Butterflies of Conservation Interest in Alberta, British Columbia, and Yukon

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ABSTRACT

Alberta, British Columbia and Yukon support 78% of the resident Canadian butterfly fauna. Our knowledge of butterfly taxonomy and distribution in this area is reviewed. Five specific areas and several taxa are identified as priorities for additional work. Habitat is the real issue. Co-operative land use decisions that stress ecosystem management, supplemented by single species management where warranted, will likely be the most effective strategy to retain butterflies at risk.

Key words: Alberta, butterflies, distribution, habitats, insect, taxonomy, Yukon.

Butterflies are the "charismatic megafauna" of the insect world. In the parlance of conservation optics, the phrase "charismatic microfauna" can be used to reflect the growing popularity of butterflies as subjects of recreational fulfilment, scientific enquiry, and conservation efforts. New et al. (1995) refer to butterflies as important flagship taxa for invertebrate conservation. This paper explores the faunal context of the butterflies of Alberta, British Columbia, and Yukon, mentions past work, identifies several areas that are deemed to be of primary conservation interest and discusses management issues and strategies.

Scott (1986) provides context for the butterflies of this area through his range maps for the butterflies of all of North America. Layberry et al. (1998) provide an updated treatment of butterflies of Canada, Bird et al. (1995) provide a detailed treatment of the butterflies of Alberta, Lafontaine and Wood (1997) summarize the butterflies of Yukon, and Shepard and Guppy (in prog.) supply a detailed treatment of the butterflies of British Columbia. Only a few sources of information are specific to butterfly fauna and conservation in the areas of primary conservation interest in British Columbia and Alberta: Smith and Bird (1977), Thormin et al. (1980), Bird (1982), Guppy and Shepard (1994), Guppy et al. (1994), Kondla et al. (1994), Shepard (1995), St. John (1996), and Kondla (1998).

The literature on conservation of butterflies has grown substantially recently. Pyle et al (1981) and Samways (1993) address insect conservation with many butterfly examples, while Pyle (1976), Hammond and McCorkle (1984), New (1991), Pollard and Yates (1993), Gaskin (1995), and New et al. (1995) discuss butterfly conservation specifically.

FAUNAL AND GEOGRAPHIC CONTEXT

Insects constitute between 75 and 85% of the animal kingdom species diversity. Globally, Gaston (1991) reviewed past estimates of species diversity in insects and provided a plausible analysis to arrive at an estimate of 5 million described and undescribed insect species in the world. In North America there may be >150,000 species and in Canada the number of insect species has been estimated at 55,000 (Danks 1978).

As pointed out by Gaston (1991), the Lepidoptera are generally regarded as the best collected and studied of the 4 major insect orders. Six of the 7 families of butterflies in this order occur in Canada: Hesperiidae, Papilionidae, Pieridae, Lycaenidae, Riodinidae, Nymphalidae. Layberry et al. (1998) report that 293 species of butterflies have been found in Canada. Of these, 24 only irregularly or rarely find their way into Canada as migrants or strays and hence are not viewed as part of the resident fauna.

In comparing the butterfly species diversity of Alberta, British Columbia, and Yukon to the national picture, we see

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the following interesting numbers:

- this area (21% of the Canadian land base) supports 78% of the resident Canadian butterfly fauna;
- Alberta and British Columbia comprise only 16% of the Canadian land base but contain 76% of the resident Canadian butterfly fauna;
- 24% of Canadian butterfly species are only found in Alberta, British Columbia, and Yukon;
- 25 species are found only in British Columbia;
- 19 species are found only in British Columbia and Alberta;
- 2 species are found only in British Columbia and Yukon;
- Alberta and Yukon each have 1 unique species.

These numbers will change due to pending and future taxonomic changes but they show the very significant contribution that extreme western Canada makes to species-level diversity. This exceptional level of species richness in butterflies is consistent with the results reported by Pojar (1993) for other groups of plants and animals and is not surprising when considering the geological, elevational, climatic, and ecological diversity of this part of Canada.

TAXONOMY AND DISTRIBUTION

Although imperfect and incomplete information should not be used to justify inaction in butterfly conservation, we should proceed with humility and recognize that taxa believed to be imperilled may in fact not be so. This is an important consideration in western Canada, where our knowledge of fundamentals like taxonomy and distribution is not what it should be to support definitive assessments of conservation status.

