa obeliscoides* (Gn.)
10819 *Euxoa choris* (Harv.)
10820 *Euxoa hollemani* (Grt.) = *andera* of authors
10820.1 *Euxoa subandera* Laf. = *hollemani* of authors
10824 *Euxoa brevipennis* (Sm.)
10825 *Euxoa costata* (Grt.)
10826 *Euxoa idahoensis* (Grt.)
10826.1 *Euxoa castanea* Laf.

- 10829 *Euxoa laetificans* (Sm.)
10830 *Euxoa quadridentata* (Grt. & Rob.)
10832 *Euxoa agema* (Stkr.)
10833 *Euxoa olivalis* (Grt.)
10834 *Euxoa oblongistigma* (Sm.)
10836 *Euxoa dargo* (Stkr.)
10839 *Euxoa cicatricosa* (Grt. & Rob.)
10843 *Euxoa teleboa* (Sm.)
10845 *Euxoa difformis* (Sm.)
10846 *Euxoa murdocki* (Sm.)
10848 *Euxoa latro* (B. & Benj.)
10850 *Euxoa infracta* (Morr.)
10852 *Euxoa auripennis* Laf.
10854 *Euxoa servita* (Sm.)
10855 *Euxoa munis* (Grt.)
10860 *Euxoa perolivalis* (Sm.)
10861 *Euxoa ridingsiana* (Grt.)
10861.1 *Euxoa maimes* (Sm.)
10862 *Euxoa aberrans* McD.
10864 *Euxoa flavicollis* (Sm.)
10865 *Euxoa perpolita* (Morr.)
10865.1 *Euxoa nomas* (Erschov)
*³ 10867 *Euxoa wilsoni* (Grt.)
10889 *Pseudorthosia variabilis* Grt.
10891 *Ochropleura implecta* Laf.
10905 *Euagrotis exuberans* (Sm.)
10910 *Euagrotis tepperi* (Sm.)
10913 *Crassivesica bocha* (Morr.)
10915 *Peridroma saucia* (Hbn.)
10916 *Diarsia calgary* (Sm.)
10917 *Diarsia rubifera* (Grt.)
10918 *Diarsia dislocata* (Sm.)
10920 *Diarsia esurialis* (Grt.)
10921 *Diarsia rosaria* (Grt.)
10923 *Protexarnis squalida* (Gn.)
10924 *Actebia fennica* (Tauscher)
10925.1 *Rhyacia clemens* (Sm.)
10926 *Spaelotis clandestina* (Harr.)
10927.1 *Spaelotis bicava* (Grt.)
10928 *Graphiphora augur* (F.)
10929 *Eurois occulta* (L.)
10930 *Eurois astricta* Morr.
10931 *Eurois nigra* (Sm.)
10939 *Xestia okakensis* (Pack.)
10942 *Xestia c-nigrum* (L.)
10944 *Xestia smithii* (Snellen)
*^{Intr.} 10945 *Xestia xanthographa* (F.)
10947 *Xestia oblata* (Morr.)
10948 *Prognorisma substrigata* (Sm.)
10951 *Pseudohermonassa tenuicula* (Morr.)
*³ 10952 *Pseudohermonassa flavotincta* (Sm.)
10954 *Agnorisma bugrai* (Koçak)
10957 *Xestia atrata* (Morr.)
10957.1 *Xestia ursae* (McD.)
10958 *Xestia fabulosa* (Ferg.)
10959 *Xestia mixta* (Wlk.)
10960 *Xestia speciosa* (Hbn.)
10962 *Xestia perquiritata* (Morr.)
*² 10963 *Xestia lupa* Laf. & Mikkola = *laetabilis* of authors (In Zone in AB)
- 10964 *Xestia homogena* (McD.)
10965 *Xestia imperita* (Hbn.)
10968.1 *Xestia praevia* Laf.
10971 *Xestia mustelina* (Sm.)
10971.1 *Xestia plebeia* (Sm.)
10972 *Xestia infimatis* (Grt.)
10972.2 *Xestia finatimis* Laf.
*³ 10973.1 *Xestia verniloides* Laf.
10974 *Setagrotis pallidicollis* (Grt.)
10977 *Tesagrotis atrifrons* (Grt.)
10978 *Tesagrotis piscipellis* (Grt.)
10978.1 *Tesagrotis corrodera* (Sm.)
10981 *Xestia maculata* (Sm.)
10986 *Xestia bryanti* (Benj.)
10988 *Coenophila opacifrons* (Grt.)
10989 *Adelphagrotis stellaris* (Grt.)
10991 *Adelphagrotis indeterminata* (Wlk.)
10992 *Paradiarsia littoralis* (Pack.)
10995.2 *Cerastis enigmatica* Laf. & Crabo
10996 *Cerastis salicarum* (Wlk.)
10999 *Aplectoides condita* (Gn.)
11000 *Anaplectoides prasina* ([D. & S.])
11001 *Anaplectoides pressus* (Grt.)
11003 *Chersotis juncta* (Grt.)
11004 *Protolampra rufipectus* (Morr.)
11008 *Eueretagrotis perattenta* (Grt.)
*^{Intr.} ³ 11010.2 *Noctua comes* Hbn.
11012 *Cryptocala acadiensis* (Bethune)
11013 *Abagrotis erratica* (Sm.)
11016 *Abagrotis vittifrons* (Grt.)
11018 *Abagrotis trigona* (Sm.)
11019 *Abagrotis mirabilis* (Grt.)
11022 *Abagrotis glenni* Buckett
11024 *Abagrotis nefascia* (Sm.) = *crumbi* Franci.
11024.1 *Abagrotis forbesi* (Benj.) = *nefascia* of authors
*³ 11028 *Abagrotis baueri* McD.
11030 *Abagrotis turbulenta* McD.
11032 *Abagrotis variata* (Grt.)
11032.1 *Abagrotis orbis* (Grt.) = *barnesi* of authors
11033 *Abagrotis scopeops* (Dyar)
*³ 11036 *Abagrotis pulchrata* (Blkmre.)
11037 *Abagrotis apposita* (Grt.)
11038 *Abagrotis nanalis* (Grt.)
11039 *Abagrotis duanca* (Sm.)
11040 *Abagrotis reedi* Buckett
11041 *Abagrotis placida* (Grt.)
11042 *Abagrotis dodi* McD.
11042.1 *Abagrotis dickeli* Laf.
11043 *Abagrotis cupida* (Grt.)
11044 *Abagrotis brunneipennis* (Grt.)
11047 *Parabagrotis exertistigma* (Morr.)
11047.1 *Parabagrotis sulinaris* Laf.
11047.2 *Parabagrotis formalis* (Grt.)
*³ 11047.3 *Parabagrotis cupidissima* (Grt.)
11048 *Parabagrotis insularis* (Grt.)
11049 *Pronoctua typica* Sm.
11049.1 *Pronoctua peabodyae* (Dyar)
11049.2 *Pronoctua crabo* Laf.

