## PROJECT DETAILS

- **Funders:** Agriculture and Agri-Food Canada, Alberta Canola, SaskCanola and Manitoba Canola Growers Association
- **Research program:** Canola Agronomic Research Program (CARP)
- **Principal investigator:** Juliana (Julie) Soroka, Agriculture and Agri-Food Canada (AAFC) Saskatoon
- **Collaborators/additional investigators:** Lloyd Dosdall, Owen Olfert, and John Gavloski
- **Year completed:** 2012

**Final report**

**Experimental Plan**

A network of entomologists and agrologists from across the prairies volunteered their time to set out traps for flea beetle collection and return them for examination. Initially, in 2007 surveyors placed traps in the Peace River region of British Columbia/Alberta, and central and southern regions of Saskatchewan and Manitoba (Table 1). In 2008 and later, attempts were made to sample in all the principal vegetative zones of the prairies – the Peace River Lowlands and the boreal transition and aspen parkland vegetative zones ("North" in Saskatchewan and Alberta, "Central" in Manitoba), moist mixed grassland ("Central" in Alberta and Saskatchewan), mixed grasslands ("South" in Alberta and Saskatchewan), and the Interlake Plain ("North") and Lake Manitoba Plain ("South") in Manitoba. In 2010 and 2011 sites from North Dakota were also added to the survey, designated by geographical distance from the international border into North, Central and South locations. Five, or at a few sites 10 or 20, yellow sticky card traps (ConTech, Delta, BC) per field, 13.0x7.5 mm in dimension and coated on both sides with an adhesive, were attached to wire or wooden stakes and placed in or near newly-seeded canola fields at the time of seeding in spring. The traps were oriented running parallel to a convenient perimeter of a field, at the edge of or about 10 m into the field and 25 m apart. The bottom edge of each trap was set 1-2 cm above soil level or at the level of the seedlings as these grew. Traps were changed at intervals ranging from 3 to 30 days, but usually weekly. They were maintained for periods from one to 26 weeks, but usually four weeks or four sampling intervals. Traps were examined under a magnifier or stereomicroscope in the laboratory and the number of flea beetles captured per trap per day recorded. The species composition percentage of the three most commonly occurring flea beetles *P. striolata*, *P. cruciferae*, and *Psylliodes punctulata* Melsh. was determined for each site. From 2009 onward the number and, if possible, identification of flea beetles other than these three was also recorded. These "other" specimens were identified from the descriptive key of Fauske (2003) to at least genus level. Cards were also examined for the presence of *Microctonus vittatus* Mues., a small wasp parasitoid of flea beetles.

**Results: Growing Conditions, Flea Beetle Numbers and Population Development**

Although local exceptions occurred, in general spring weather conditions in the years of the survey were not conducive to the development of high flea beetle populations, especially in 2010 and 2011, when cold and wet conditions predominated over much of the northern Grain Belt and most populations of flea beetles were very low. In 2010 and 2011 several surveyors in eastern Saskatchewan and western Manitoba had difficulty placing or maintaining traps out of water, as field flooding was common. The Peace River area of northern Alberta was the only region that was consistently dry in the spring during the years of the survey. These conditions were reflected in reports by the provincial entomologists to the Western Committee on Crop Pests annual meetings 2007-2011. Except for sporadic, isolated foliar spraying for flea beetle control elsewhere, the Peace River region was the only region that required widespread foliar application, for 6 years in a row according to Meers (2010).

The number of flea beetles caught on traps in the survey reflected the inclement spring weather conditions. Flea beetle numbers generally were low in the spring in each year; over all the years two thirds of the locations surveyed had maximum flea beetle densities lower than five per trap per day (Table 2), with 86 of the 300 locations surveyed (28.7%) having densities of 1 flea beetle caught per trap per day or less. In each year and over all the years the greatest numbers of flea beetles caught were found in areas closest to the 49$^{th}$ parallel (Table 2). Numbers greater than 10 per trap per day were found at 46 sites in the five year study, principally near the 49$^{th}$ parallel (Tables 2, 3). Manitoba had the greatest number of sites with the highest flea beetle numbers – 16 of 46 or 35% of the sites sampled there (Table 3). North Dakota was second, surprising since it was surveyed for only 2 years. The highest number of flea beetles trapped per day in the survey, 91.2, was recorded at Brandon, MB, in 2011.

**Results: Flea Beetle Species Distribution Patterns**

The number and location of sites surveyed varied from year to year, as did the timing and duration of sampling period at each location. Additionally, because *P. striolata* adults emerge from overwintering sites earlier than *P.cruciferae* adults, and *Ps. punctulata* adults emerge earlier than those of *P. striolata*, a chronological comparison of flea beetle species at different locations was problematic. Therefore, the unit of comparison utilized to determine species distribution patterns was the proportion of particular flea beetle species at the time of maximum flea beetle numbers at a location in the spring. Table 4 summarizes the number of locations that had a particular flea beetle species as the largest proportion of the population, and Table 5 summarizes the percent of each of the three principal species of flea beetles found at the height of flea beetle populations, tabulated by province/state and by region within province/state.



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By province, Alberta had the most locations and greatest proportion of *P. striolata* over the survey period (Tables 4, 5a, Fig. 1). The high proportion of *P. striolata* - 85% of all flea beetles collected at population peak - found in Alberta in 2007 was confounded by the fact that only areas in the Peace River were surveyed in the province in that year. In 2010 and 2011, when numbers and locations of survey sites were approximately similar over the province, species proportions had stabilized, with about 63.5% of the populations being striped flea beetles. Similarly, only sites in central and southern Saskatchewan were surveyed in 2007, which skewed the proportion of *P. cruciferae* beetles. However, in contrast to the situation in Alberta, where numbers of *P. striolata* were stable and high, numbers of *P. striolata* increased and *P. cruciferae* decreased in Saskatchewan, Manitoba, and North Dakota over the duration of the survey (Table 5a, Fig. 1).