Distribution and abundance information is key to assessing which taxa may be at risk. Wrong decisions can lead to costly restrictions on land and resource use as well as directing scarce resources towards taxa that are not at risk while others become more imperilled or even extinct. An example of this situation is the designation of the West Virginia white (*Pieris virginiensis*) as an endangered species in Ontario in the 1970s. Subsequently, many new and stable populations were discovered in the 1980s and the species was wisely removed from the endangered species list in 1990 (Layberry et al. 1998). During the same period, 1 species (frosted elfin, *Callophrys irus*) and 1 subspecies (Karner blue, *Lycaeides melissa samuelis*) became extirpated from Ontario and Canada, through lack of appropriate habitat management.

Both the taxonomy and nomenclature of North American butterflies have been dynamic over the past 20–30 years. There will be additional changes over the next 10–20 years before the dust settles. The situation is not as stable as workers on birds and mammals are accustomed to. Note that this instability is due to rapidly advancing scientific knowledge. Samways (1993) observes that: "Many species are being separated and others synonymized, all within the slippery realms of not knowing exactly when a species is a good species." However, if conservation efforts are postponed until all the taxonomic issues are resolved, it may be too late for some species.

Some people are not fond of the subspecies concept, especially where phenotypic variation is gradual and continuous across the landscape. However, conservation of genetic material below the species level is an important and useful component of insect conservation. Like it or not, conservation decisions are ultimately political decisions. Having a scientific and common name to apply to a recognizable set of populations or metapopulations that are at risk, where scientifically sound, is helpful in seeking the necessary decisions. Good luck to anyone who strives to bring scarce resources to bear on an imperilled but unnamed "bug."

We need to be clear on the source and geographic scale of our existing information so that it is not used to draw erroneous conclusions. Distribution maps for Canada (Layberry et al. 1998) portray some areas of the country with numerous dots, thereby suggesting a high level of sampling intensity in such areas. While this is true relative to other, less intensely sampled areas, it is not true in absolute terms. Mostly these distribution dots (like those in other Canadian butterfly publications) simply mean that a butterfly enthusiast saw or caught at least 1 specimen while exploring a few hectares of land on a sunny afternoon or while making a 20-minute roadside stop at a location that they perceive as likely having some butterflies. Some arithmetic would likely show that about 99% of Canada has never seen a butterfly net nor a person that can accurately identify more than a few common butterfly species. This is especially so in the large area covered in this paper, with few qualified observers being out and about regularly. Seeing one or a few dots on a published distribution map does not mean the taxon is at risk. All this means is that we need to do further work to see if it really is at risk and hence worthy of our efforts to retain it as a component of our biodiversity.

What this means in a practical sense when dealing with small organisms living in a large landscape is that butterflies believed to be rare or even extinct can show up unexpectedly. Some examples are:

- An undescribed subspecies of the large marble (*Euchloe ausonides* ssp.) known in Canada only from the extreme southern Vancouver Island area was believed to be globally extinct. Fortunately, the world does not stop at political borders. A recent discovery of this subspecies in nearby Washington State means that it is not globally extinct and opens the door to possible future reintroduction to Canada.
- Fender's blue (*Icaricia icarioides fenderi)*, a resident of native grasslands in the Willamette Valley of western Oregon, was believed to have been extinct since 1937; however, a surviving colony was found in 1989 (Hammond 1995).

- The hobomok skipper (*Poanes hobomok)* was not reported from Alberta until the late 1970s (Bird and Smith 1979), even though it was subsequently found to reside across the road from the campus of the University of Alberta which has employed entomologists since the early 1900s.
- The eastern tailed blue (*Everes comyntas*) was for some years known in British Columbia from only 1 remote locality in the east Kootenays; in the past 2 years we have discovered a sizeable population in the west Kootenays which has a 100-year history of resident butterfly enthusiasts.

The ease with which small and visually ephemeral organisms can be overlooked by even experienced researchers is illustrated by the following example. An often-sampled spot near Atlin, B.C., was explored by parking in a public pull-out and walking up the mountain slope. It was not until one of us parked in the same place and walked down the slope that we discovered a population of a butterfly previously unknown in the northern half of British Columbia.

Only long term and repetitive field exploration will improve our knowledge of what lives where. As pointed out by Gaskin (1995), "rare" can be just a reflection of surveys not done in the right place, not done in the right months, or not done in the right years.

HABITATS AND BUTTERFLIES AT RISK

Despite our limited knowledge, we can confidently identify the following 5 areas in Alberta and British Columbia that warrant recognition as hot spots for butterfly conservation:

1. the extreme south coast of British Columbia, especially southeastern Vancouver Island;
2. the southern Interior of British Columbia, especially the southern Okanagan Valley and the adjacent Similkameen Valley;
3. the extreme southeast corner of British Columbia and immediately adjacent corner of southwest Alberta;
4. the Peace River lowlands, especially the Peace River Valley of Alberta and British Columbia; and
5. the lower Milk River area of extreme southern Alberta.