Ufeinae - 2

- 11051 *Ufeus satyricus* Grt.
11052 *Ufeus plicatus* Grt.

Heliiothinae - 15

- 11062 *Eutricopis nexilis* Morr.
11064 *Pyrrhia exprimens* (Wlk.)
11068 *Helicoverpa zea* (Boddie)
11072 *Heliiothis phloxiphagus* Grt. & Rob.
11074 *Heliiothis paradoxus* (Grt.) (Jones, 1951)
11077 *Heliiothis ononis* (F.) (Jones, 1951)
11078 *Heliiothis oregonicus* (Hy. Edw.)
11082 *Schinia nuchalis* (Grt.)
11083 *Schinia villosa* (Grt.)
11083.2 *Schinia intermontana* Hdwk.
11088 *Schinia sueta* (Grt.)
11102 *Schinia honesta* (Grt.)
11184 *Schinia walsinghami* (Hy. Edw.)
11190 *Schinia acutillinea* (Grt.)
11192 *Schinia cumatilis* (Grt.) (Jones, 1951)

Additions to Montane Cordillera Ecozone macro- moth fauna from SW Alberta - 14 (includes 1 undescribed species)

- 6281 *Itame simplex* (Dyar)
6715 *Aspitates aberratus* (Hy. Edw.)
7434 *Epirrita undulata* (Harrison)
8128 *Dodia albertae* Dyar
8186 *Grammia williamsii* (Dodge)
9394 *Apamea contradicta* (Sm.)
9417 *Oligia egens* (Wlk.)
10647 *Agrotis patula* (Wlk.)
10798 *Euxoa basalis* (Grt.)
10802 *Euxoa cursoria* (Hufn.)
10943 *Xestia normaniana* (Grt.)
10973 *Xestia vernilis* (Grt.)
11041.1 *Abagrotis hermina* Laf.

APPENDIX 2

BUTTERFLIES OF BRITISH COLUMBIA – 177

HESPERIOIDEA

HESPERIIDAE - Skippers - 29

Pyrginae - Pyrgine Skippers

- 3870 *Epargyreus clarus* (Cramer, [1775]) - Silver-spotted Skipper

- 3910 *Thorybes pylades* (Scudder, 1870) - Northern Cloudywing
3945 *Erynnis icelus* (Scudder & Burgess, 1870) - Dreamy Duskywing
*₃ 3949 *Erynnis propertius* (Scudder & Burgess, 1870) - Propertius Duskywing
3955 *Erynnis pacuvius* (Lintner, 1876) - Pacuvius Duskywing
3960 *Erynnis afranius* (Lintner, 1876) - Afranius Duskywing (Layberry et al., 1998)
3961 *Erynnis persius* (Scudder, 1863) - Persius Duskywing
3962 *Pyrgus centaureae* (Rambur, 1840) - Grizzled Skipper
3963 *Pyrgus ruralis* (Boisduval, 1852) - Two-banded Checkered Skipper
3966 *Pyrgus communis* (Grote, 1872) - Common Checkered Skipper
3977 *Pholisora catullus* (Fabricius, 1793) - Common Sootywing