An examination of species distribution by region revealed that *P. striolata* predominated in the Peace River region of Alberta and British Columbia, and the northern areas of Saskatchewan and Manitoba over the length of the survey (Table 5b). Most locations in Central Alberta also had high proportions of *P. striolata* over the four years of surveying in the region. It is in the Southern Alberta, Central Saskatchewan, and Central and Southern Manitoba regions that proportions changed over the years, with the proportion of *P. striolata* increasing and *P. cruciferae* decreasing. This change in proportions is most clearly seen in the Central Saskatchewan and Manitoba regions (Table 5b). Populations of *P. striolata* increased in southern Manitoba over the duration of the survey, but irregularly so. *P. cruciferae* was the only flea beetle found in South Saskatchewan traps in 2007 (Table 5b); species proportions many have been biased by the paucity of locations, the extremely low numbers of flea beetles present, and the brevity of the sampling period in that year. Proportions of *P. cruciferae* and *P. striolata* remained stable in South Saskatchewan from 2008-2011, with *P. striolata* comprising just under 10% of the flea beetle species proportion during that time. And although only two years of surveying were undertaken in North Dakota, *P. striolata* proportions rose while that of other flea beetles decreased in the northern part of the state in 2011 over 2010.

*Ps. punctulata* was found in many sites early in the spring, but rarely reached significant numbers at the time of population peaks. *Ps. punctulata* occurred at levels greater than 10% in some years in the Peace River region, in Central Saskatchewan, and, in 2011, in locations in North and South Manitoba (Table 5). *P. punctulata* comprised the principal flea beetle species at three site years in the survey – Worsley, Alberta in 2009 (Peace River region -76.4% of 9.0 flea beetles/ trap/day from June 3-10), Hays, Alberta in 2011 (South Alberta - 57.1% of 0.21 flea beetles/trap/day from May 13-30), and Swan River, Manitoba in 2011 (North Manitoba - 63.5% of 0.4 flea beetles/trap day from May 18-26).

Other flea beetle species appear to be increasing in proportion relative to *P. cruciferae*, especially in North and



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Central Alberta and Saskatchewan (Table 5, Fig. 1). Likewise, in 2010 species in the Other category outnumbered *P. striolata* and *Ps. punctulata* in all areas of North Dakota. Several species of *Chaetocnema* were the main components of the Other category, especially in North Dakota. In 2010 traps near Charlson, Max, and Regan, ND, and in 2011 traps near Regent, ND contained *Chaetocnema* spp. as the principal flea beetle at the time of the population peak. Six Canadian sites had other species as the largest component of the flea beetle mix. A St. Albert, AB, location had *Chaetocnema* sp. as the principal flea beetle at the population peak on June 15-22, 2010. In 2011 a site near Halcourt, AB, in the Peace River region, had *Chaetocnema* sp. as the dominant flea beetle species at the time of population peak from May 31-June 9; a site near St Albert, AB had a mixture of flea beetles other than the standard three species comprising the largest category of flea beetles from May 30-June 6, while a site near Vegreville had *Chaetocnema* sp. as the dominant flea beetles on May 11-19; a site near Prince Albert, SK, had *Crepidodera nana* (Say), as the dominant flea beetle species at the flea beetle peak Jun 7-17; and a site near Burr, SK, had *Chaetocnema* sp. as the principal flea beetle species from Jun 3-10.

In order to trace possible species population shifts more accurately than in the general survey, where locations and sampling periods varied, we considered locations that were surveyed at the same site or very close to the same site over the years. In total, 19 locations representing 80 site years were identified as sampling the same local flea beetle populations through time (Table 6). The results concurred with the conclusions drawn from the general survey – sites in the Peace River region, Central Alberta and North Saskatchewan had *P. striolata* as the main flea beetle present throughout the survey. South Alberta and Central Saskatchewan had populations shifted (Table 5). This is most dramatically illustrated in Fig. 2, which depicts proportions of flea beetles collected from the exact same location at the Saskatoon Research Centre Farm (Saskatoon1) over a 7 year period. Surveys of flea beetles at the same four locations in South Saskatchewan indicate *P. striolata* proportions were not increasing there. Populations of flea beetles were variable at four sites in Central and South Manitoba (Table 6); however, 10 of 17 site years had *P. striolata* higher than 20% of the flea beetle population maximum. While these generalizations held true for most sites, exceptions did occur; the proportion of *P. striolata* at the Cardiff, AB site decreased through time for reasons unknown.

Despite the increase in *P. striolata* and Other flea beetle proportions found during the course of the survey, *P. cruciferae* was the most frequently collected species at locations with high flea beetle numbers. This species predominated at 40 of 46 sites where numbers were greater than 10/trap/day at the population peak (Table 3). Of the six site-years where high numbers of *P. striolata* predominated, four occurred in Alberta in 2011. *Microctonus* spp, parasitic wasps of flea beetles, were identified from 36 location-years sampled across the three Prairie Provinces and North Dakota, indicating a general distribution wherever flea beetles were found. In 20 sites from which *Microctonus* spp. were collected, *P. striolata* was the most numerous flea beetle surveyed.



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At 14 sites, *P. cruciferae* predominated, at one Alberta site adults of *Ps. punctulata* were the most numerous flea beetle caught on the traps, and in one site in North Dakota other flea beetles (*Chaetocnema* spp.) were most numerous. Proportions of parasitoid to flea beetle were low, although this may have been a reflection of the relative attractiveness of the yellow sticky trap to the wasp. Accurate determination of parasitism levels requires rearing of flea beetles and parasitoids, not trapping.