The south coast of British Columbia is home to about 75% of the human population of the province and all but the steepest habitats are open to the sundry forms of development needed to sustain a burgeoning human population. Those remaining areas not directly impacted by construction or agriculture are then negatively impacted by fragmentation, invasion of introduced weeds, wildfire suppression, and the press of humanity using such "green spaces" for recreation. This area should clearly remain a priority for further research and, more importantly, the development and implementation of conservation actions. Several taxa are under status review by COSEWIC (Committee on the Status of Endangered Wildlife in Canada): large marble (coastal subspecies), Taylor's checkerspot (*Euphydryas editha taylori*), island checkerspot (*Euphydryas chalcedona perdiccas*), greenish blue (*Plebejus saepiolus insulanus*), and dun skipper (*Euphyes vestris*).

The south Okanagan Valley and lower Similkameen Valley are also subject to the increasing press of human activity and rank as a close second in terms of urgency for further attention to the locally distributed butterflies of this area. Wholesale habitat conversion and the effects of aggressive weeds are the primary threats to several butterflies. Behr's hairstreak (*Satyrium behri*) is under review by COSEWIC and a few others, such as Mormon metalmark (*Apodemia mormo*) and sooty hairstreak (*Satyrium fuliginosum*), should be formally assessed as well. The monarch (*Danaus plexippus*), which breeds in a wider area of the southern Interior, is already listed as "vulnerable" by COSEWIC.

The situation in extreme southeastern British Columbia and southwestern Alberta is not as bleak as the 2 previous areas; although the only known British Columbia population of the grey copper (*Lycaena dione*) is at high risk from urban development at Cranbrook. Long-term threats to the survival of localized taxa emanate from fire suppression and excessive levels of livestock grazing. Well-planned logging, grazing, and revegetation of disturbed areas can even be helpful in retaining populations of some butterflies such as Gillette's checkerspot (*Euphydryas gillettii)* and eastern tailed blue.

The lower Milk River area of southern Alberta seems to be in generally good shape insofar as there is still substantial natural habitat for those butterflies for which we have relatively few records. Long-term threats include flooding of riparian areas, excessive livestock grazing, and inappropriate location of oil and gas industry infrastructure. COSEWIC is reviewing the status of Weidemeyer's admiral (*Limenitis weidemeyeri*).

The Peace River area, especially the Peace River Valley of Alberta and British Columbia, is a real sleeper in terms of significance for butterfly conservation. It does not have the intensity of human activity present in other areas and most of the land use impacts are a "done deed." However, it does contain a number of highly localized butterfly phenotypes, most of which remain to be critically examined taxonomically. Unlike most of the other taxa that are of conservation interest, these phenotypes are not found in other political jurisdictions and hence their fate rests in our hands. Fire suppression has changed the natural disturbance ecology of the remaining grasslands and shrublands of the residual natural habitats. Continued "unnatural" succession will not bode well for the long-term survival of taxa that require grassland (e.g., Alberta Arctic, *Oeneis alberta*) or that may have evolved to survive in a natural disturbance regime that produces juxtaposed grassland, shrubland, and forest patches (e.g., northern checkerspot, *Chlosyne palla* ssp.). Establishment of protected areas such as parks and ecological reserves will not assure the sur-

vival of these butterflies in the future.

We include Yukon in this brief review primarily to provide a written reference to a good news scenario. Persons unfamiliar with butterflies should not consider any Yukon butterflies as being at risk based solely on a few known records. Much additional fieldwork will be needed to clearly define the distribution and habitats of Yukon butterflies. The scant human population in relation to the size of the land base and the nature of contemporary land use means that there is no cause for concern in the foreseeable future. The only butterfly conservation issue we are aware of in Yukon is periodic heavy grazing of the unique Duke River grasslands, and resulting possible reduction in populations of grass-feeding species such as the draco skipper (*Polites draco*).

MANAGEMENT IMPLICATIONS

We should not lean heavily on legislated prohibition of direct human predation (collecting) as an effective means of ensuring butterfly conservation. We agree with the observations made by Gaskin (1995) on this matter:

- It gives the illusion of decisive remedial action while the real culprits of habitat destruction and degradation continue unabated.
- Efforts of amateur and professional entomologists to undertake basic research are discouraged by intricate regulatory requirements.
- Poorly framed regulations, especially those with unnecessarily punitive prohibitions, cause more problems than they solve, especially without habitat protection.
- Overzealous application of poorly framed laws alienates landowners, discourages much needed volunteer fieldwork, and creates an atmosphere of distrust that prevents the kind of cooperative relationships needed for effective conservation.
- Of course having legislation that deals with outright poaching of endangered species is valuable.