Heteropterinae

- 3982 *Carterocephalus palaemon* (Pallas, 1771) - Arctic Skipper

Hesperinae - Branded Skippers

- 4007 *Oarisma garita* (Reakirt, 1866) - Garita Skipperling
intr. 4012 *Thymelicus lineola* (Ochsenheimer, 1808) - European Skipper
4019 *Hesperia juba* (Scudder, [1871]) - Juba Skipper
4020 *Hesperia comma* (Linnaeus, 1758) - Common Branded Skipper
4020.1 *Hesperia colorado* (Scudder, 1874) - Western Branded Skipper
*₁ 4020.2 *Hesperia assiniboia* (Lyman, 1892) - Plains Skipper
4035 *Hesperia nevada* (Scudder, 1874) - Nevada Skipper
4036 *Polites peckius* (W. Kirby, 1837) - Peck's Skipper
4037 *Polites sabuleti* (Boisduval, 1852) - Sandhill Skipper
4039 *Polites draco* (W.H. Edwards, 1871) - Draco Skipper
4041 *Polites themistocles* (Latreille, [1824]) - Tawny-edged Skipper
4043 *Polites mystic* (W.H. Edwards, 1863) - Long Dash Skipper
4044 *Polites sonora* (Scudder, 1871) - Sonoran Skipper
4049 *Atalopedes campestris* (Boisduval, 1852) - Sachem
4054 *Ochlodes sylvanoides* (Boisduval, 1853) - Woodland Skipper
4078 *Euphyes vestris* (Boisduval, 1852) - Dun Skipper
4105 *Amblyscirtes vialis* (W.H. Edwards, 1862) - Common Roadside Skipper

PAPILIONOIDEA - True Butterflies

PAPILIONIDAE

- Parnassians and Swallowtails 10

Parnassiinae - Parnassians

- 4153 *Parnassius evermanni* Ménétriés, 1851 - Eversmann's Parnassian
4154 *Parnassius clodius* Ménétriés, 1855 - *Clodius* Parnassian
4155.1 *Parnassius smintheus* Doubleday, [1847] - Rocky Mountain Parnassian

Papilioninae - Swallowtails

- 4166 *Papilio machaon* Linnaeus, 1758 - Old World Swallowtail
4167 *Papilio zelicaon* Lucas, 1852 - Anise Swallowtail
4168 *Papilio indra* Reakirt, 1866 - Indra Swallowtail
4176.1 *Papilio canadensis* Rothschild & Jordan, 1906 - Canadian Tiger Swallowtail
4177 *Papilio rutulus* Lucas, 1852 - Western Tiger Swallowtail
4178 *Papilio multicaudatus* Kirby, 1884 - Two-tailed Swallowtail
4179 *Papilio eurymedon* Lucas, 1852 - Pale Swallowtail

PIERIDAE - Whites and Sulphurs 27

Pierinae – Whites

- 4187 *Neophasia menapia* (C. & R. Felder, 1859) - Pine White
4191 *Pontia beckerii* (W.H. Edwards, 1871) - Becker's White
4192 *Pontia sisymbrii* (Boisduval, 1852) - Spring White
4193 *Pontia protodice* (Boisduval & Leconte, 1829) - Checkered White
4194 *Pontia occidentalis* (Reakirt, 1866) - Western White
*₂ 4195.1 *Pieris angelika* Eitchsberger, 1981 - Arctic White
4195.2 *Pieris marginalis* Scudder, 1861 - Margined White
4195.3 *Pieris oleracea* Harris, 1829 - Mustard White
Intr. 4197 *Pieris rapae* (Linnaeus, 1758) - Cabbage White
4200 *Euchloe ausonides* (Lucas, 1852) - Large Marble
4201 *Euchloe creusa* (Doubleday, [1847]) - Northern Marble
4203.1 *Euchloe lotta* Beutenmüller, 1898 - Desert Marble
*₃ 4206 *Anthocharis sara* Lucas, 1852 - Pacific Orangetip
4206.1 *Anthocharis stella* W.H. Edwards, 1879 - Stella Orangetip

Coliadinae - Sulphurs

- 4209 *Colias philodice* Godart, 1819 - Clouded Sulphur
4210 *Colias eurytheme* Boisduval, 1852 - Orange Sulphur
4211 *Colias alexandra* W.H. Edwards, 1863 - Queen Alexandra's Sulphur
4211.1 *Colias christina* W.H. Edwards, 1863 - Christina Sulphur
4212 *Colias occidentalis* Scudder, 1862 - Western Sulphur
4213 *Colias meadii* W.H. Edwards, 1871 - Mead's Sulphur (Layberry et al., 1998)
*₂ 4214 *Colias hecla* Lefèbvre, 1836 - Hecla Sulphur
4215.1 *Colias canadensis* Ferris, 1982 - Canada Sulphur

- 4216 *Colias nastes* Boisduval, 1834 - Labrador Sulphur
4218 *Colias palaeno* (Linnaeus, 1761) - Palaeno Sulphur
4220 *Colias interior* Scudder, 1862 - Pink-edged Sulphur
4221 *Colias pelidne* Boisduval & Leconte, 1829 - Pelidne Sulphur
4222 *Colias gigantea* Strecker, 1900 - Giant Sulphur

LYCAENIDAE

- Coppers, Hairstreaks, and Blues -39

Lycaeninae - Coppers

- 4251 *Lycaena phlaeas* (Linnaeus, 1761) - American Copper
4252 *Lycaena cuprea* (W.H. Edwards, 1870) - Lustrous Copper
4253.1 *Lycaena dione* (Scudder, 1869) - Grey Copper (Layberry et al., 1998)
4259 *Lycaena heteronea* Boisduval, 1852 - Blue Copper
4261 *Lycaena dorcas* W. Kirby, 1837 - Dorcas Copper
4262 *Lycaena helloides* (Boisduval, 1852) - Purplish Copper
4263 *Lycaena nivalis* (Boisduval, 1869) - Lilac-bordered Copper
4264 *Lycaena mariposa* (Reakirt, 1866) - Mariposa Copper