**Discussion**

Results from the current investigation both corroborate and contradict those from historic studies. When flea beetles first became a problem in rapeseed production in the early 1970s, several surveys were conducted to determine flea beetle species composition and biology on the prairies. In a 1971-1974 investigation of flea beetles in prairie rapeseed fields, Burgess (1977) found that *P. cruciferae* was by far the most abundant and serious pest species, followed in order by *Ps. punctulata* and *P. striolata*. Geographically, *P. cruciferae* was commonly found throughout Manitoba, Saskatchewan, and central and southern Alberta; few *P. cruciferae* were present in collections of flea beetles in the Peace River region in 1973, with *Ps. punctulata* the most common species there (Burgess 1977). Burgess (1977) collected *P. striolata* across the parkland agricultural area from southern Manitoba to north of the Peace River in Alberta, usually in fewer numbers than *P. cruciferae* or *Ps. punctulata*. *P. striolata* was not found in 1973 and1974 in the Lethbridge region of southern Alberta. Wylie (1979) found that *P. cruciferae* comprised 80-90% of the flea beetle populations on rapeseed crops in the Red River Valley, *P. striolata* comprised less than 10%, and *Ps. punctulata* comprised most of the remainder. Populations near Portage, Brandon, Virden, Birtle and Neepawa had similar compositions, while Interlake populations around Dauphin, Grandview, and Roblin had *P. cruciferae* numbers in the 50-70% range, with *P. striolata* comprising most of the remainder (Wylie 1979). Burgess (1977) found *Ps. punctulata* to be present in a large number of rape fields across the agricultural area from southern Manitoba to northern Alberta, but only occasionally was it the most common flea beetle found in a field, and never at economic levels. Over time *P. striolata* was noted to be more abundant than in the past, especially in the northern parkland area of the prairies (Wylie 1979, Burgess 1984, Burgess and Spurr 1984).

In contrast to the findings of Burgess (1977), in the current survey *P. striolata* was the predominant flea beetle in 46 of 50 site years from the Peace River region of Alberta and British Columbia, with *P. cruciferae* most abundant in only two fields, and *Ps. punctulata* and other flea beetles most abundant in each of the two remaining fields. The results indicate that *P. striolata* has supplanted *Ps. punctulata* as the main flea beetle in the region, but it should be noted that levels of *Ps. punctulata* were not high in the region to begin with. Because *P. cruciferae* was found infrequently in the region in both studies, it is likely that the current increase in occurrence of *P. striolata* is not so much a displacement of the niche previously occupied by *P. cruciferae*,



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but simply an expansion of populations of *P. striolata* in the area. This expansion occurred concomitantly with the amount and frequency of rapeseed/canola grown in the region. Burgess (1982) predicted that problems with *P. striolata* could occur if rapeseed production was extended northward into the boreal forest zone. Similar to results from the Peace River region, the current study found *P. striolata* to be the principal flea beetle in 43 of the 50 canola fields sampled in Central Alberta, with four fields having *P. cruciferae*, three fields having Other flea beetles, and no fields having *Ps. punctulata* as the principal flea beetle. This is in direct contrast to the results of Burgess (1977) 38 years earlier when *P. cruciferae* predominated, and may represent a true species shift. However, if a shift has occurred, it happened previous to the start of the current survey, and possibly previous to the widespread use of neonicotinoid seed treatments that began in 2004. The fact that sites near Cardiff, AB, have decreasing proportions of *P. striolata* during the survey while surrounding areas had high numbers of the species points out that flea beetle species dominance is site specific. Reasons for such location anomalies within regions are unknown, but may be related to site variation, field history, and/or changing agronomic practices.

In the current study most sites in southern Alberta had very low numbers of *P. striolata*. Results from the Lethbridge area, where very low numbers of *P. striolata* were found, are similar to those of Burgess (1977), who did not collect any *P. striolata* in irrigated rape fields near the city. The results from Brooks, where *P. striolata* proportions increased from 0.4% in 2008 to 70.6% in 2011, are an interesting exception, and may represent the front of the *P. cruciferae:P. striolata* population reversal. This front may be influenced by latitude; thus, Chestomere and Strathmore, at latitudes of 51º3’ and 51º 2’N lat., respectively, are in the *P. striolata* zone; Vauxhall, Taber, and Lethbridge, at 50º 4’, 49º 47’, and 49º 44’ N lat., respectively, are in the *P. cruciferae* zone, and Brooks, at 50º 34’N lat., has a flea beetle species dominance that is changing through time.

Previous surveys (Burgess 1977, Burgess 1984, Wylie 1979) found that *P. striolata* numbers were greater in northern Saskatchewan and Manitoba than in southern areas. This was also true in the current survey, but currently the proportion of the striped beetle is much greater in northern and central areas than previously recorded, especially in years and locations when overall numbers of flea beetles are low. *P. striolata* is more shade tolerant the *P. cruciferae* (Tahvanainen 1972), and Burgess (1984) speculated that this may be a principal reason why *P. striolata* occurs in greater numbers in the northern Parkland zone than in more southerly prairies. While this factor may have had merit in the time of vast areas of land clearing, it is less pertinent today. Burgess (1984) suggested that results may have been skewed because sweep nets catch more *P. cruciferae* than *P. striolata*, which, being shade-tolerant, could occur lower down in the canopy and under leaves, making collection by sweeping difficult. This factor is not applicable to current results which are based



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on sticky traps and not sweep samples. While we did not evaluate the relative attractiveness of the yellow trap to each species encountered, this attractiveness should not have changed over the course of the survey, and thus changes in population proportions in the five years of the survey are likely valid.