Habitat! Habitat! Habitat! This timeless refrain rings as true with butterflies as it does with other animals and plants, both in identifying the cause and the cure for butterflies at risk. Remorseless habitat destruction and degradation by *Homo sapiens* has unquestionably reduced the historical range and population levels of some butterflies. Of course, human activity has also expanded the range and increased the populations of other butterflies—but the overall trend is clearly downward.

Given the reality of human subsistence needs and recreational desires, the only issue that will have a measurable impact on butterfly conservation (at least in our corner of the world) is land use. We will not be able to retain butterflies at risk without making land use decisions that provide for their continued existence.

Habitat destruction and degradation are not limited to immediate and obvious wholesale ecosystem changes such as cultivating a piece of natural grassland, new housing developments, or clearcutting a patch of old seral forest. Replacement of native vegetation by aggressive weeds is insidious and equally as serious a threat to natural ecosystems. Even the simple and popular act of planting trees can be a disaster. Witness for example the major contribution to extirpation of the Karner blue in Canada by "reforesting" Pinery Provincial Park in Ontario. By creating a closed canopy forest in a landscape that was never naturally forested, at least not in historical times, the well-meaning architects of this new forest unintentionally destroyed not only the Karner blue and other endangered organisms but an entire natural ecosystem (Cundiff 1995).

An example of a decision that may have unintentionally benefited butterflies is the story of a dense population of Mormon metalmarks at Keremeos, B.C. A historical decision to construct a railroad at the base of a slope and subsequent mechanical disturbance of the slope may have resulted in a dramatic increase in abundance of the butterflies' larval food plant (snow buckwheat, *Eriogonum niveum*). Highway construction has created more cutbank habitat for additional subpopulations. A viable metapopulation of this butterfly could likely be ensured in the lower Similkameen Valley by artificially increasing food plant density on suitable southerly facing slopes, ensuring the presence of nectar sources and keeping livestock grazing intensity to a reasonable level.

The primary strategy for conservation of butterflies at risk is to pursue the decision-making fundamentals of information, choice, action, and evaluation of actions. Some people call this adaptive management but the good sense approach of making decisions and evaluating them has been in existence for a long time. This simple strategy has the advantage of being independent of geographic scale, time, and the nature of the decision being made.

Sufficient information exists to narrow the geographic scope of further information collection to the 5 areas mentioned in the previous section. In these areas we need to determine the exact locations and habitats of the taxa that appear to be at risk, likely threats to their continued existence, population trends, and habitat trends. At the same time we should continue to more fully investigate the status of many other taxa outside of these areas which are known from relatively few sites (Guppy et al. 1994, Kondla 1998) but for which no evidence supports any "at risk" designation.

Most taxa that appear to be at risk in our area are in fact "corner weeds" that are widely distributed in North America. Risk management suggests that maintaining populations of endemic organisms is more important than maintaining a peripheral population of an organism that is "rare" only through the view of political boundaries. We do not suggest that we do nothing about the peripheral gene pools but rari-

ty created by political boundaries should certainly influence our decisions on priorities and allocation of resources.

No single person or institution in our society has the power and resources needed to act unilaterally in retaining our butterflies at risk. Good science and good legislation will not be enough. Good information sitting in a computer or office will not be enough. Establishing various kinds of protected areas will not be enough. What will be enough will be to have situational and strategic partnerships among the relevant decision-makers. These partnerships will need to operate primarily by ecosystem management and selectively exercise single species management where a combination of science and social choice point to such an approach. The partnerships will need to encompass the gamut of individual private land owners, corporate land owners, First Nations, municipal government, federal government and not-for-profit conservation organizations.

As we go about doing good things for species at risk, we should maintain humility and a larger perspective. Some points to ponder from a thought-provoking article by McFadden and Parker (1994) are:

- Of all the species that have ever existed, 99% are extinct.
- Extinction is a normal part of the evolutionary process.
- We humans are just another component of the species mix on planet Earth.
- We have become a major system perturbation that could eventually have impacts as great as all the natural events that have ever occurred.
- Extinction will continue, and so will speciation and biological diversity.

How much of an increased extinction rate due to human activity will there be? There will be some. The amount of extinction that we can influence will be determined through value-driven social choice and the financial capacity of our collective institutions.

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