Theclinae - Hairstreaks

- 4276 *Satyrium behrii* (W.H. Edwards, 1870) - Behr's Hairstreak
4277 *Satyrium fuliginosum* (W.H. Edwards, 1861) - Sooty Hairstreak
4279 *Satyrium californicum* (W.H. Edwards, 1862) - California Hairstreak
4280 *Satyrium sylvinum* (Boisduval, 1852) - Sylvan Hairstreak
4280.1 *Satyrium titus* (Fabricius, 1793) - Coral Hairstreak
*₁ 4285 *Satyrium liparops* (Leconte, 1833) - Striped Hairstreak (Layberry et al., 1998)
4288 *Satyrium saepium* (Boisduval, 1852) - Hedgerow Hairstreak
4305 *Callophrys affinis* (W.H. Edwards, 1862) - Western Green Hairstreak
4307 *Callophrys sheridanii* (W.H. Edwards, 1877) - Sheridan's Hairstreak
4310 *Callophrys spinetorum* (Hewitson, 1867) - Thicket Hairstreak
*₃ 4311 *Callophrys johnsoni* (Skinner, 1904) - Johnson's Hairstreak
4312 *Callophrys rosneri* (K. Johnson, 1976) - Rosner's Hairstreak
4313 *Callophrys barryi* (K. Johnson, 1976) - Barry's Hairstreak
4322 *Callophrys augustinus* (Westwood, 1852) - Brown Elfin
4323.1 *Callophrys mossii* (Hy. Edwards, 1881) - Moss's Elfin
4324 *Callophrys polia* (Cook & Watson, 1907) - Hoary Elfin
4329 *Callophrys eryphon* (Boisduval, 1852) - Western Pine Elfin
4336 *Strymon melinus* Hübner, [1818] - Grey Hairstreak

Polyommatae - Blues

- 4361 *Everes comyntas* (Godart, [1824]) - Eastern Tailed Blue (Layberry et al., 1998)
4362 *Everes amyntula* (Boisduval, 1852) - Western Tailed Blue
4363 *Celastrina ladon* (Cramer, [1780]) - Spring Azure
4366 *Euphilotes battoides* (Behr, 1867) - Square-spotted Blue
4371 *Glaucopsyche piasus* (Boisduval, 1852) - Arrowhead Blue
4372 *Glaucopsyche lygdamus* (Doubleday, 1841) - Silvery Blue
4374 *Lycaeides idas* (Linnaeus, 1761) - Northern Blue
4375 *Lycaeides melissa* (W.H. Edwards, 1873) - Melissa Blue
4376 *Plebejus saepiolus* (Boisduval, 1852) - Greenish Blue
4378 *Icaricia icarioides* (Boisduval, 1852) - Boisduval's Blue
4380 *Icaricia acmon* (Westwood & Hewitson, [1852]) - Acmon Blue
*₂ 4383 *Vacciniina optilete* (Knoch, 1781) - Cranberry Blue
4384 *Agriades glandon* (de Prunner, 1798) - Arctic Blue

RIODINIDAE - Metalmarks

- 4402 *Apodemia mormo* (C. & R. Felder, 1859) - Mormon Metalmark

NYMPHALIDAE

- Brush-footed Butterflies

Nymphalinae - Tortoise Shells, Anglewings, etc.

- 4422 *Polygonia satyrus* (W.H. Edwards, 1869) - Satyr Comma
4423 *Polygonia faunus* (W.H. Edwards, 1862) - Green Comma
4427 *Polygonia gracilis* (Grote & Robinson, 1867) - Hoary Comma
4428 *Polygonia oreas* (W.H. Edwards, 1869) - Oreas Comma
4429 *Polygonia progne* (Cramer, [1776]) - Grey Comma
4430 *Nymphalis vaualbum* (Denis & Schiffermüller, 1775) - Compton Tortoiseshell
4431 *Nymphalis californica* (Boisduval, 1852) - California Tortoiseshell
4432 *Nymphalis antiopa* (Linnaeus, 1758) - Mourning Cloak
4433 *Nymphalis milberti* (Godart, [1819]) - Milbert's Tortoiseshell
4434 *Vanessa virginiensis* (Drury, 1773) - American Lady
4435 *Vanessa cardui* (Linnaeus, 1758) - Painted Lady
4436 *Vanessa annabella* (Field, 1971) - West Coast Lady
4437 *Vanessa atalanta* (Linnaeus, 1758) - Red Admiral

Argynninae - Fritillaries

- 4447 *Euptoieta claudia* (Cramer, [1775]) - Variegated Fritillary (Layberry et al., 1998)