Current results from southern Saskatchewan are similar to those from previous surveys, with *P. cruciferae* predominating; southern Manitoba results, on the other hand, were extremely variable and site specific. Thus, it is hard to interpret what figures of 5, 76, 6, and 72% *P. striolata* for the years 2008-2011, respectively, mean in terms of population trends of flea beetles near Carman, MB. In broad regional terms, by 2011 all three geographic regions of Manitoba had *P. striolata* as the most frequently occurring flea beetle at the time of population peak, indicating that, if not specifically, generally the striped flea beetle is the species most frequently encountered in Canadian canola fields.

The investigation found *P. cruciferae* to be the principal flea beetle in North Dakota canola fields; in 2010, 20 of 23 fields had *P. cruciferae* as their principal flea beetle species, and this ratio was 18 of 21 fields in 2011. While no North Dakota fields in 2010 had *P. striolata* as the main species (the remaining three fields had other flea beetles, chiefly *Chaetocnema* spp., as the most frequently caught flea beetle), further surveying would be required to determine if the two fields in 2011 in which *P. striolata* occurred in the greatest proportion are merely a blip or the beginning of a trend in species change.

A diverse group of other flea beetles was found in the current survey; the numbers of some of which increased through time. Small numbers of several *Phyllotreta* species other than *P. cruciferae* and *P. striolata* were found to occur near crucifers in both previous studies (Burgess 1977, Wylie 1979) and the current study. However, the numbers of *P. albionica*, *P. armoraceae*, *P. robusta*, and *P. pusilla* found in the current study were low and not any greater than found previously, suggesting that the population ecology of such species on the prairies is stable. Flea beetle species such as *Crepidodera nana*, *Epitrix tuberus*, *Mantura chrysanthemi*, and *Aphthona lacertosa* found in this survey do not feed on crucifers, and they may merely have been attracted to the yellow colour of the sticky traps. Numbers of the several species in the genus *Chaetocnema,* which were found in sites from the northern Peace River region to southern North Dakota, increased during the current survey. *Chaetocnema* species have a broad host range, including plants in the Brassciacea family, and can sometimes cause significant economic damage to a variety of cultivated crops (White 1996).There may be several reasons for the apparent increase in the number of *Chaetocnema* flea beetles caught in the survey. Higher numbers of such other species may indicate a greater care in identification as the survey wore on, they may be a reflection of specific site or geographic conditions such as high moisture conditions in eastern Saskatchewan or western Manitoba more amenable to other flea beetle species, or they may represent a true increase in numbers of



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these other flea beetles. If the latter is the case, then, depending on their host range, they could have the potential of replacing *P. cruciferae* as an economic pest of canola production. The amount of canola grown in North Dakota, where *Chaetocnema* numbers were higher relative to other sites, is proportionately much less than on the Canadian prairies, and the crucifer specialist species such as *P. cruciferae* may not have had the opportunity to proliferate as fast as in Canada. The economic impact of the *Chaetocnema* species found in the North Dakota traps is unknown. Likewise, the efficacy of neonicotinoid seed dressings on *Chaetocnema* beetles is also uncertain.

Despite the increasing occurrence of *P. striolata* and other flea beetle species found in this survey, *P. cruciferae* continues to comprise the greatest proportion of flea beetles in fields with high numbers of the pest. Most sites with high flea beetle numbers were located in the south (or in the north, in the case of North Dakota). In such locations *P. striolata* may have less optimum levels of developmental parameters than *P. cruciferae*. Investigations on interactions between the two species could answer some of the questions surrounding flea beetle species development in prairie canola fields.

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**References**

**Bain, A. and L. LeSage.** A late seventeenth century occurrence of *Phyllotreta striolata* (Coleoptera: Chrysomelidae) in North America, *Canadian Entomologist* 130, 715-719.

**Beirne, B. 1971.** Pest Insects of Annual Crop Plants in Canada. I. Lepidoptera II. Diptera III. Coleoptera, *Memoirs of the Entomological Society of Canada*, 78, 124 pp.

**Burgess, L. 1977.** Flea beetles (Coleoptera: Chrysomelidae) attacking rape crops in the Canadian prairie provinces. Can. Entomol. 108:27-36.

**Burgess, L. 1982**. Occurrence of some flea beetle pests of parkland rapeseed crops in open prairie and forest in Saskatchewan (Coleoptera: Chrysomelidae). Can. Entomol. 114: 623–627.

**Burgess, L.** 1984. Changes in relative abundance of the flea beetles *Phyllotreta striolata* and *Phyllotreta cruciferae* (Coleoptera: Chrysomelidae) in Saskatchewan parkland with increasing distance from the boreal forest, *Canadian Entomologist* 116, 653-656.

**Burgess, L. and D.T. Spurr. 1984.** Distribution and abundance of overwintering flea beetles (Coleoptera: Chrysomelidae) in a grove of trees. Environ. Entomol. 13: 941-944.

**Fauske, G. 2003.** Common flea beetles of North Dakota. North Dakota State University, Fargo, ND. http://www.ndsu.edu/ndmoths/Fleabeetles/alticini_home.htm

**Knodel, J. J., and D. L. Olson. 2002.** Crucifer flea beetle biology and integrated pest management in canola. North Dakota State University. NDSU Extension Bulletin E-1234.

**Lamb, R. J., and W. J. Turnock. 1982.** Economics of insecticidal control of flea beetles (Coleoptera: Chrysomelidae) attacking rape in Canada. Can. Entomol. 114: 827-840.

**Meers, S. 2010**. 2010 Alberta Insect Report. Appendix Ic, Provincial Insect Pest Summaries. Pp 25-30 *In* Minutes of the 50rth Annual Meeting. Western Committee on Crop Pests. Lethbridge, AB, Oct. 14, 2010. [Online] http://www.westernforum.org/WCCP%20Minutes.html

**Soroka, J. J., R. F. Grenkow, and R. B. Irvine. 2008.** Impact of decreasing ratios of insecticide treated seed on flea beetle (*Phyllotreta* spp., Chrysomelidae: Coleoptera) feeding levels and canola seed yields. J. Econ. Entomol. 101: 1811-1820.