- 4450 *Speyeria cybele* (Fabricius, 1775) - Great Spangled Fritillary
4451 *Speyeria aphrodite* (Fabricius, 1787) - Aphrodite Fritillary
4456 *Speyeria zerene* (Boisduval, 1852) - Zerene Fritillary
4457 *Speyeria callippe* (Boisduval, 1852) - Callippe Fritillary
4459 *Speyeria atlantis* (W.H. Edwards, 1862) - Atlantis Fritillary
4459.1 *Speyeria hesperis* (W.H. Edwards, 1864) - Northwestern Fritillary
4460 *Speyeria hydaspae* (Boisduval, 1869) - Hydaspae Fritillary
4461 *Speyeria mormonia* (Boisduval, 1869) - Mormon Fritillary
4462 *Boloria napaea* (Hoffmansegg, 1804) - Mountain Fritillary
4463 *Boloria eunomia* (Esper, [1799]) - Bog Fritillary
4464 *Boloria selene* (Denis & Schiffermüller, 1775) - Silver-bordered Fritillary
4465 *Boloria bellona* (Fabricius, 1775) - Meadow Fritillary
4466 *Boloria frigga* (Thunberg, 1791) - Frigga Fritillary
4467 *Boloria improba* (Butler, 1877) - Dingy Fritillary
4469 *Boloria epithore* (W.H. Edwards, [1864]) - Pacific Fritillary
4470 *Boloria polaris* (Boisduval, [1828]) - Polaris Fritillary
4471 *Boloria freija* (Thunberg, 1791) - Freija Fritillary
*₂ 4471.1 *Boloria natazhati* (Gibson, 1920) - Beringian Fritillary
4472 *Boloria alberta* (W.H. Edwards, 1890) - Alberta Fritillary (Layberry et al., 1998)
4473 *Boloria astarte* (Doubleday & Hewitson, [1847]) - Astarte Fritillary
4475 *Boloria chariclea* (Schneider, 1794) - Arctic Fritillary

Melitaeinae - Checkerspots and Crescents

- 4481.1 *Phyciodes cocyta* (Cramer, [1777]) - Northern Crescent
4482 *Phyciodes batesii* (Reakirt, 1865) - Tawny Crescent (Layberry et al., 1998)
4483 *Phyciodes pratensis* (Behr, 1863) - Field Crescent
4487 *Phyciodes pallidus* (W.H. Edwards, 1864) - Pale Crescent
4488 *Phyciodes mylitta* (W.H. Edwards, 1861) - Mylitta Crescent
4492 *Chlosyne palla* (Boisduval, 1852) - Northern Checkerspot
4496 *Chlosyne damoetas* (Skinner, 1902) - Damoetas Checkerspot
4497 *Chlosyne hoffmanni* (Behr, 1863) - Hoffmann's Checkerspot (Layberry et al., 1998)
4517 *Euphydryas chalcedona* (Doubleday, [1847]) - Variegated Checkerspot
4520 *Euphydryas editha* (Boisduval, 1852) - Edith's Checkerspot

Limnithidinae - Admirals

- 4521 *Euphydryas gillettii* (Barnes, 1897) - Gillette's Checkerspot (Layberry et al., 1998)

4522 *Limenitis arthemis* (Drury, [1773]) - White Admiral
4523 *Limenitis archippus* (Cramer, [1776]) - Viceroy
4525 *Limenitis lorquini* (Boisduval, 1852) - Lorquin's Admiral

species have been added, and 9 subspecies listed by Jones are now recognized as valid species, bringing the new total to 177.

Satyrinae

- Satyrs, Nymphs, Ringlets, Arctics, and Alpines

4583 *Coenonympha tullia* (Müller, 1764) - Common Ringlet
4587 *Cercyonis pegala* (Fabricius, 1775) - Common Wood-Nymph
4589 *Cercyonis sthenele* (Boisduval, 1852) - Great Basin Wood-Nymph
4590 *Cercyonis oetus* (Boisduval, 1869) - Small Wood-Nymph
4591 *Erebia vidleri* Elwes, 1898 - Vidler's Alpine
4592 *Erebia rossii* (Curtis, 1835) - Ross's Alpine
4593.1 *Erebia mancinus* Doubleday & Hewitson, [1851] - Taiga Alpine
4594 *Erebia magdalena* Strecker, 1880 - Magdalena Alpine
4596 *Erebia discoidalis* (W. Kirby, 1837) - Red-disked Alpine
*₂ 4597 *Erebia theano* (Tauscher, 1809) - Theano Alpine
4599 *Erebia epipsodea* Butler, 1868 - Common Alpine
4604 *Oeneis nevadensis* (C. & R. Felder, [1866]) - Great Arctic
4605 *Oeneis macounii* (W.H. Edwards, 1885) - Macoun's Arctic
4606 *Oeneis chryxus* (Doubleday & Hewitson, [1849]) - Chryxus Arctic
4607 *Oeneis uhleri* (Reakirt, 1866) - Uhler's Arctic
4608 *Oeneis alberta* Elwes, 1893 - Alberta Arctic (Layberry et al., 1998)
4610 *Oeneis bore* (Schneider, 1792) - White-veined Arctic
4611 *Oeneis jutta* (Hübner, [1806]) - Jutta Arctic
4612 *Oeneis melissa* (Fabricius, 1775) - Melissa Arctic
4613 *Oeneis polixenes* (Fabricius, 1775) - Polixenes Arctic
*₂ 4613.1 *Oeneis rosovi* Kurentzov, 1960 - Philip's Arctic
4613.2 *Danainae* - Milkweed Butterflies
4614 *Danaus plexippus* (Linnaeus, 1758) - Monarch

Additional butterflies from the Montane Cordillera Ecozone in Alberta (7).