**Tahvanainen, J.O. 1972.** Phenology and microhabitat selection of some flea beetles (Coleoptera: Chrysomelidae) on wild and cultivated crucifers in Central New York. Entomol. Scand. 3: 120-138.

**Tansey, J.A., L.M. Dosdall, B.A. Keddie, and R.M. Sarfraz. 2008**. Differences in *Phyllotreta cruciferae* and *P. striolata* (Coleoptera: Chrysomelidae) responses to neonicotinoid seed treatments. J. Econ. Entomol. 101: 159-




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167.
**Westdal, P.H. and W. Romanow. 1972**. Observations on the biology of the flea beetle *Phyllotreta cruciferae* (Coleoptera: Chrysomelidae), *Manitoba Entomologist* 6, 34-45.
**White, R.E. 1996.** A revision of the genus *Chaetocnema* of America north of Mexico (Coleoptera: Chrysomelidae). Contributions of the American Entomological Institute **29**: 1–158.
**Wylie, G. 1979.** Observations on distribution, seasonal life history and abundance of flea beetles (Coleoptera: Chrysomelidae) that infest rape crops in Manitoba. Can. Entomol. 113: 665-671.

Table 1. Regions and number of locations that were surveyed with yellow sticky traps for crucifer-feeding flea beetles across the prairies 2007-2011.

| Province/state | Region | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|
| Alberta | Peace River | 7 | 3 | 14 | 13 | 13 |
| | Central | - | 12 | 7 | 13 | 16 |
| | South | - | 4 | 3 | 6 | 10 |
| Saskatchewan | North | - | 2 | 3 | 10 | 9 |
| | Central | 9 | 2 | 3 | 4 | 6 |
| | South | 2 | 4 | 6 | 12 | 11 |
| Manitoba | North | - | - | 2 | 7 | 6 |
| | Central | 3 | 4 | 3 | 6 | 5 |
| | South | 4 | 3 | 3 | 4 | 2 |
| North Dakota | North | - | - | - | 10 | 11 |
| | Central | - | - | - | 5 | 2 |
| | South | - | - | - | 8 | 8 |
| **Total** | | **25** | **34** | **44** | **98** | **99** |



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Table 2. Number of survey locations with maximum flea beetle numbers less than, equal to, or greater than 5-10 per yellow sticky trap per day, 2007-2011.

| | | 2011 | | | | All years | | | |
|---|---|---|---|---|---|---|---|---|---|
| Area | Region | No. sites | <5 | 5-10 | >10 | No. sites | <5 | 5-10 | >10 |
| AB | Peace R. | 13 | 12 | 1 | 0 | 50 | 43 | 6 | 1 |
| | Central | 16 | 9 | 4 | 3 | 50 | 36 | 11 | 3 |
| | South | 10 | 5 | 2 | 3 | 21 | 10 | 4 | 7 |
| SK | North | 9 | 8 | 1 | 0 | 24 | 23 | 1 | 0 |
| | Central | 6 | 5 | 1 | 0 | 24 | 21 | 2 | 1 |
| | South | 11 | 6 | 3 | 2 | 35 | 17 | 10 | 8 |
| MB | North | 6 | 4 | 2 | 0 | 15 | 9 | 4 | 2 |
| | Central | 5 | 0 | 2 | 3 | 21 | 6 | 6 | 9 |
| | South | 2 | 1 | 0 | 1 | 16 | 6 | 5 | 5 |
| ND | North | 11 | 3 | 3 | 5 | 21 | 8 | 6 | 7 |
| | Central | 2 | 1 | 0 | 1 | 7 | 5 | 0 | 2 |
| | South | 8 | 8 | 0 | 0 | 16 | 15 | 0 | 1 |
| **Total** | | **99** | **62** | **19** | **18** | **300** | **199** | **55** | **46** |
| North* | | | | | | 105 | 90 | 11 | 4 |
| Central | | | | | | 100 | 66 | 19 | 15 |
| South* | | | | | | 95 | 43 | 25 | 27 |
| **Total** | | | | | | **300** | **199** | **55** | **46** |



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| | | 2007 | | | | 2008 | | | |
|---|---|---|---|---|---|---|---|---|---|
| Area | Region | No. sites | <5 | 5-10 | >10 | No. sites | <5 | 5-10 | >10 |
| AB | Peace R. | 7 | 3 | 3 | 1 | 3 | 3 | 0 | 0 |
| | Central | - | - | - | - | 12 | 10 | 2 | 0 |
| | South | - | - | - | - | 4 | 0 | 2 | 2 |
| SK | North | - | - | - | - | 2 | 2 | 0 | 0 |
| | Central | 9 | 8 | 0 | 1 | 2 | 2 | 0 | 0 |
| | South | 2 | 2 | 0 | 0 | 4 | 3 | 1 | 0 |
| MB | North | - | - | - | - | - | - | - | - |
| | Central | 3 | 2 | 1 | 0 | 4 | 0 | 0 | 4 |
| | South | 4 | 3 | 0 | 1 | 3 | 0 | 2 | 1 |
| **Total** | | **25** | **18** | **4** | **3** | **34** | **20** | **7** | **7** |

| | | 2009 | | | | 2010 | | | |
|---|---|---|---|---|---|---|---|---|---|
| Area | Region | No. sites | <5 | 5-10 | >10 | No. sites | <5 | 5-10 | >10 |
| AB | Peace R. | 14 | 12 | 2 | 0 | 13 | 13 | 0 | 0 |
| | Central | 9 | 4 | 5 | 0 | 13 | 11 | 2 | 0 |
| | South | 1 | 1 | 0 | 0 | 6 | 4 | 0 | 2 |
| SK | North | 3 | 3 | 0 | 0 | 10 | 10 | 0 | 0 |
| | Central | 3 | 3 | 0 | 0 | 4 | 3 | 1 | 0 |
| | South | 6 | 1 | 3 | 2 | 12 | 5 | 3 | 4 |
| MB | North | 2 | 0 | 1 | 1 | 7 | 5 | 1 | 1 |
| | Central | 3 | 1 | 1 | 1 | 6 | 3 | 2 | 1 |
| | South | 3 | 0 | 2 | 1 | 4 | 2 | 1 | 1 |
| ND | North | - | - | - | - | 10 | 5 | 3 | 2 |
| | Central | - | - | - | - | 5 | 4 | 0 | 1 |
| | South | - | - | - | - | 8 | 7 | 0 | 1 |
| Total | | **44** | **25** | **14** | **5** | **98** | **72** | **13** | **13** |

***** Because ecoclimate for *P. cruciferae* in North Dakota is most favourable closest to the Canadian border (Olfert, unpubl. data), flea beetle numbers from ND were included in the "mirror image" of numbers from Canada, that is, those from northern ND were included with numbers from southern Canada, and numbers from southern ND were included with northern Canadian numbers.



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Table 3. Locations across the prairies where maximum flea beetle numbers per sticky trap at the population peak exceeded 10 per day and the species that predominated at the population peak.

| Year | Trap location | Maximum flea beetle numbers/trap/day | Predominant flea beetles | |
|---|---|---|---|---|
| | | | Species | Proportion (%) |
| 2007 | Saskatoon2, SK | 30.3 | *P. cruciferae* | 97.6 |
| | Rosenfeld, MB | 20.2 | *P. cruciferae* | 99.7 |
| | Sweetwater, BC | 15.7 | *P. striolata* | 98.0 |
| 2008 | Griswald, MB | 48.3 | *P. cruciferae* | 96.3 |
| | Oakville, MB | 28.1 | *P. cruciferae* | 94.2 |
| | Portage la Prairie, MB | 25.4 | *P. cruciferae* | 77.7 |
| | Lethbridge2, AB | 18.4 | *P. cruciferae* | 98.8 |
| | Lethbridge1, AB | 16.1 | *P. cruciferae* | 98.1 |
| | Carman, MB | 13.9 | *P. cruciferae* | 93.6 |
| | Rignold, MB | 12.3 | *P. cruciferae* | 70.9 |
| 2009 | Oakville, MB | 37.9 | *P. cruciferae* | 76.0 |
| | Avonlea2, SK | 28.6 | *P. cruciferae* | 99.6 |
| | Avonlea1, SK | 28.0 | *P. cruciferae* | 98.6 |
| | Teulon, MB | 25.5 | *P. striolata* | 55.0 |
| | Lowe Farm, MB | 12.7 | *P. cruciferae* | 96.0 |
| 2010 | Avonlea1, SK | 58.8 | *P. cruciferae* | 99.3 |
| | Bottineau, ND | 44.8 | *P. cruciferae* | 97.2 |
| | Oakville, MB | 41.3 | *P. cruciferae* | 91.4 |
| | St. Pierre, MB | 37.2 | *P. cruciferae* | 77.6 |
| | Ethelbert, MB | 23.7 | *P. cruciferae* | 71.9 |
| | LethbridgeE AB | 20.3 | *P. cruciferae* | 99.8 |
| | Moose Jaw SK | 18.0 | *P. cruciferae* | 95.3 |
| | Mott3 ND | 12.5 | *P. cruciferae* | 96.8 |
| | Langdon ND | 11.5 | *P. cruciferae* | 99.1 |
| | LethbridgeW AB | 11.6 | *P. cruciferae* | 99.4 |
| | Indian Head2, SK | 11.2 | *P. cruciferae* | 75.0 |
| | Norwich ND | 10.6 | *P. cruciferae* | 95.8 |
| | Richardson SK | 10.3 | *P. cruciferae* | 93.2 |
| 2011 | Brandon, MB | 91.2 | *P. cruciferae* | 81.6 |
| | Antler, ND | 40.0 | *P. cruciferae* | 94.5 |
| | Bottineau, ND | 37.5 | *P. cruciferae* | 99.7 |
| | Rugby, ND | 29.6 | *P. cruciferae* | 99.9 |
| | Portage la Prairie, MB | 28.1 | *P. cruciferae* | 86.8 |
| | Simcoe, ND | 22.1 | *P. cruciferae* | 99.4 |
| | Oakville, MB | 20.7 | *P. cruciferae* | 74.7 |
| | Lethbridge1, AB | 19.1 | *P. cruciferae* | 99.6 |
| | Swift Current, SK | 14.2 | *P. cruciferae* | 84.7 |
| | Rowatt, SK | 14.1 | *P. cruciferae* | 98.1 |
| | Barrhead, AB | 13.5 | *P. striolata* | 98.3 |
| | LethbridgeTP1, AB | 13.3 | *P. cruciferae* | 99.0 |
| | Mohall, ND | 13.1 | *P. cruciferae* | 96.8 |
| | LethbridgeTP2, AB | 11.2 | *P. cruciferae* | 99.1 |
| | Morinville, AB | 11.1 | *P. striolata* | 93.1 |
| | Wetaskiwin, AB | 11.0 | *P. striolata* | 96.3 |
| | Max, ND | 10.8 | *P. cruciferae* | 96.7 |
| | Carman, MB | 10.6 | *P. striolata* | 71.5 |



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Table 4. Number of locations where maximum flea beetle numbers correspond to particular species at the time of population peak near canola fields across the prairies, by region 2007-2011.