4018 *Hesperia uncas* W.H. Edwards, 1863 - Uncas Skipper
4202 *Euchloe olympia* (W.H. Edwards, 1871) - Olympia Marble
4256 *Lycaena hyllus* (Cramer, 1775) - Bronze Copper
4278 *Satyrium acadicum* (W.H. Edwards, 1862) - Acadian Hairstreak
4379 *Icaricia shasta* (W.H. Edwards, 1862) - Shasta Blue
4454 *Speyeria edwardsii* (Reakirt, 1866) - Edwards' Fritillary
4603 *Neominois ridingsii* (W.H. Edwards, 1865) - Ridings' Satyr

NOTE: Number of butterflies in Montane Cordillera (177 in BC -11 not in Ecozone + 7 in Alberta = 173 in Ecozone).

NOTE: Jones (1951) lists 155 species of butterflies of which 14 have been reduced to subspecies status, 27 additional

APPENDIX 3

The following species were recorded from British Columbia in the Jones (1951) list. In the first list are species deleted from the list through synonymy or taxonomic splitting of species and are independent of the identity of British Columbia material.

In the second list are species deleted as misidentifications or probable misidentifications. These are species that are reported so far out of their known range that they can not be accepted without voucher material. Where the original material has been located and reidentified, the correct identity is indicated. All species are listed in their current generic placement with their MONA number.

Species deleted from Jones (1951) list through taxonomic revision.

6267 *Protitame hulstaria* (Tayl.) (= *virginalis*, McGuffin, 1972)
6589 *Iridopsis emasculata* (Dyar) (= *larvaria*, McGuffin, 1977)
6730 *Euchlaena mollisaria* (Hulst) (= *johnsonaria*, McGuffin, 1981)
6906 *Nepytia canosaria* (Wlk.) (west pop. described as *freemani* in 1963)
7536 *Eupithecia multiscripta* (Hulst) (= *behrensata*)
8034 *Gnophaela latipennis* (Bdv.) ssp. *vermiculata* (Grt.) (*vermiculata* a valid species)
8731 *Euclidia cuspidea* (Hbn.) (BC population as *ardita* Francl. in 1957)
8737 *Caenurgina distincta* (Neum.) (= *crassiuscula*)
8810 *Catocala cleopatra* Stkr. (= *faustina*)
8819 *Catocala pura* Hulst (= *semirelictata*)
8820 *Catocala nevadensis* Beutenmüller (= *semirelictata*)
8828 *Catocala arizonae* Grt. (= *junctura*)
8928 *Syngrapha selecta* (Wlk.) (BC material revised to *viridisigma*)
9204 *Acronicta hesperida* Sm. (= *dactylina*)
9206 *Acronicta leporina* (L.) (BC material revised to *vulpina*)
9213 *Acronicta tartarea* Sm. (prob. only a melanic form of *grisea*)
9263 *Acronicta distans* (Grt.) (= *impressa*)
9279 *Merolonche ursina* Sm. (= *lupini*)
9342 *Apamea multicolor* (Dyar) (= *vultuosa*)
9348 *Apamea arctica* (Freyer) (= *amputatrix*)
9349 *Apamea castanea* (Grt.) (= *amputatrix*)
9362 *Apamea indocilis* (Wlk.) (= *remissa*)
9364 *Apamea finitima* Gn. (= *sordens*)
9367 *Apamea dubitans* ssp. *cogitata* (*cogitata* a valid species)
9371 *Apamea indela* Sm. (= *inficita*)
9376 *Apamea obscura* (= *niveivenosa*)
9385 *Apamea maillardi* (Geyer) (= *zeta*)
9400 *Eremobina hanhami* (B. & B.) (= *claudens*)