| | | 2007 | | | 2008 | | | 2009 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Area** | **Region** | ***P.cruc*** | ***P.strio*** | **Other** | ***P.cruc*** | ***P.strio*** | **Other** | ***P.cruc*** | ***P.strio*** | **Other** |
| AB | Peace R. | 0 | 7 | 0 | 0 | 3 | 0 | 0 | 13 | 1 |
| | Central | - | - | - | 1 | 11 | 0 | 1 | 6 | 0 |
| | South | - | - | - | 4 | 0 | 0 | 1 | 2 | 0 |
| SK | North | - | - | - | 0 | 2 | 0 | 0 | 3 | 0 |
| | Central | 8 | 1 | 0 | 1 | 1 | 0 | 1 | 2 | 0 |
| | South | 2 | 0 | 0 | 4 | 0 | 0 | 6 | 0 | 0 |
| MB | North | - | - | - | - | - | - | 0 | 2 | 0 |
| | Central | 3 | 0 | 0 | 4 | 0 | 0 | 2 | 1 | 0 |
| | South | 4 | 0 | 0 | 2 | 1 | 0 | 2 | 1 | 0 |
| **Total** | | **17** | **8** | **0** | **16** | **18** | **0** | **13** | **30** | **1** |

| | | 2010 | | | 2011 | | | All years | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Area** | **Region** | ***P.cruc*** | ***P.strio*** | **Other** | ***P.cruc*** | ***P.strio*** | **Other** | ***P.cruc*** | ***P.strio*** | **Other** |
| AB | Peace R. | 0 | 13 | 0 | 1 | 11 | 1 | 1 | 47 | 2 |
| | Central | 1 | 11 | 1 | 1 | 13 | 2 | 14 | 40 | 4 |
| | South | 6 | 0 | 0 | 7 | 2 | 1 | 8 | 4 | 1 |
| SK | North | 1 | 9 | 0 | 0 | 7 | 2 | 1 | 21 | 2 |
| | Central | 2 | 2 | 0 | 0 | 6 | 0 | 12 | 12 | 0 |
| | South | 12 | 0 | 0 | 11 | 0 | 0 | 35 | 0 | 0 |
| MB | North | 1 | 6 | 0 | 1 | 4 | 1 | 2 | 12 | 1 |
| | Central | 3 | 3 | 0 | 3 | 2 | 0 | 15 | 6 | 0 |
| | South | 4 | 0 | 0 | 1 | 1 | 0 | 13 | 3 | 0 |
| ND | North | 9 | 0 | 1 | 10 | 1 | 0 | 19 | 1 | 1 |
| | Central | 3 | 0 | 2 | 2 | 0 | 0 | 5 | 0 | 2 |
| | South | 8 | 0 | 0 | 6 | 1 | 1 | 14 | 1 | 1 |
| **Total** | | **50** | **44** | **5** | **43** | **48** | **8** | **139** | **147** | **14** |



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Table 5. Proportion (%) of *Phyllotreta cruciferae* (crucifer), *P. striolata* (striped), *Psylliodes punctulata* (hop) and other flea beetles collected on yellow sticky traps at the time of population peak over all locations across the prairies by a) province/state, and b) region, 2007-2011.

| | 2007 | | | 2008 | | | 2009 | | | | 2010 | | | | 2011 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **a) Prov/ state** | *P. cruc* | *P. striol* | *Ps. punct** | *P. cruc* | *P. striol* | *Ps. punct** | *P. cruc* | *P. striol* | *Ps. punct* | **Other** | *P. cruc* | *P. striol* | *Ps. punct* | **Other** | *P. cruc* | *P. striol* | *Ps. punct* | **Other** |
| Alberta! | 3.5 | 84.8 | 11.7 | 29.3 | 69.0 | 1.7 | 11.8 | 78.2 | 9.4 | 0.6 | 26.9 | 63.6 | 2.4 | 7.0 | 25.6 | 63.4 | 5.0 | 5.9 |
| Saskatchewan | 90.2 | 7.8 | 1.9 | 50.6 | 39.3 | 10.0 | 59.4 | 38.8 | 1.7 | 0 | 52.6 | 39.8 | 5.1 | 2.5 | 37.6 | 49.7 | 3.1 | 9.5 |
| Manitoba | 89.8 | 10.0 | 0.2 | 77 | 21 | 1 | 49.5 | 48.6 | 1.0 | 0.9 | 45.8 | 49.4 | 2.4 | 2.4 | 32.4 | 58.4 | 8.8 | 0.4 |
| N Dakota | - | - | - | - | - | - | - | - | | - | 83.3 | 02.3 | 0.5 | 13.8 | 80.3 | 11.3 | 1.3 | 7.1 |
| **b) Region** | | | | | | | | | | | | | | | | | | |
| AB North! | 3.5 | 84.8 | 11.7 | 15.3 | 79.2 | 5.5 | 2.8 | 81.9 | 14.2 | 1.1 | 8.5 | 81.1 | 3.4 | 7.0 | 12.5 | 75.7 | 1.6 | 10.2 |
| Central | - | - | - | 9.9 | 89.2 | 0.9 | 19.3 | 77.5 | 3.1 | 0.1 | 14.2 | 73.4 | 2.1 | 10.3 | 6.8 | 79.2 | 8.2 | 5.8 |
| South | - | - | - | 98.0 | 1.0 | 0.9 | 36.2 | 62.3 | 1.5 | 0 | 94.4 | 4.4 | 1.1 | 0 | 72.9 | 22.2 | 4.4 | 0.6 |
| SK North | - | - | - | 4.0 | 92.4 | 3.7 | 12.3 | 85.1 | 2.6 | 0 | 9.7 | 78.5 | 5.2 | 6.6 | 0.1 | 82.0 | 5.6 | 12.4 |
| Central | 88.0 | 9.5 | 2.4 | 34.7 | 39.1 | 26.2 | 43.6 | 55.8 | 0.6 | 0 | 55.3 | 30.8 | 13.9 | 0 | 11.6 | 75.1 | 2.4 | 11.1 |
| South | 100 | 0 | 0 | 82.0 | 12.8 | 5.0 | 91.0 | 7.1 | 1.8 | 0.1 | 87.5 | 10.4 | 2.0 | 0 | 82.5 | 9.5 | 1.5 | 6.5 |
| MB North | - | - | - | - | - | - | 26.2 | 73.1 | 0.6 | 0 | 22.7 | 65.8 | 5.6 | 5.9 | 17.6 | 69.4 | 13.0 | 0 |
| Central | 86.2 | 13.4 | 0.4 | 84.8 | 13.4 | 0.8 | 59.2 | 39.9 | 0.9 | 0 | 51.2 | 48.6 | 0.1 | 0.1 | 48.2 | 51.5 | 0 | 0.3 |
| South | 92.5 | 7.5 | 0 | 67.2 | 32.0 | 0.8 | 55.4 | 41.0 | 1.4 | 2.1 | 78.1 | 21.8 | 0.05 | 0.05 | 37.0 | 43.0 | 18.2 | 1.8 |
| ND North | - | - | - | - | - | - | - | - | - | - | 80.0 | 3.5 | 1.0 | 15.5 | 82.8 | 14.8 | 0.7 | 1.9 |
| Central | - | - | - | - | - | - | - | - | - | - | 67.8 | 2.7 | 0 | 29.5 | 95.7 | 4.2 | 0 | 0.1 |
| South | - | - | - | - | - | - | - | - | - | - | 97.2 | 0.7 | 0.2 | 1.9 | 73.2 | 8.2 | 2.6 | 16.0 |