9431 *Parastichtis discivaria* (Wlk.) (= *suspecta*)
 9438 *Hypocoena variana* (Morr.) (= *inquinata*)
 9456 *Amphipoea interoceanica* (Sm.) (BC material reidentified as *americana*)
 9519 *Hydraecia columbia* (B. & B.) (= *pallescens*)
 9656 *Platyperigea extima* (Wlk.) (= *montana*)
 9878 *Lithomoia solidaginis* (Hbn.) (N. Amer. material revised to *germana*)
 9890 *Lithophane ferealis* Grt. (= *petulca*)
 9911 *Lithophane torrida* (Sm.) (BC material revised to *pertorrida*)
 9965 *Xanthea lutea* (Ström) (revised to new species)
 9969 *Fishia evelina* (French) (= *discors*)
 9984 *Mniotype versuta* (Sm.) (= *ducta*)
 9985 *Mniotype miniota* (Sm.) (= *tenera*)
 10056 *Apharetra pyralis* (Sm.) (= *dentata*)
 10162 *Sympistis funesta* (Paykull) (= *funebria*)
 10273 *Polia discalis* (Grt.) (BC material revised to *piniae*)
 10308 *Trichordestra meodana* (Sm.) (= *liquida*)
 10310 *Papestra ingravis* (Sm.) (= *quadrata*)
 10332 *Anarta cordigera* (Thunb.) (N. Amer. material revised to *luteola*)
 10336 *Lasionycta leucocycla* (Stgr.) ssp. *poca* (*poca* a valid species)
 10361 *Lasionycta rainieri* (Sm.) (= *mutilata*)
 10431 *Faronta albilinea* (Hbn.) = *diffusa*)
 10434 *Aletia luteopallens* (Sm.) (= *oxygala*)
 10524 *Nephelodes emmedonia* (Cramer) (N. Amer. Material reidentified as *minians*)
 10659 *Agrotis volubilis* Harv. (BC material reidentified as *obliqua*)
 10670 *Feltia ducens* (Wlk.) (= *jaculifera*)
 10718 *Euxoa colata* (Grt.) (= *lewisi*)
 10726 *Euxoa esta* Sm. (= *atomaris*)
 10730 *Euxoa thanatologia* (Dyar) (= *adumbrata*)
 10764 *Euxoa stigmatalis* (Sm.) ssp. *atrofusca* (Sm.) (*atrofusca* = *tessellata*)
 10780 *Euxoa luteotincta* McD. (= *comosa*)
 10780 *Euxoa ontario* (Sm.) (= *comosa*)
 10780 *Euxoa quinquelinea* of authors (= *comosa*)
 10785 *Euxoa holoberba* Sm. (= *infausta*)
 10785 *Euxoa sponsa* Sm. (= *infausta*)
 10786 *Euxoa perfusca* (Grt.) (= *satis*)
 10807 *Euxoa verticalis* (Grt.) (= *albipennis*)
 10809 *Euxoa lindseyi* Blkmre. (= *catenula*)
 10816 *Euxoa excellens* (Grt.) (= *perexcellens*)
 10822 *Euxoa andera* Sm. (= *hollemanii*)
 10851 *Euxoa redimicula* (Morr.) (BC material revised to *auripennis*)
 10865 *Euxoa exculta* (Sm.) (= *perpolita*)
 10866 *Euxoa incognita* Sm. (= *nomas*)
 10891 *Ochropleura plecta* (L.) (N. Amer. material revised to new species)
 10915 *Peridroma margaritosa* (Haw.) (= *saucia*)
 10917 *Diarsia cynica* (Sm.) (= *rubifera*)
 10923 *Protexarnis balanitidis* (Grt.) (= *squalida*)
 10927 *Spaelotis havilae* (Grt.) (BC material revised to new species)
 10928 *Graphiphora haruspica* (Grt.) (= *augur*)
 10954 *Xestia collaris* (Grt. & Rob.) (= *bugrai*)

10967 *Xestia elimata* (Gn.) BC material (revised to new species)
 10974 *Setagrotis plantifrons* (Sm.) (= *pallidicollis*)
 10975 *Setagrotis cinereicollis* (Grt.) (= *pallidicollis*)
 10995 *Cerastis cornuta* (Grt.) (BC material revised to *enigmatica*)
 11018 *Abagrotis sambo* (Sm.) (= *trigona*)
 11050 *Pronoctua pyrophiloides* (Harv.) (BC material revised to *peabodyae*)
 11052 *Ufeus electra* Sm. (= *plicatus*)
 11052 *Ufeus hulsti* Sm. (= *plicatus*)
 11063 *Pyrrhia umbra* (Hufn.) (= *adela*)
 11082 *Schinia scutosa* (Hufn.) (= *nuchalis*)
 11190 *Schinia separata* (Grt.) (= *acutillinea*)

Species deleted from Jones (1951) list as probable misidentifications.

6248 *Ceranemota tearlei* (Hy. Edw.) (reident. as *albertae* Clarke)
 6305 *Itame denticuloides* (Hulst) (misident. southern species)
 6352 *Semiothisa granitata* (Gn.) (Eastern species)
 6401 *Semiothisa meadearia* (Pack.) (= *subminiata*, McGuffin, 1972)
 6461 *Stenoporpia dissonaria* Hulst (misident. southern species)
 6582 *Anacamptodes vellivolata* (Hulst) (Eastern species)
 6684 *Drepanulatrix bifilata* (Hulst) (misident. southern species)
 6728 *Euchlaena effecta* (Wlk.) (misident., McGuffin, 1981)
 6733 *Euchlaena amoenaria* (Gn.) (misident., McGuffin, 1981)
 6798 *Ennomos subsignaria* (Hbn.) (Eastern species)
 7046 *Nemoria bistrifaria* Hbn. (Eastern species)
 7047 *Nemoria rubrifrontaria* (Pack.) (Eastern species)
 7175 *Leptostales hepaticaria* (Gn.) (Southeastern US)
 7239 *Hydriomena pluvialata* (Gn.) (incl. *transfigurata*) (both are eastern)
 7461 *Eupithecia subvirens* Dietze (misident. Calif. species)
 7463 *Eupithecia chiricahuata* McD. (misident. Arizona species)
 7602 *Eupithecia implorata* (Hulst) (misident. Calif. species)
 7603 *Eupithecia cestata* (Hulst) (misident. Calif. species)
 7641 *Lobophora montanata* Pack. (Southern Rockies)
 7701 *Malacasoma americanum* (F.) (Eastern sp. mislabelled or misident.)
 7724 *Coloradia pandora* Blake (escaped or mislabelled)
 8353 *Zanclognatha ochreipennis* (Grt.) (Eastern species)
 8618 *Drasteria graphica* Hbn. (Eastern species)
 8714 *Zale calycanthata* (J.E. Sm.) (Eastern species)
 9184 *Colocasia flavicornis* (Sm.) (Eastern species)
 9237 *Acrionicta interrupta* Gn. (Eastern species)
 9243 *Acrionicta ovata* Grt. (Eastern species)
 9392 *Luperina morna* (Stkr.) (misident. *venosa*)
 9529 *Aseptis perfumosa* (Hamp.) (Calif. species)
 9680 *Elaphria georgei* (Moore & Rawson) (Eastern species)
 9684 *Elaphria grata* Hbn. (Eastern species)
 9979 *Xylotype capax* (Grt.) (reident. as *acadia*)
 9996 *Brachylomia curvifascia* (Sm.) (misident. *thula*?)

10072 *Oncocnemis hayesi* Grt. (misident. *sandaraca* ?)
 10187 *Cucullia solidaginis* (Stkr.) (= *serraticornis*; Calif. & AZ)
 10240 *Scotogramma densa* Sm. (would need a specimen)
 10244 *Discestra nevada* (= *ptilodonta*) (Great Basin and southern Rockies)
 10287 *Polia montara* (Sm.) (Southwestern US)
 10304 *Trichordestra legitima* (Grt.) (Eastern species)
 10341 *Lasionycta phoca* (Moesch.) (Eastern species)
 10363 *Lasionycta sedilis* (Sm.) (Colorado)
 10537 *Homorthodes mania* (Stkr.) (Arizona and New Mex.)
 10602 *Hexorthodes senatoria* (Sm.) (Arizona and New Mex.)
 10674 *Feltia subgothica* (Haw.) (misident. *jaculifera* ?)
 10687 *Copablepharon viridisparsum* Dod (reident. as *absidum*)
 10706 *Euxoa dissona* Mösch. (Northeastern species)
 10725 *Euxoa feniseca* (Grt.) (= *fuscigera*, a Calif. species)
 11045 *Rhynchagrotis anchocelioides* (Gn.) (Eastern species)
 11091 *Schinia perminuta* (Hy. Edw.) (misident. *villosa* ?)
 11157 *Schinia biundulata* Sm. (escaped or mislabelled)

APPENDIX 4

Exotic Lepidoptera in British Columbia (Additions and corrections)

Smith -1994 gives a list of 67 exotic Lepidoptera species recorded in British Columbia, with the comment that this is only a partial list that has been extracted from four literature sources.

Four species must be deleted from this list since they are listed twice:

Coleophora fuscadinella (a synonym of *C. serratella*, which is also listed)
Cnephasia longana (listed twice)
Pardia cynosbatella (listed also as *P. cynasbatella* [sic])
Rhopobota naevana (listed twice)

Three species are native and occur in British Columbia naturally, the latter two as seasonal migrants:

Melanchra picta (Harr.)
Peridroma saucia (Hbn.)
Trichoplusia ni (Hbn.)

Four species appear to have been reported in error:

Cnephasia interjectana (Haw.)
Cnephasia stephensiana (Dbldy.)

Deidamia inscripta (Harr.)
Papilio polyxenes F.

To the remaining 56 species, the following 34 can be added, bringing the total of exotic species to 90

Coleophoridae

Coloephora mayrella (Hbn.) (Palearctic)
Coloephora spinella (Schrank) (Palearctic)
Coloephora trifolii (Curt.) (Palearctic)

Gelechiidae

Scrobipalpa atriplicella (F. v. Röslerstamm) (Palearctic)
Dichomeris marginella (F.) (Palearctic)

Geometridae

Ennomos alniaria (L.) (Palearctic)

Gracillariidae

Phyllonorycter blancardella (F.) (Palearctic)
Phyllonorycter mespillella (Hbn.) (Palearctic)

Noctuidae

Apamea ophiogramma (Esper) (Palearctic)
Noctua comes Hbn. (Palearctic)
Calophasia lunula (Hufn.) (Palearctic)
Macronoctua onusta Grt. (Eastern North. Am.)
Xestia xanthographa (F.) (Palearctic)

Oecophoridae

Agonopterix alstroemeriana (Cl.) (Palearctic)
Agonopterix nervosa (Haw.) (Palearctic)
Depressaria daucella (L.) (Palearctic)
Hofmannophila pseudospretella (Staint.) (Palearctic)
Carcina quercana (F.) (Palearctic)

Psychidae

Dahlica triquetrella (Hbn.) (Palearctic)

Pyralidae

Achroia grisella (F.) (Palearctic)
Aglossa caprealis (Hbn.) (Palearctic)
Cadra cautella (Wlk.) (tropics)
Ephestia elutella (Hbn.) (Old World tropics)
Etiella zinckenella (Tr.) (Palearctic)
Pyralis farinalis L. (Palearctic)
Trachycera suavella (Zinck.) (Palearctic)

Schreckensteiniidae

Schreckensteinia festaliella(Hbn.) (Palaeartic)

Tineidae

Nemapogon granella(L.) (Palaeartic)

Trichophaga tapetzella(L.) (Palaeartic)

Tortricidae

Enarmonia formosana(Scop.) (Palaeartic)

Clepsis spectrana(Treitschke) (Palaeartic)

Yponomeutidae

Yponomeuta padella(L.) (Palaeartic)

Ypsolophidae

Ypsolopha dentella(F.) (Palaeartic)

Ypsolopha ustella(Cl.) (Palaeartic)