* In 2007 and 2008 the *Ps. punct* category included a small number of flea beetles other than *Psylliodes punctulata* (hop flea beetle).
! Including two sites from British Columbia in 2007



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Table 6. Proportion (%) of *P. striolata* striped flea beetles collected on yellow sticky traps in or near canola fields that were located within 2 km of previous year`s sites, by location 2007-2011.

| Province | Region | Location | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|
| Alberta | Peace River | BeaverlodgeRF | 96.6 | 100 | 94.0 | 90.7 | 97.7 |
| | Central | Barrhead | | 100 | 94.2 | 90.9 | 98.9 |
| | | Westlock | | 100 | 98.8 | 96.0 | 98.9 |
| | | Morinville | | 98.2 | 91.4 | 93.7 | 94.8 |
| | | Cardiff | | 87.0 | 74.8 | 50.0 | 40.1 |
| | | Ft. Saskatchewan | | 93.3 | 88.7 | 94.2 | 95.2 |
| | South | Brooks | | 0.4 | 8.3 | 20.0 | 70.6 |
| Saskatchewan | North | Smeaton | | 94.0 | 93.0 | 92.9 | 88.2 |
| | | Melfort | | 90.7 | 100 | 100 | 98.4 |
| | Central | Saskatoon1 | 65.8 | 71.0 | 61.4 | 51.9 | 92.0 |
| | | Saskatoon2 | 1.4 | 7.2 | 6.0 | 47.2 | 85.4 |
| | South | Avonlea 1 | | 40.0 | 0.4 | 0.8 | 1.5 |
| | | Avonlea2 | | 11.3 | 1.1 | 0.5 | 3.4 |
| | | Richardson | | 0 | 1.9 | 0.5 | 1.9 |
| | | Rowatt | | 0 | 0 | 5.4 | 1.2 |
| Manitoba | Central | Portage la Prairie | 26.6 | 21.7 | - | 29.9 | 6.5 |
| | | Oakville | 9.4 | 5.7 | 21.3 | 7.3 | 42.8 |
| | South | Carman | | 5.3 | 76.2 | 5.7 | 71.5 |
| | | Lowe Farm | | 22.0 | 4.1 | 24.2 | 14.5 |



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Figure 1. Proportion of flea beetle species collected from yellow sticky traps placed near or in canola fields in the spring across the Prairies, 2007-2011.




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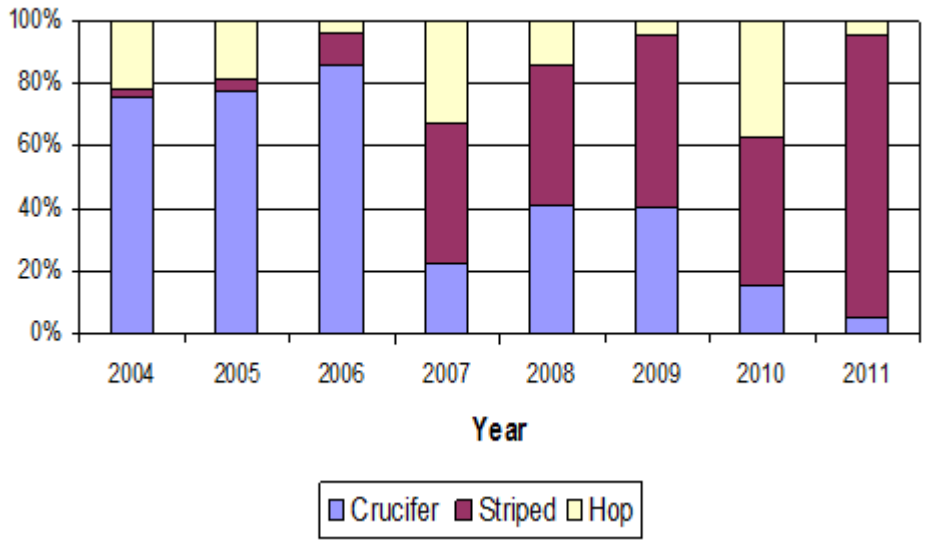
Figure 2. Proportion of flea beetle species collected on yellow sticky traps near the edge of a canola plot, Saskatoon Research Centre Farm, 2004-2011.



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